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Background and Effects of Physical Therapy for Adult Patients with Constipation, A Systematic Review

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Abstract

Constipation is a – often chronic - common and prevalent gastrointestinal motility disorder with high impact on quality of life, daily, sport and work activities of patients. Constipation has been defined as abnormal stool frequency < 3 bowel movements (BMs) per week. Besides this, also other symptoms, such as excessive straining, passage of hard stool, inability to defecate at will, unproductive urges, and sensation of incomplete evacuation, occur. Few systematic reviews have investigated the effectiveness of physical therapy. Several conservative treatment modalities for patients with constipation exist, in many cases up to now without sufficient or convincing scientific or clinical evidence. Often based on limited data about their effect, recommendations, advise, as first-line treatments, before any specific medication is subscribed, the use of general exercises or physical activity, behavioral changes regarding fluid intake and bowel habit and – regimen are mentioned. Next to this, physical therapy is recommended.

This systematic review evaluated the effects of physical therapy on constipation, quality of life (QOL), and muscle strength and -relaxation in adult patients with constipation. Six RCTs met our study selection criteria. The PEDro rating score was used to classify the methodological quality, resulting in moderate to high methodological quality of the studies. Current RCT data may indicate positive effects of physical therapy for patients with pelvic floor dysfunction related to constipation, but more high-quality studies are warranted.

Keywords: Pelvic floor; Constipation; Obstipation; Systematic review; Biofeedback

Introduction

Constipation is a – often chronic - common and prevalent gastrointestinal motility disorder Because of it, many patients have decreased daily live activities. About 30 % of the general population experiences problems with constipation during life time, with elderly people and women being mostly affected [1]. Constipation has also a huge impact on sport- and work activities. Standardization of terminology and definition of constipation have been operationalized in the Rome diagnostic criteria for constipation, the Rome IV criteria (Table 1), especially for enrolment in clinical trials [2,3]. However, so far, no widely accepted, useful definition for the clinical practice of constipation exists. Constipation has been defined as abnormal stool frequency < 3 bowel movements (BMs) per week [4]. Besides this, also other symptoms, such as excessive straining, passage of hard stool, inability to defecate at will, unproductive urges, and sensation of incomplete evacuation, occur (Table 2) [4,5].

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Table 1: ROME IV criteria for functional constipation.

1	Straining to evacuate	>25% of defecations
	Lumpy or hard stools	>25% of defecations
	Sensation of incomplete evacuation	>25% of defecations
	Sensation of anorectal obstruction/blockage	>25% of defecations
	Manual maneuvers to facilitate defecations	>25% of defecations
	Less than three evacuations per week	Yes
2	Diarrhea must not be present except after using a laxative	
3	Insufficient criteria for irritable bowel syndrome (IBS)	
Symptoms must be present for at least 6 months before the diagnosis		

Table 2: Defecatory and post-defecatory symptoms of constipation.

Feeling of incomplete bowel evacuation	Complaint that the rectum does not feel empty after defecation and may be accompanied by a desire to defecate again.
Straining to defecate	Complaint of the need to make an intensive effort (by abdominal straining or Valsalva) to either initiate, maintain, or improve defecation.
Sensation of blockage	Complaint suggestive of anorectal obstruction.
Digitation	Complaint of the need to make an intensive effort (by abdominal straining or Valsalva) to either initiate, maintain, or improve defecation.
	Vaginal digitation: Use of thumb or fingers in the vaginal to assist in evacuation of stool.
Splinting	Support perineum or buttocks manually (usually with thumb or fingers) to assist in evacuation of stool content.
Post defecatory soiling	Soiling occurring after defecation.

To the best of our knowledge, few systematic reviews have investigated the effectiveness of physical therapy such as pelvic floor muscle training (PFMT), alone or in combination with biofeedback (BF), electrical stimulation (ES), rectal balloons, defecation training, behavioral training, relaxation therapy or other types of exercises. The lack of consensus on the effects of these treatments necessitated this systematic review. Therefore, this systematic review evaluated the effects of physical therapy on constipation, quality of life (QOL), and muscle strength and -relaxation in adult patients with constipation, compared with no treatment, placebo, sham, and surgery.

Assessment and evaluation

Any relevant physician should check for the presence of abdominal pain as a primary symptom (if present, consider irritative bowel syndrome (IBS) with constipation (IBS-C)) and needs to eliminate any existing red flags suggestive of organic disease (e.g., unexplained weight loss > 4.5 kg, colorectal cancer, anemia, symptoms or signs of occult blood). If present, specialized medical consultation is absolutely required. If no red flags, the cause of constipation should be evaluated as primary or secondary.

Primary (idiopathic) constipation involves IBS-C, normal-transit constipation, slow-transit constipation, defecatory or rectal evacuation disorders e.g., pelvic floor dyssynergia, anismus, descending perineum syndrome, spastic pelvic floor syndrome, paradoxical pelvic floor contraction [6].

Secondary constipation because of inadequate diet, dehydration, inadequate physical activity, use of certain medications, e.g., antidepressants, pain medication, diuretics, and neurologic conditions, e.g., CVA, MS, psychological conditions, e.g., depression, anxiety [6]. For primary (idiopathic) constipation there are 3 categories, classified as 1. normal-transit constipation (NTC; patients in this subgroup may have symptoms also indicating IBS-C) [7], slow-transit constipation (STC), and 3. anorectal outlet abnormalities (including dyssynergia and pelvic floor dysfunction [5]. These categories may also overlap (e.g., STC and pelvic floor dysfunction, NTC, and IBS-C) [5,7]. Symptoms of both chronic constipation and IBS-C as well as common co-morbidities may co-exist [8]. Symptoms of prolonged or excessive straining, feelings of incomplete evacuation, application of perineal or vaginal pressure, or direct digital evacuation of stool (including soft stool) may be indications of anorectal outlet abnormality [6]. These symptoms should be followed-up with a PFM functional assessment [9,10]. Signs of no- or insufficient perineal descent during observation and anorectal digital examination indicate pelvic floor dysfunction such as paradoxical contractions of the PFM and external anal sphincter. Medical data based on physiologic studies (colonic-transit tests, anorectal manometry, balloon expulsion tests, and defecography) can be helpful for the physical therapist before start of the physical therapeutic diagnostic consultation to further evaluate the consequences of the health problem constipation in order to determine if and to what extent physical therapy is warranted for the individual patient under assessment and evaluation [5,9]. Realistically, in most cases results of these tests are not (yet) available for the physical therapist. Frequently, they only will be performed until dietary and lifestyle changes, trials of fiber and laxatives and physical therapy have produced no improvement [5].

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Physical therapy for constipation

Several conservative treatment modalities for patients with constipation exist, in many cases up to now without sufficient or convincing scientific or clinical evidence. Often based on limited data about their effect, recommendations, advise, as first-line treatments, before any specific medication is subscribed, the use of general exercises or physical activity, behavioral changes regarding fluid intake and bowel habit and – regimen has been descibed Next to this, specialized physical therapy is recommended.

Besides PFM training, physical therapy for constipation includes use of BF, behavioral therapy, and ES. BF and ES stimulation are often used for patients with outlet obstruction or functional defecation disorders [11]. BF supports PFM and anal sphincter muscle training by converting intracavity electronic signals or pressure, captured with a small intra-rectal balloon or electronic probe to a computer screen which makes it possible for the patient to see (and/or hear) if and to what extent the pelvic floor is used adequately during PFM contractions and relaxations during physical activities [9]. It can be used to train patients to relax their PFM while straining and to coordinate relaxation and pushing to achieve defecation. BF may be helpful in patients with symptoms or physical examination findings that suggest pelvic floor dysfunction, or for those in whom conservative therapies have failed and who have diagnostic test results indicative of this disorder [5,12,13].

Physical therapy for (chronic) constipation aims to improve or restore normal bowel function and relieve symptoms such as abnormal or excessive straining during defecation, bloating, and feelings of incomplete evacuation. Together with physical therapy in patients with STC and some patients with NTC laxatives or promotility agents may be used [6]. In case of pelvic floor dyssynergia the physical therapist specialist may offer PFMT with BF, alone or in combination with prescribed medication, to stimulate coordination, timing and selective contractions/relaxation of the PFM including the external anal sphincter [5,14].

If there is no known secondary cause of constipation, also the latest International Consultation on Incontinence generally recommends physical therapy as first-line therapy [15], involving also general regular exercise, increased fluid intake, and bowel habit training [14]. This in the light of who will benefit still largely is unknown, since only limited clinical trial data supporting the effectiveness of such approaches are available. Camilleri and Bharucha [12] proposed targeted therapy for chronic constipation: physical therapy (PFMT with BF how to coordinate abdominal and PFM in order to increase intra-abdominal pressure while keeping the PFM relaxed during evacuation) for outlet dysfunction and evacuation disorders, and pharmacological treatment for constipation not associated with outlet dysfunction. The authors stated that BF therapy involving coordinated functional activity of abdominal muscles and relaxation of the PFM during evacuation of stool is the treatment of choice for functional defecation disorders. More high-quality scientific studies to identify those patients who will benefit and who will not, particularly when evaluated in patients with *chronic* constipation, is urgently needed [5]. Johanson indicated that ritualizing bowel habits may also help some patients [6]. He made his recommendation on the basis of observations that most patients without constipation have a regular pattern of defecation and that certain activities (e.g. waking and eating) stimulate colonic activity [14]. So far, no prospective study to warrant this recommendation has been performed [16].

Materials and Methods

This investigation was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [17] statement and the JBI methodology for systematic reviews. We searched the Cochrane Incontinence Group Specialized Trials Register, which contains trials identified from the Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE, PreMEDLINE, EMBASE, ClinicalTrials.gov (a register of clinical trials and handsearching of journals and conference proceedings (from 1990 to December 2023). We also searched other electronic and non-electronic bibliographic databases and the reference lists of the included studies as well as contacting researchers in the field to identify other relevant trials. Selection criteria were randomized controlled trials with full reports in English, German, French, Portuguese or Dutch reporting on PFMT, behavioral therapy BF or ES as conservative treatment in adults with constipation.

For our data collection and analysis the two review authors (BB and MS) independently assessed all the identified trials for eligibility. To assess the quality of trials we used the PEDro scale [18]. This scale assesses quality based on the presence or absence of design features thought to influence validity, including true concealed randomization, blinding of participants and assessors, adequate follow-up and intention-to-treat analysis (see Table 4). So, risk of bias was assessed using this scale for determining bias. Disagreements were resolved by discussion, and a third reviewer was involved in the case of no consensus. Data were analyzed using Cochrane methods. Data extraction and management of the included studies was performed independently by the two review authors (BB and MS) using a standardized form. Any disagreement was resolved by discussion or by consulting a third party. Where there was insufficient information regarding the primary outcome in the published reports, study authors were contacted. For data entry, performed by BB, Review Manager software (RevMan 5.4) was used. Processing of the included data of trials was according to the Cochrane Handbook for Systematic Reviews of Interventions [19].

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Results

Totally, 23 citations were identified, 9 studies remained for the screening process. Finally, only 6 RCTs met our study selection criteria. The characteristics of the 6 included RCTs are detailed in Table 3.

Due to flaws in methodological designs, small study groups, variability in protocols, few available RCTs, until 15 years ago we widely had to rely on little scientific evidence from systematic reviews and trials and expert expertise [20].

Table 3: RCTs on physical therapy to treat constipation.

Author	**Heymen et al 1999**
Design	4-arm RCT Group (gr)1, out-patient intra-anal electromyographic biofeedback training (EMG); 2, EMG plus intrarectal balloon training (BT); 3, EMG plus a home trainer (HT); and 4, EMG, BT and HT
Sample size and age+/-sd (years)	N=40; included N=36 (26 females, 10 males) mean age 61 (range, 18-82 years)
Diagnosis	Constipation with chronic problem paradoxical puborectalis contraction (PPC) requiring laxatives, enemas, digitation or combination
Training protocol	All patients: 1x/week 1-hour outpatient BF sessions, gr 1: pelvic floor muscles (PFM) EMG activity feedback, education bowel and PF function, operant conditioning; gr 2: additional balloon distension sensory training, no home trainer, home PFMT; gr 3 in addition to gr 1 home trainer EMG BF after 1st session instructing; gr 4: in addition gr1balloon distension training and home training unit (as gr 3)
Drop-out	4/40
Adherence	Not reported
Results	↑ unassisted bowel movements (UBMs) ($p<0.05$) for gr 1, 2 and 4; gr 3 $p=0.063$ ↓ use of cathartics for gr 1, 2, 3; gr 4 $p=0.170$ Neither addition of home trainer nor inclusion intrarectal balloon improved outcome
Author	Koutsomanis et al., 1995
Design	2-arm RCT: perianal EMG biofeedback (BF) plus balloon defecation training vs balloon defecation training alone (muscular coordination training (MCT) without a visual display cross-over BF→MCT: 3; MCT→BF: 5
Sample size and age (years)	60 adults, mean 40.5 years, range 20-64
Diagnosis	assessment of symptoms with diary card number of bowel actions and stool consistency; the number of straining episodes and total time spent straining each day; the need for digitation, episodes pain, use of laxatives, etc EMG, radiography for gut transit rate, rectal balloon expulsion
Training protocol	BF: 1-7 session of BF first same as MCT but with watching EMG trace on monitor MCT: 1-4 sessions contraction anal canal vigorously, note sensation, coordination between protrusion abdomen and relaxing PF, expulsion balloon
Drop-out	1 out of 60
Adherence	Not applicable
Results	No major differences between groups. Increased bowel frequency (N=23) explained by frequent straining efforts with passage small stools. Two patients in BF and one in MCT rectocele with barium trapping on defecating proctography. Difficulty in defecation > infrequent stools commonest problem in both groups
Author	Chiarioni et al., 2006
Design	2-arm RCT EMG BF Laxatives +bowel retraining program
Sample size and age (years)	109 (104 women); age not stated
Diagnosis	Chronic severe constipation > 12 months according to Rome III criteria, no response to standard medical treatment
Training protocol	BF: 5 weekly 30-minute training sessions; strain more effectively and to coordinate expulsion efforts with their breathing. Next, relaxation PFM. Next. defecating 50-mL, air-filled balloon, motivational support also for home training Laxatives and bowel retraining program first 6 months 14.6 g (1 packet) daily PEG 4000 (SELG 250; Promefarm, Milano, Italy) dissolved in 250 mL water. After 6 months 14.6 g twice a day; 5-minute counselling sessions, equivalent BF

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Drop-out	At 12 months FU 6/109
Adherence	All patients completed 5 BF sessions or medication counselling as prescribed. 67% subsequently ↓ intake back to 1 packet/day for remainder 12-month trial because of adverse effects (4 patients) or intolerance for taste PEG
Results	BF: paradoxical increases in pelvic floor EMG during defecation decreased from 100% before treatment to 16.7% at 6 months and remained at this level even at 24-month follow-up Laxatives: 96.4% patients continued to show paradoxical increases in pelvic floor EMG at 6 and 12 months. BF: first unable to evacuate a 50-mL, water-filled balloon decreased from 100% to 18.5% at 6 months, remained at this level at 12 months, and decreased further to 16.7% at 24 months. Laxatives: 96.4% still unable to evacuate balloon at 6 and 12 months BF: N=43 ↓ anal pressure and PFM EMG when straining Laxatives: no relaxation in all but 2 patients
Author	Rao et al., 2007
Design	3-arm RCT 1. BF (manometric-assisted anal relaxation, muscle coordination, and simulated defecation training 2. Sham feedback 3. Standard treatment (diet, exercise, laxatives)
Sample size and age (years)	77 (69 women); mean age 43, range 18-75
Diagnosis	Rome II criteria for functional constipation, exhibited dyssynergetic pattern defecation during attempted defecation, and either prolonged difficulty with expelling simulated stool (>1 minute) or prolonged delay (>20% marker retention) in colonic transit
Training protocol	Standard: attempt bowel movement for 5 minutes, 2/day, 30 minutes after eating, irrespective urge to defecate. Nurse therapist taught subjects how to improve pushing effort by using postural and diaphragmatic breathing techniques and instructed practice these manoeuvres at home for 15 minutes 3/day BF: Standard + 2x/week 1-hour BF sessions, up to max 6 sessions/3 months; Rectoanal coordination ↑ pushing effort reflected by ↑ in intra-abdominal/intrarectal pressures and synchronized relaxation reflected by ↓ in anal sphincter pressure.
Drop-out	12/77 (15.5%)
Adherence	mean (range) N sessions for both BF and sham feedback groups 5 (4– 6).
Results	BF > correct dyssynergia (P < .0001), ↑ defecation index (P <.0001), ↓ balloon expulsion time (P = .02) > than other groups. Colonic transit ↑ after BF or standard (P = .01) but not after sham. In BF N complete spontaneous bowel movements ↑ (P < .02) and > (P < .05) than other groups, and use of digital manoeuvres ↓(P = .03). Global bowel satisfaction ↑ (P =.04) in BF than sham group.
Author	Heymen et al., 2009
Design	3-arm RCT BF Diazepam Sham Sham treatment
Sample size and age (years)	84(71 women); mean age 50
Diagnosis	Chronic constipation, Rome II diagnostic criteria for pelvic floor dyssynergia; anorectal manometry and intra-anal surface electromyography to determine whether pelvic floor dyssynergia
Training protocol	Run-in phase 4 weeks education including review manometry test results and medical management. instructed not to strain excessively (< 50 percent max effort); diaries recording unassisted bowel movements, assisted bowel movements (defined as bowel movements occurring within 12 hours taking laxatives or suppositories); straining; feeling of incomplete evacuation. Training phase: 1) electromyography BF to teach relaxation pelvic floor muscles during straining to defecate, 2) use 5 mg dose of diazepam to relax skeletal muscles (taken one-two hours prior to scheduled attempt to defecate each evening), or 3) use sham tablet in place of diazepam. 6 2x/week per 3 months period. Duration training visits same for patients in all three groups (approximately 50 minutes).

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Drop-out	18/84 (21.5%)
Adherence	Not reported
Results	BF > diazepam by ITT (70% *vs.* 23% adequate relief constipation 3 months after treatment, $\chi 2 = 13.1$, $p < 0.001$), and also > sham (38% successful, $\chi 2 = 5.7$, $p = 0.017$). BF significantly > unassisted bowel movements at follow-up compared to sham ($p = .005$). BF ↓ pelvic floor EMG during straining significantly > diazepam patients ($p < 0.001$).
Author	Rao et al., 2019
Design	2-arm RCT Office BF (OB) Home BF (HB)
Sample size and age+/-sd (years)	100 (96 women); age OB: mean 42.4+/-15.4; HB 37.1 +/-11.9; range 18-65
Diagnosis	Dyssynergic defecation Rome III criteria: (1) exhibited dyssynergic pattern on anorectal manometry (ARM), and (2) either prolonged difficulty with expelling simulated stool (>1 minute), or prolonged delay (>20% marker retention) in colonic transit
Training protocol	OB: 2x/week 1-hour BF sessions, up to max 6 sessions/3 months; instruction on diaphragmatic breathing technique to enhance the push effort Rectoanal coordination ↑ pushing; effort reflected by ↑ in intra-abdominal/intrarectal pressures and synchronized relaxation reflected by ↓ in anal sphincter pressure; train patients to efficiently pass artificial stool HB: baseline visit, how use home device and 3 brief monthly office visits (total 4 visits); 15-bearing down maneuvers 2x/day throughout study period. With anal relaxation, ↑ lights would illuminate on LCD display. ↓ lights associated with paradoxical or increased anal contraction on bearing down
Drop-out	19/100
Adherence	Not reported
Results	6/ 8 QOL domains ↑ ($p<0.05$) in OB, while 4/8 domains ↑ ($p<0.05$) in HB; HB non-inferior to OB. BF significantly ↑ QOL in patients with DD regardless OB or HB setting

Koutsomanis et al. [21] compared in 60 adults with constipation perianal electromyographic (EMG) BF for relaxation plus balloon defecation training versus balloon defecation training alone. The RCT found similar improvements between groups in the number of straining episodes a week 1 week after treatment. However, reviewing the data of this RCT results should be interpreted with caution because of methodological issues: the analysis apparently included people who had crossed over to alternative treatment after only two unsuccessful treatment sessions (8 people) [22]. Heymen et al. (1999) compared four methods of biofeedback for patients with constipation [23]. Thirty-six patients were prospectively, randomly assigned to one of four protocols:

1) outpatient intra-anal electromyographic biofeedback training;
2) electromyographic biofeedback training plus intrarectal balloon training;
3) electromyographic biofeedback training plus home training; or 4) electromyographic biofeedback training, balloon training, and home training.

All 36 patients received weekly one-hour outpatient biofeedback training. Success was measured by increased unassisted bowel movements and reduction in cathartic use. In all instances patients maintained a daily log in which documentation was maintained regarding each bowel evacuation and the need for any cathartics. There was a significant improvement in outcome after all four treatment protocols for constipation; however, no significant difference was found among the treatments.

Chiarioni et al. (2006) demonstrated in a RCT of 54 patients with pelvic floor dyssynergia that BF therapy, aiming at coordinating relaxation of PFM with increase of intra-abdominal pressure by adequate use of abdominal muscles is significantly more effective than laxative use in this patient population [24]. At 6 months, 80% of patients receiving BF vs 22% of those receiving laxatives reported statistically significant symptom improvement. One RCT (77 people with chronic constipation (69 women, 8 men) compared three treatment groups: BF (relaxation, coordination PFM with abdominal muscles) versus sham versus standard treatment (including laxatives, diet, and exercise) [25]. The RCT found that BF significantly improved the rate of complete spontaneous bowel movements a week compared with sham treatment and standard treatment. BF also significantly improved global bowel satisfaction compared with sham treatment but not standard treatment at 3 months. BF significantly improved stool frequency compared with standard treatment, but not sham treatment at 3 months. The RCT also found no significant difference for BF for stool consistency or laxative consumption compared with either sham or standard treatment at 3 months [25]. Heymen et al. (2009) compared in 84 patients with dyssynergia-type constipation BF (relaxation PFM, coordination with abdominal muscles during evacuation) with diazepam or placebo [23]. All patients were trained to do PFMT to correct

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pelvic floor dyssynergia during 6 biweekly 1-hour sessions, but only BF patients received electromyography feedback. All other patients received pills 1-2 hours before attempting defecation. BF was superior to diazepam by intention to treat analysis. and also superior to placebo. BF patients had significantly more unassisted bowel movements at follow-up compared to placebo, with a trend favoring BF over diazepam. BF patients reduced pelvic floor electromyography during straining significantly more than diazepam patients. The authors concluded that instrumental BF is effective and essential for successful treatment of this kind of patients. In a fairly recent RCT comparing home and office BF (relaxation, coordination PFM/abdominal muscles) in patients with dyssynergic defecation (DD) (Rome III), Rao et al. (2019) included 100 patients (96 female, 50 in each treatment arm) to investigate whether home BF improves quality of life (QOL and is cost-effective when compared to office BF [26]. The authors concluded that BF therapy significantly improves QOL in patients with DD regardless of home or office setting. They also stated that home BF is a cost-effective treatment option for DD compared to office BF, and offers the potential of treating many more patients in the community.

Methodological quality

The PEDro rating score was used to classify the methodological quality of the 6 included trials (Table 4), resulting in moderate (5/10) to high (8/10) methodological quality. Also, for the treatment of constipation it should be noted that the two criteria related to blinding of the therapist and patient are almost impossible to meet in physical therapy trials.

Quality of the intervention

Most of the studies treated dyssynergetic defecation. In general, the training protocols refer to PFM relaxation, coordination and adequate use together with BF, but lack sufficient information on dose-response issues, intensity of home and office training and adherence to the protocols, so it is difficult to judge the quality and adequacy of the PFMT. With EMG BF electromyographic (EMG) activity and manometry BF paradoxical increases in anal pressure during straining easily could be detected [27]. BF is specifically indicated for dyssynergetic defecation. Retraining works through teaching patients to relax the PFM and anal muscles during straining. Anal pressure may be measured by means of water-perfused

Table 4: PEDro quality score of RCTs in systematic review of physical therapy to treat constipation.

E – Eligibility criteria specified												
1 – Subjects randomly allocated to groups												
2 – Allocation concealed												
3 – Groups similar at baseline												
4 – Subjects blinded												
5 – Therapist administering treatment blinded												
6 – Assessors blinded												
7 – Measures of key outcomes obtained from > 85% of subjects												
8 – Data analyzed by intention to treat												
9 – Statistical comparison between groups conducted												
10 – Point measures and measures of variability provided												
Study	E	1	2	3	4	5	6	7	8	9	10	Total score
Koutsomanis 1995	+	+	+	+	–	–	?	+	–	+	+	6
Heymen 1999	+	+	?	+	–	–	?	+	–	+	+	5
Chiarioni 2006	+	+	+	+	–	–	+	+	+	+	+	8
Rao 2007	+	+	+	+	–	–	+	+	+	+	+	8
Heymen 2009	+	+	?	+	+	–	+	–	+	+	+	7
Rao 2019	+	+	+	+	–	–	+	–	+	+	+	7

criterion is clearly satisfied; −, criterion is not satisfied; ?, not clear if the criterion was satisfied. Total score is determined by counting the number of criteria that are satisfied, except that 'eligibility criteria specified' score is not used to generate the total score. Total scores are out of 10

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catheters, solid state transducers or balloon catheters. No single technique seems superior to the others, and the choice relies on the therapist's training and experience. Anal EMG may be recorded either by intra-anal probes or by peri-anal EMG electrodes stuck to the skin [27].

Chiarioni et al. (2006) mentioned that defective expulsion is commonly investigated by asking the patient to defecate a 50-mL water-filled rectal balloon and that patients with functional defecation disorders usually fail this test [24,27]. Chiarioni et al. (2006) indicated that behavior therapy is to first explain the anorectal dysfunction and discuss its relevance with the patient before approaching the treatment [24]. The protocols used by authors of the RCTs include training the patients on a more effective use of the abdominal muscles and instructions on diaphragmatic breathing technique to enhance the push effort. Patients are next shown anal manometry or EMG recordings displaying their anal function and are taught through trial and error to relax the PFM and anal muscles during straining. By increasing the intra-abdominal/intra-rectal pressures with synchronized relaxation of the anal sphincters using visual and verbal feedback from manometry recto-anal coordination can be improved. Visual feedback on PFM relaxation and contraction is continuously encouraged by the physical therapist. When the patient has learned to relax the PFM during straining, the visual and auditory help can be discontinued. Another kind of training is to use an air-filled balloon attached to a catheter, which is slowly withdrawn from the rectum while the patient concentrates on the evoked sensation and tries to facilitate its passage [27]. Then the patient should defecate the balloon spontaneously without any assistance. Also, it is possible to use the rectal balloon for sensory retraining in case of a hyposensitive rectum. Usually, this kind of BF training is safe, has no side-effects [28] and will last up to 6 intensive supervised sessions of 30 to 60 minutes each, provided by a well-trained and experienced physical therapist [24]. RCTs comparing different BF protocols to each other are still needed.

Discussion

BF, aiming at coordinated relaxation of PFM and adequate use of abdominal muscle to increate intra-abdominal pressure during evacuation, may have a role in people with constipation caused by obstructed defecation secondary to anismus [29] or by functional outlet obstruction [30]. BF has demonstrated efficacy in that small group of chronically constipated patients who do not respond to standard therapies and who exhibit evidence of pelvic floor dyssynergia on diagnostic testing. In fact, according to Chiarioni et al (2005) BF therapy does not benefit constipated patients *without dyssynergetic defecation* [31].

The American Neurogastroenterology and Motility Society (ANMS) and the European Society of Neurogastroenterology and Motility (ESNM) convened a task force to examine the indications, study performance characteristics, methodologies used and the scientific basis, noting especially the results of RCTs and the impact of BF therapy on patient reported outcomes, objective measurements and quality of life [28]. These measures were used to provide evidence-based recommendations regarding the clinical utility and efficacy of biofeedback therapy for dyssynergetic defecation, levator ani syndrome leading to constipation. Next, the ANMS and ESNM published a position paper and consensus guidelines on BF, with the aims described before, for anorectal disorders. They have stated that, based on the strength of evidence, BF is recommended for the short term and long term treatment of constipation with dyssynergetic defecation (Level I, Grade A). They indicated also that, based on 'fair' evidence, BF may be useful in the short-term treatment of Levator Ani Syndrome with dyssynergetic defecation (Level II, Grade B) [28].

Conclusions

Current RCT data may indicate positive effects of PFMT with BF for patients with pelvic floor dysfunction related to constipation, but more specific high-quality RCTs are needed to enrich the evidence [32].

Author contributions

Conceptualization, BB. and MS.; methodology, BB.; software, BB.; validation, BB, MS,.; formal analysis, BB.; investigation, BB.; resources, BB, MS.; data curation, BB,; writing original draft preparation, BB.; writing review and editing, BB, MS.; visualization, BB.; supervision, BB.; project administration, BB, MS.

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

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