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RESEARCH ARTICLE

PHYSIOTHERAPY IN CHILDHOOD BLADDER AND BOWEL DYSFUNCTIONS: A SYSTEMATIC REVIEW OF RANDOMISED CONTROLLED TRIALS

Marieke L van Engelenburg – van Lonkhuyzen[1]*, Esther M.J. Bols[2], Janet Chase[3], Rob A. de Bie[1]

[1]Department of Epidemiology, School for Public Health and Primary Care (CAPHRI), Maastricht University Medical Centre, Maastricht, Netherlands
[2]Research group Autonomy and Participation for Persons with a Chronic Illness & Academy Physiotherapy, Zuyd University of Applied Sciences, Heerlen, The Netherlands.
[3]Paediatric Gastroenterology Victoria, Royal Children's Hospital, Melbourne, Australia

*m.vanengelenburg@maastrichtuniversity.nl

Abstract

Background: Bladder and bowel dysfunctions include daytime urinary incontinence, enuresis, urgency as well as constipation and faecal incontinence. Bladder and bowel dysfunctions are common in children of all ages worldwide. Dysfunction of the pelvic floor muscles is a major suggested cause of the bladder and bowel dysfunctions. Therefore, physiotherapists as musculoskeletal specialists, using standard motor control interventions, might play a role. There are no systematic studies that support this assumption.

Aims: To determine whether physiotherapy has beneficial effects on bladder and bowel dysfunctions in otherwise healthy children, aged 4-18 years compared to standard medical care or urotherapy. Secondary aims are to investigate whether physiotherapy have any effect at all on childhood bladder and bowel dysfunctions and if so, which type of physiotherapy is preferable.

Methods: A systematic review of randomised controlled trials (physiotherapy versus physiotherapy or physiotherapy versus no intervention, standard medical care, urotherapy, sham-intervention) was undertaken. The primary outcome was the number of cured children from bladder and bowel dysfunctions at six and twelve months. The methodological quality was assessed using the Physiotherapy Evidence Database-scale. To grade and assess the quality of the evidence, the Grading of Recommendation, Assessment, Development and Evaluation-tool was used.

Results: Sixteen out of 1728 retrieved publications were eligible for this review. Compared to standard medical care or urotherapy, in favour of physiotherapy, significantly more children were cured from faecal incontinence at 6 months, and from urinary incontinence, day and night, and urgency at 12 months. Significantly more children were cured at 6 and 12 months from all bladder dysfunctions and constipation when receiving physiotherapy. Making substantiated statements about aspects of physiotherapy intervention was impossible.

Conclusion: Physiotherapy in children over four years seems to be justified in bladder and bowel dysfunctions, but firm evidence is lacking. Further research is required. Larger pragmatic studies must be executed. Studies should be more tailored to specific age groups, taken in account the natural attrition of symptoms and developmental differences. Methods should include a range of primary and secondary outcomes which are most suitable, including questionnaires of psychometric sufficient quality. Adverse events, or its absence, should be reported.

Keywords: children; motor control interventions; physiotherapy; standard medical care; urotherapy; biofeedback; electrical stimulation; pelvic floor muscles; bladder and bowel; daytime urinary incontinence; enuresis; constipation; faecal incontinence.

BACKGROUND

Childhood bladder and bowel dysfunctions cover, separately or combined, non-neurogenic lower urinary tract symptoms and bowel dysfunctions. Childhood bladder and bowel dysfunctions, in otherwise healthy children are common in children of all ages, worldwide.[1-7]

Children with lower urinary tract symptoms generally present with various bladder problems, including daytime urinary incontinence, enuresis (bedwetting) and symptoms of urgency and frequency.[8] Daytime urinary incontinence affects approximately 7-10% of children aged 5-13 years.[9,10] Enuresis is both a symptom and a condition of intermittent urinary incontinence that occurs during periods of sleep.[8] The prevalence of primary enuresis in children in various studies lies around 15% at the age of 6 years, decreasing to 4.8% at 12-13 years and to about 3% in puberty, whereas 0.5-1% of adults still wet their beds.[11,12] The most common defaecation disorder in children is functional constipation, occurring in about 10% of children worldwide.[13-15] Faecal incontinence (FI) comprises constipation-associated FI and non-retentive FI.[16] The majority of those children (80%) have FI due to faecal retention.[14] The prevalence of functional non-retentive faecal incontinence ranges from 0.0% to 1.8% with a pooled prevalence of 0.4% (95%CI 0.2-0.7).[17] The term "functional" indicates that no organic cause can be identified.

Standard medical care (SMC) for childhood bladder and bowel dysfunctions (CBBD) consists of education for parents and child, demystification by addressing their myths and fears, dietary advice (adequate fibre and fluid), [18] and, when needed, prescription of medication.[4,8,9,16,19,20] SMC is often supported by diaries, charts, and pictures such as the Bristol Stool Form Scale.[21] SMC is often supplemented with urotherapy. Urotherapy is an umbrella term for all non-surgical, non-pharmacological interventions for lower urinary tract) in children and adolescents, aiming to normalise micturition and bowel patterns and to prevent further functional disturbances by repeated training.[18,22] Standard urotherapy includes components such as provision of information, instructions, life-style advice, counseling and documentation of symptoms.[18] Specific urotherapy is tailored towards specific disorders and includes alarm (clock) treatment, pelvic floor muscle training (with and without biofeedback), neurostimulation, clean intermittent catheterisation and specific programs for children with treatment-resistant symptoms.[18]

Dysfunction of the pelvic floor muscles is a major suggested cause of CBBD.[23-25] Factors which affect the effective interplay of autonomic and somatic function and the integrity of nerve impulse pattern generators in the brainstem are held responsible for different coordinated motor activities, in which the pelvic floor muscles are involved, such as breathing, coughing, and straining, Underactivity, overactivity or dyscoordination of the muscles, often the case in children with functional bladder and bowel dysfunctions, can lead to learned but subconscious dysfunctional patterns of motor control, which

are amenable to re-training by physiotherapists.[26]

The pelvic floor muscles work in muscle chains and in close synergy with the diaphragm, the abdominal and spinal muscles, therewith creating a functional muscular 'capsule'.[27,28] This muscular 'capsule' is used throughout the day to maintain spinal or core stability. In bladder and bowel issues, co-ordinated use of the muscle chains is essential to allow the person to remain continent, prevent incontinence and empty or evacuate both bladder and bowel. Core stability is necessary for a balanced position on the toilet, to allow relaxed bladder emptying and effective straining during defaecation. Overall, physiotherapists might play a role in treating children with bladder and bowel dysfunctions. Until now, there are no systematic studies that support this assumption.

Physiotherapists as musculoskeletal specialists use standard motor control interventions in therapy and are experienced in training (ab)normal mobility, posture and movements, muscle strength and relaxation, core stability, and the sensory systems (bodily awareness).[29] Physiotherapy in CBBD provides a patient-tailored approach and its content, sequence and intensity depends on the child's age, motivation and cognition, parents motivation, and concomitant co-morbidities. It consists of education and patient-centred instruction, comparable to standard medical care or urotherapy, added with specific physiotherapeutic *motor control interventions*, in which exercise therapy plays a central role. Exercise therapy includes motor learning programs, programs of deliberate and repeated practice to achieve cure[30-38] and sensory integration techniques.[39-43].

The aim of *motor control interventions* in CBBD is to enhance continence by practising a stabilised and relaxed posture on the toilet and adequate straining to defaecate, to increase awareness of abdominal sensations as the urge to urinate or defaecate, to increase awareness of the muscles (abdominal and pelvic floor muscles), to avoid dysfunctional voiding or dyssynergic defaecation, to achieve continence, and to prevent urinary tract infections and constipation. Varying methods, techniques, and exercise equipment as mirrors, exercise balls, and balance boards (appropriate for the age and complaints) can be used.

Exercise therapy in physiotherapy is usually supported by adjunct interventions,[22,44-49] like biofeedback, electrotherapy and massage therapy. Biofeedback includes (a) non-invasive electromyography (EMG)-biofeedback to determine and evaluate muscle activity, (b) anorectal manometry to evaluate the pressures in the anal canal, the sensation of stool in the rectum, and the neural reflexes that are needed for normal bowel movements and (c) rectal balloon training to develop awareness of the sensory thresholds and to strain in an effective way.[38,39] electrotherapy includes (a) electrical stimulation and (b) interferential therapy. It is applied to neuromodulate or to stimulate muscles in order to improve function that is lost or to increase the awareness of the pelvic floor muscles.[38,44,50] Massage is thought to encourage rectal evacuation by increasing intra-abdominal pressure and is postulated to

stimulate colonic movements so reducing symptoms of constipation.[51]

AIMS

The main review question was whether physiotherapy (delivered by physiotherapists) compared to standard medical care or urotherapy has beneficial effects on bladder and bowel dysfunctions in children aged 4-18 years. Next questions were: Whether has physiotherapy any effect at all on childhood bladder and bowel dysfunctions and when effectiveness is shown, which type of physiotherapy intervention is preferable.

METHODS

Search strategy and selection criteria.

The electronic databases PubMed, Cochrane Library, the Physiotherapy Evidence Database (PEDro) were searched from inception till 2023 January 1st. In addition, potential articles were searched in the reference lists of identified trials and reviews. Key words (Mesh and free text words) were constipation, dysfunctional elimination syndrome, (dyssynergic/dyssynergia) def(a)ecation, encopresis, f(a)ecal incontinence, anismus, physiotherapy/physical therapy, musculoskeletal, pelvic floor (muscles) (training), core stability, (breathing, relaxation) exercises, sensory (processing and integration), toilet training, biofeedback, manometry, myofeedback, rectal balloon, electrical (nerve) stimulation, electrotherapy, massage, child(ren), childhood and p(a)ediatric.

We included randomised controlled trials (RCTs) or quasi-RCTs in which one of the trial arms included physiotherapy. The physiotherapy intervention should at least consist of motor control interventions (MCI), (plus, when applicable, additional tools to support MCI). The comparator intervention could be physiotherapy (plus, when applicable, additional tools to support MCI), no intervention, standard medical care, urotherapy, psychological intervention, sham-intervention or medication delivered by any other health professional. Studies in English, German, French and Dutch were eligible for inclusion. We contacted the study authors when needed for clarification on their study protocols or in case of missing data.

Participants were children (aged 4 to 18 years) with CBBD. Dysfunctions were faecal or urinary incontinence, anismus, constipation, dysfunctional elimination syndrome, dysfunctional voiding, dyssynergic defaecation, encopresis, enuresis, bedwetting, urinary frequency, soiling, urgency (overactive bladder) or similar conditions. We excluded CBBD-studies when CBBD originated from neurological, psychological, psychiatric and congenital problems and studies where the outcome measures were reported within 3 months after baseline measurement.

Definitions and outcomes

The primary outcome was the number of cured children from bladder and bowel dysfunctions, expressed as daytime urinary incontinence (DUI), enuresis, dysfunctional voiding (DV), constipation, faecal incontinence (FI) or dysfunctional elimination syndrome (DES).

Secondary outcomes were (i) quantification of symptoms (diary or standardised pad test, number of voids/per day, dry/wet nights or bowel movements per week), (ii) clinician's observations (using uroflowmetry, urodynamic measurements, digital testing, myofeedback, anorectal manometry), (iii) health status measures as Global Perceived Effect (GPE), Stool consistency (Bristol Stool Form Scale) and (iv) outcome measures, quoted in individual trials judged to be important.

Data collection and analysis

One review author (MvE) performed structured data extraction from the original reports. Two review authors (MvE and EB or RdB) independently assessed all included studies. One review author (MvE) performed structured data extraction from the original reports; study design, inclusion and exclusion criteria, the number of eligible and included participants, as well as provided interventions, outcome measures, mentioned side-effects and power calculations (when reported) were noted. JC critically revised the manuscript. Any disagreements were resolved by consensus.

Quality assessment

The methodological quality of the included studies was assessed using the Physiotherapy Evidence Database (PEDro) scale by two reviewers (MvE, EB or RdB) independently. The PEDro scale, is a 10-item quality assessment scale, based on core criteria for RCTs and is a valid and reliable measure reflecting trial quality.[52]

The scale items are reported separately as well as summed to provide an overall indication of RCT quality.

Key outcomes were defined as 'outcomes which provide the primary measure or included bladder and bowel dysfunctions as defined by the trial authors. Based on the PEDro scale, we considered the methodological quality as follows: studies with scores of lower than six points were considered low-quality (LQ) studies, studies with scores 6–7 were considered as good quality (GQ) and 8–10 as excellent quality (EQ).[52-55]

Measures of treatment effect

Analyses were based on available data reported at three months, six months and one year follow-up. For trials with multiple publications, we included the one with the most complete dataset for each outcome. Where data were available from more than one study assessing the same intervention and outcome(s), we performed a meta-analysis.

Unit of analysis issues

We based the main analysis on the reported outcomes on cure. We analysed the studies with multiple treatment groups by treating each pair of study arms as a separate comparison, when appropriate.

Assessment of heterogeneity

To provide a meaningful summary, we only combined trials in which the clinical and methodological characteristics of the studies were sufficiently homogeneous in terms of intervention, outcome and length of follow-up. We assessed heterogeneity between studies according to poor overlap of 95%-CIs, the Chi^2 test for heterogeneity and the I^2 statistic. $I^2 < 30\%$ indicates heterogeneity may not be important, 30% to 50% may represent

moderate heterogeneity and > 50% may represent substantial or considerable heterogeneity. If the P value for the Chi² test was low (P < 0.10) or if the I² test was higher than 50%, we considered it statistically significant.

Assessment of reporting biases

To minimise the impact of possible publication bias, we conducted electronic and manual searches of multiple databases without substantial language restrictions. If 10 or more studies were available per comparison, a funnel plot is generated to explore reporting bias.

Per-protocol analyses

To find out whether physiotherapy has any effect in treating CBBD at all, we sub-grouped the primary outcomes (at 6 and 12 months) in per protocol meta-analyses. When multiple forms of physiotherapy were examined in a study, we selected the arm with the least extensive physiotherapy interventions.

Data synthesis

One review author (MvE) performed data entry. For dichotomous data, we used the numbers of events in the control and intervention groups of each study to calculate Mantel-Haenszel risk ratios (RRs) and 95% confidence intervals (CIs). We pooled outcome data from studies that were sufficiently similar in intervention and length of follow-up and used a random-effects model to incorporate (acceptable) heterogeneity among studies. Review Manager software (RevMan version 5.3; The Cochrane Collaboration, Copenhagen, 2014) was used for data analysis.

The Grading of Recommendation, Assessment, Development and Evaluation (GRADE) approach was used to evaluate the overall certainty of the evidence for the main outcomes of importance (number of children cured from bladder or bowel dysfunctions). We rated the overall quality of evidence and constructed 'Summary of findings' tables using the GRADE framework.[56] The four levels of quality of evidence are 'high', 'moderate', 'low' or 'very low'.

We sub-grouped data, when appropriate, by interventions, type of underlying bladder or bowel dysfunction and follow-up periods. The following factors were considered when assessing quality of evidence:

(1) **The methodological quality** (*risk of bias):* We did not downgrade the level of evidence if the methodological quality of at least 75% of the included studies was judged as 'GQ or EQ'. We downgraded the level of evidence by one if the methodological quality of ≥50% to 75% of the included studies was judged as 'GQ or EQ. We downgraded by two levels in all other cases. (2) **Inconsistency:** We downgraded the quality of evidence by one level if I^2 was between 50% and 75% and by two levels if I^2 was ≥ 75%. (3) **Indirectness:** We did not downgrade the level of evidence when we found no differences between the study populations, interventions, or primary outcomes in the included studies as outlined in the protocol. We downgraded the level of evidence by one level when we found a difference in one of these areas. If there were two or more of these areas, we downgraded by two levels. (4) **Imprecision:** We downgraded the level of evidence by one

level if one of the following rules applied: (4a) the 95%CI around the pooled effect crossed the line of no effect, or (4b) if there is more than one study with a total number of events lower than 300 (threshold rule-of-thumb value.[86] We downgraded by two levels if both came up. (5) **Publication bias:** We judged publication bias as undetected or strongly suspected. If we judged the manuscript to be strongly suspected (e.g. systematic under- or overestimation of effects in small trials, studies funded by industry etc.), we downgraded by one level. (6) Magnitude of the effect. We upgraded the quality of evidence by one level if the effect was large (risk ratio (RR) either >2.0 or <0.5 and by two levels if the effect was very large (RR either >5.0 or <0.2).

MvE constructed the 'Summary of findings' table in cooperation with RdB, working independently). Disagreements were resolved by discussion.

RESULTS

Results of the search

The flow chart of the literature retrieval and assessment process is shown in Figure 1. Electronic searches and reference checking yielded 1823 records. After first screening and removal of duplicates, we identified 95 potentially relevant full-text articles that seem to focus on musculoskeletal interventions and additional tools to support motor control interventions for both, functional bladder and bowel dysfunctions.

After abstract screening 59 trials were excluded, with reasons as no physiotherapy interventions in one of the trial arms (n=42) or no RCT (n=7). After closer inspection of the full-text papers 20 trials were excluded (figure 1); 16 studies were included for analysis, with 14 studies presenting two-armed randomised trials [33,45,57,58] [32,41,47-49,59-63] and two three-armed trials[64,65]

Participants of the included studies

The 16 studies contained 1089 participants (boys 45.4%; age 3 to 16 years (mean age 9.0, SD 1.84 years). For a description of the individual study characteristics please refer to the Appendix "Results of the studies".

Sample size

Sample sizes ranged from 34 to 134 participants per study. In four trials, the number was less than 50.[45,47,48,57]

Settings

Two multicentre trials were conducted in both primary and secondary healthcare settings[41,66], whereas the other trials in single tertiary healthcare centres. Seven (monocentre) trials were carried out in Iran[33,45,47-49,58,59], three in Egypt[60,64,65], two in the Netherlands[41,62], two in Brazil[32,57], one in Belgium[61] and one in Serbia[63].

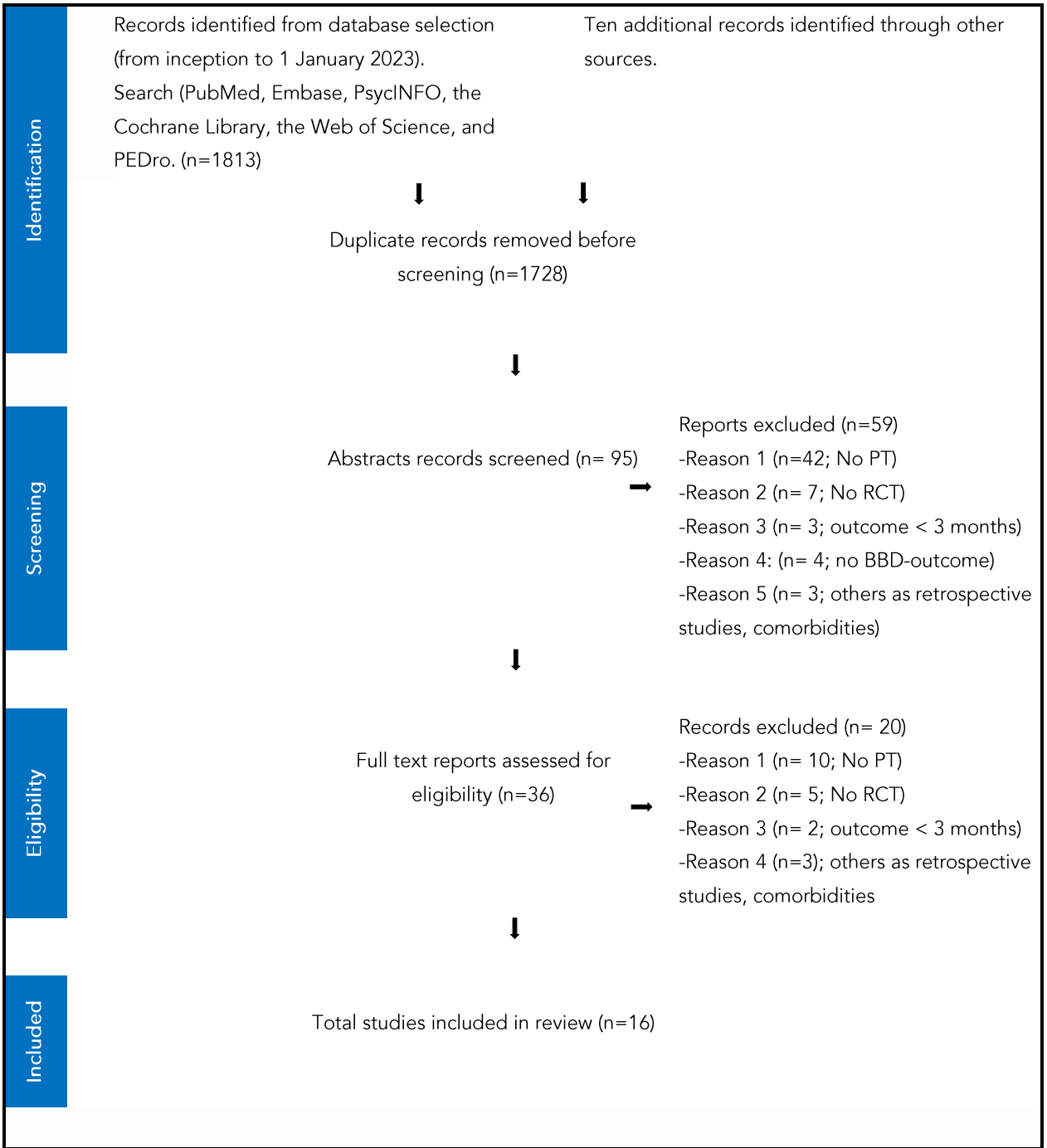

Figure 1 Study flow Physiotherapy in childhood bladder and bowel dysfunctions

Abbreviations: PT: physiotherapy; RCT: randomised controlled trial; BBD: bladder and bowel dysfunctions.

Bladder and bowel dysfunctions

We identified 8 studies for bladder symptoms with 478 participants (boys 50.8%), five studies with 441 participants (boys 47.2%) for bowel symptoms, and three studies for concomitant bladder and bowel dysfunctions, including 170 participants (boys 25.3%). The age range of the included children was 4-17

years. Diagnoses were: DES[32,48,58], DUI[47,57], enuresis[61,64], underactive bladder (UAB)[45,59], dysfunctional voiding (DV)[33,63], constipation[41,49,60,62] and FI[65].

Interventions

Physiotherapy

In all studies motor control interventions (MCI) were applied, including the following aspects:

- Motor control exercises and functional training (training the body for the normal activities performed in daily life), such as core stability and balance training to maintain an adequate posture on the toilet;[32,33,41,47,48,60,62,63]
- Sensory processing techniques used to filter, organise and integrate sensory information, facilitate attention and awareness, and, in CBBD applied to create awareness of the urge to urinate or defaecate;[32,41,47,58,61]
- Relaxation and breathing exercises to learn to relax, to teach adequate abdominal breathing and straining while defaecating, which are all prerequisites for a normal micturition and defaecation and to stay continent;[41,57,60,62,63]
- Pelvic floor and abdominal muscle training (awareness, relaxation, and functional training).[32,33,41,45,48,49,57-59,61-63,65]

Comparator interventions (physiotherapy)

In nine studies, the comparator intervention was physiotherapy (motor control interventions (MCI) added with biofeedback or electrotherapy).[32,45,47-49,59-61,63-65] Two of these trials were three-armed and compared also MCI added with biofeedback to MCI added with electrotherapy (ET).[64,65] Biofeedback consisted of rectal balloon[65], animated games, anal pressure probe[64], uroflowmetry/electromyography BFB[33,47,58] or EMG-BFB using skin electrodes[32,61]. ET included transcutaneous posterior tibial nerve stimulation (TPTNS)[65], functional electrical stimulation (FES) with intra-anal probe[64], interferential functional electrical stimulation (IF-FES)[45,47-49,59,60] or SHAM-(IF-FES)[49,60].

Comparator interventions (no physiotherapy)

In the remaining seven studies, the comparator intervention was standard medical care or urotherapy.

Standard medical care and urotherapy consisted primarily of education, motivation, voiding charts and training optimal voiding posture.[33,41,58,61-63,67] In one study, the intervention was urotherapy added with an anticholinergic drug (oxybutynin).[57] In two studies urotherapy (without MCI) was delivered by physiotherapists.[61,63] Other health professionals were medical doctors[41,58,62] or unspecified.[33,67]

We found no studies reporting on 'no intervention' or 'massage'.

Table 1 Characteristics of included studies

Study	BBD* primary outcome	n	boys (%)	Age		Interventions
				mean	range	
Abd El-Moghny 2018	MNE	90	85.6	10.1	8-12	PT versus PT+BFB PT versus PT+ET[1] PT+BFB versus PT+ET[1]
Abdelrahman 2021	FNRFI	102	42.2	13.0	?	PFM versus BFB PFM versus ET[1] BFB versus ET[1]
Campos 2013	NMNE	47	38.3	8.7	3-10	PT versus UT+anticholinergics
Kajbafzadeh 2011	DES	80	22.5	8.8	5-16	PT versus SMC
Kajbafzadeh 2015	Underactive bladder	36	41.7	8.8	5-13	PT versus PT+ET[2]
Ladi-Seyedian 2014	Dysfunctional voiding	60	21.7	8.0	5-14	PT versus SMC
Ladi-Seyedian 2015	Underactive bladder	50	54.0	8.9	5-16	PT versus SMC
Ladi-Seyedian 2019	Urinary incontinence	46	19.6	8.4	5-13	PT+BFB versus PT+ ET[2]
Ladi-Seyedian 2020	DES	34	21.4	7.4	5-13	PT versus PT+ ET[2]
Samhan2020	Constipation[3]	62	74.2	12.9	7-15	PT+ SHAM versus PT+ ET[2]
Sharifi-Rad 2018	Constipation[4]	90	47.8	6.5	5-13	PT+ET[2] (SHAM) versus PT+ET[2]
van Engelenburg-van Lonkhuyzen 2016	Constipation[4]	53	45.3	8.6	6-16	PT versus SMC
van Kampen 2009	Enuresis	63	77.8	8.6	?	PT versus PT+BFB
van Summeren 2019	Constipation[4]	134	38.8	7.6	4-17	PT versus SMC
Vasconcelos 2006	DES	56	33.9	10.5	5-15	PT (3 m) versus PT+BFB (2 m)
Zivkovic 2011	Dysfunctional voiding	86	47.1	7.1	5-13	PT versus SMC

**As reported by the trial authors*

MNE: monosymptomatic enuresis; PT: physiotherapy; BFB: biofeedback; ET: electrotherapy; PFM: pelvic floor muscles; FNRFI: functional non-retentive faecal incontinence; NMNE: non-monosymptomatic enuresis; DES: dysfunctional elimination syndrome; UT; urotherapy; SMC: standard medical care.

[1] *Functional electrical stimulation*

[2] *Interferential functional electrical stimulation*

[3] *Pelvic floor dysfunctions according to author*

[4] *According to Rome III-criteria*

Methodological quality

The methodological quality of the included studies is assessed using the PEDro scale (Table 2).

Settings

Two multicentre trials were conducted in both primary and secondary healthcare settings[41,66], whereas the other trials in single tertiary healthcare centres. Seven (monocentre) trials were carried out in Iran[33,45,47-49,58,59], three in Egypt[60,64,65], two in the Netherlands[41,62], two in Brazil[32,57], one in Belgium[61] and one in Serbia[63].

Table 2 PEDro quality score of randomised controlled trials of physiotherapy for childhood bladder and/or bowel dysfunctions

Study	E	1	2	3	4	5	6	7	8	9	10	Total	
Abd El-Moghny 2018	+	+	+	+	-	-	+	+	?	?	+	6	GQ
Abdelrahman 2021	?	+	+	+	-	-	?	?	-	?	+	4	LQ
Campos 2013	?	+	+	+	-	-	?	+	-	?	+	5	LQ
Kajbafzadeh 2011	?	?	?	?	-	-	?	+	?	?	?	2	LQ
Kajbafzadeh 2015	+	+	+	+	-	-	?	+	?	?	?	5	LQ
Ladi-Seyedian 2014	-	+	+	+	-	-	?	+	+	+	+	7	GQ
Ladi-Seyedian 2015	+	+	+	+	-	-	?	+	?	?	?	4	LQ
Ladi-Seyedian 2019	?	+	+	+	-	-	?	+	+	+	+	7	GQ
Ladi-Seyedian 2020	+	+	?	+	-	-	?	?	?	?	-	2	LQ
Samhan2020	+	+	+	+	-	-	+	+	?	-	-	5	LQ
Sharifi-Rad 2018	+	+	+	+	-	-	+	+	+	+	+	8	EQ
van Engelenburg-van Lonkhuyzen 2016	+	+	+	+	-	-	+	+	+	+	+	8	EQ
van Kampen 2009	-	+	+	+	-	-	-	+	-	+	+	6	GQ
van Summeren 2019	?	+	+	?	-	-	+	-	-	-	+	4	LQ
Vasconcelos 2006	?	+	+	?	-	-	?	+	-	-	-	3	LQ
Zivkovic 2011	?	+	+	+	-	-	+	-	+	-	+	5	LQ

BBD Included bladder and bowel dysfunctions as defined by the authors.

E= Eligibility criteria specified; 1 = Random allocation; 2 = Concealed allocation; 3 = Groups similar at baseline; 4 = Subjects blinded; 5 = Therapists administering treatment blinded; 6 = Assessors blinded; 7 = Measures of at least one primary key outcome obtained from >85% of subjects; 8 = Data analysed by intention to treat; 9 = Statistical comparisons between groups conducted; 10 = Both point measures and measures of variability provided.

+: criterion is clearly satisfied; -: criterion is not satisfied; ?: not clear if the criterion was satisfied.

Total scores are out of 10. Based on the PEDro scale, the quality of papers was classified as follows: LQ: low quality < 6 points; GQ: good quality 6–7 points; EQ: excellent quality 8–10 points.[55]

Measures of treatment effect

COMPARING PHYSIOTHERAPY (BOTH MOTOR CONTROL INTERVENTIONS MOTOR CONTROL INTERVENTIONS ADDED WITH BIOFEEDBACK) WITH STANDARD MEDICAL CARE OR UROTHERAPY

In eight studies, the comparator intervention to physiotherapy was standard medical care or urotherapy.[33,41,58,59,61-63,68] In two studies[61,63] standard medical care, information and education, was provided by physiotherapists. In the remaining studies, standard medical care or urotherapy was provided by a medical doctor, nurse or the health professional was unclear.

To answer the main study question, we sub-grouped data by type of underlying bladder or bowel dysfunction and follow-up periods 6 and 12 months, when appropriate. We rated the overall quality of evidence and constructed summary of findings tables (Figures 2-7). We were only able to use the data for meta-analysis in six studies.[31,33,41,58,59,61] Campos et al[67]. evaluated their results at three months, van Summeren[62] at four and eight months. The details of all studies are extensively described (see Appendix "Results of the studies").

Bladder problems

Daytime urinary incontinence

Two trials provided information on the number of children cured from daytime urinary incontinence at 6 months[58,59] and four studies at 12 months[33,58,59,63]. Pooling the results of these studies showed no significant differences between the interventions at 6 months [RR:1.00, 95%CI (0.30-3.29; P=1.00)]. GRADE judged these studies as of very low evidence. Significant differences were found at 12 months [RR:0.34, 95%CI (0.19-0.61); P=0.0003] in favour of physiotherapy (Figure 2), however, according to the GRADE approach, based on low-quality evidence (Summary of findings, Table 3.)

Enuresis

Two studies reported on cured enuresis at 6 months[58,59] and five studies at 12 months[33,58,59,61,63]. The pooled results showed no significant difference in the effect of the interventions at 6 months [RR 0.63, 95%CI (0.22-1.81); P=0.39)] although, at 12 months significant differences were found [RR 0.58, 95%CI (0.42-0.80); P=0.001)] in favour of physiotherapy (Figure 2). GRADE judged these studies as very low evidence for 6 months and low evidence for 12 months (Summary of findings, Table 3.)

Urgency

Two studies[33,58] reported cured urgency complaints at 12 months. Significant improvement occurred in favour of physiotherapy [RR 0.31, 95%CI (0.12-0.81); P=0.02] (Figure 2). GRADE judged these results as moderate quality of evidence (Summary of findings, Table 3).

Urinary tract infections

Two trials presented data on number of children cured from UTI at 6 months[58,59] and four at 12 months.[33,58,59,63] Significant differences between the effect of the interventions at 6 months [RR 0.33, 95%CI(0.11-0.97); P=0.04)] and at 12 months

[RR 0.38, 95%CI (0.23-0.63); P=0.0002)] were observed in favour of physiotherapy (Figure 5). According to GRADE, both were based on moderate quality of evidence (Summary of findings, Table 3).

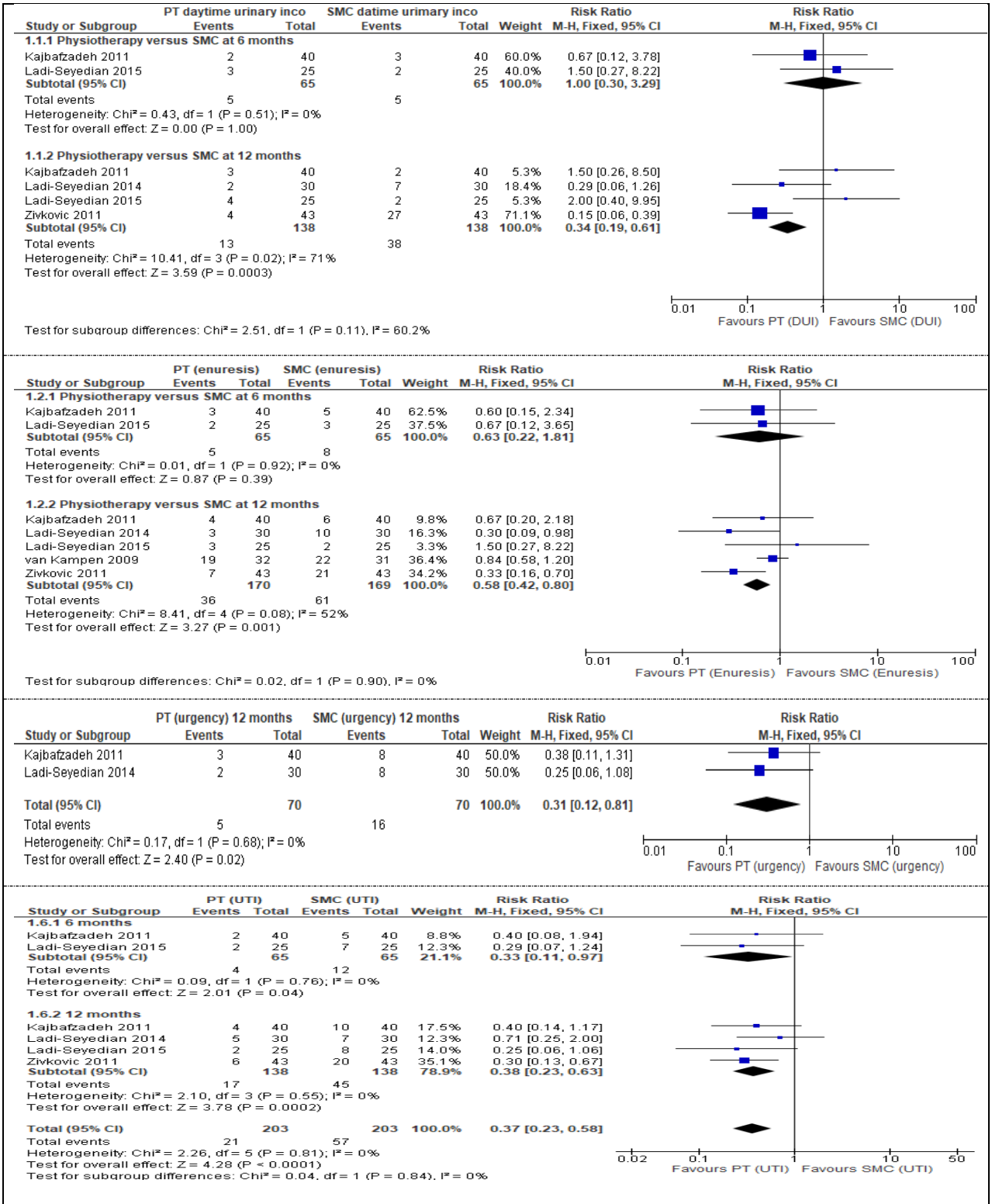

Figure 2 Physiotherapy compared to Standard Medical Care: bladder problems.

Outcomes: Daytime urinary incontinence (DUI), enuresis, urgency and urinary tract infections (UTI) at 6 and 12 months. Urgency at 12 months, at 6 months no appropriate data available.

Abbreviations PT: physiotherapy; SMC: standard medical care; M-H: Mantel-Haenszel.

Bowel problems

Constipation

Four studies[41,58,59,63] at 6 months and four studies[33,58,59,63] at 12 months were pooled in meta-analysis. At 6 and 12 months, significant differences occurred in favour of physiotherapy, respectively [RR 0.41, 95%CI (0.24-0.71); P=0.001] and [RR 0.41, 95%CI (0.21-0.81); P=0.01] (Figure 3). According to the GRADE approach, these results held moderate evidence for 6 months and high-quality evidence for 12 months (Summary of findings, Table 3).

Faecal incontinence

Only two trials presented data on number of children cured from faecal incontinence at 6 months.[41,58] Significant differences of the effect of the interventions were shown [RR 0.12, 95%CI (0.03-0.42); P=0.001] (Figure 3). According to the GRADE approach, these results were of moderate-quality evidence (Summary of findings, Table 3).

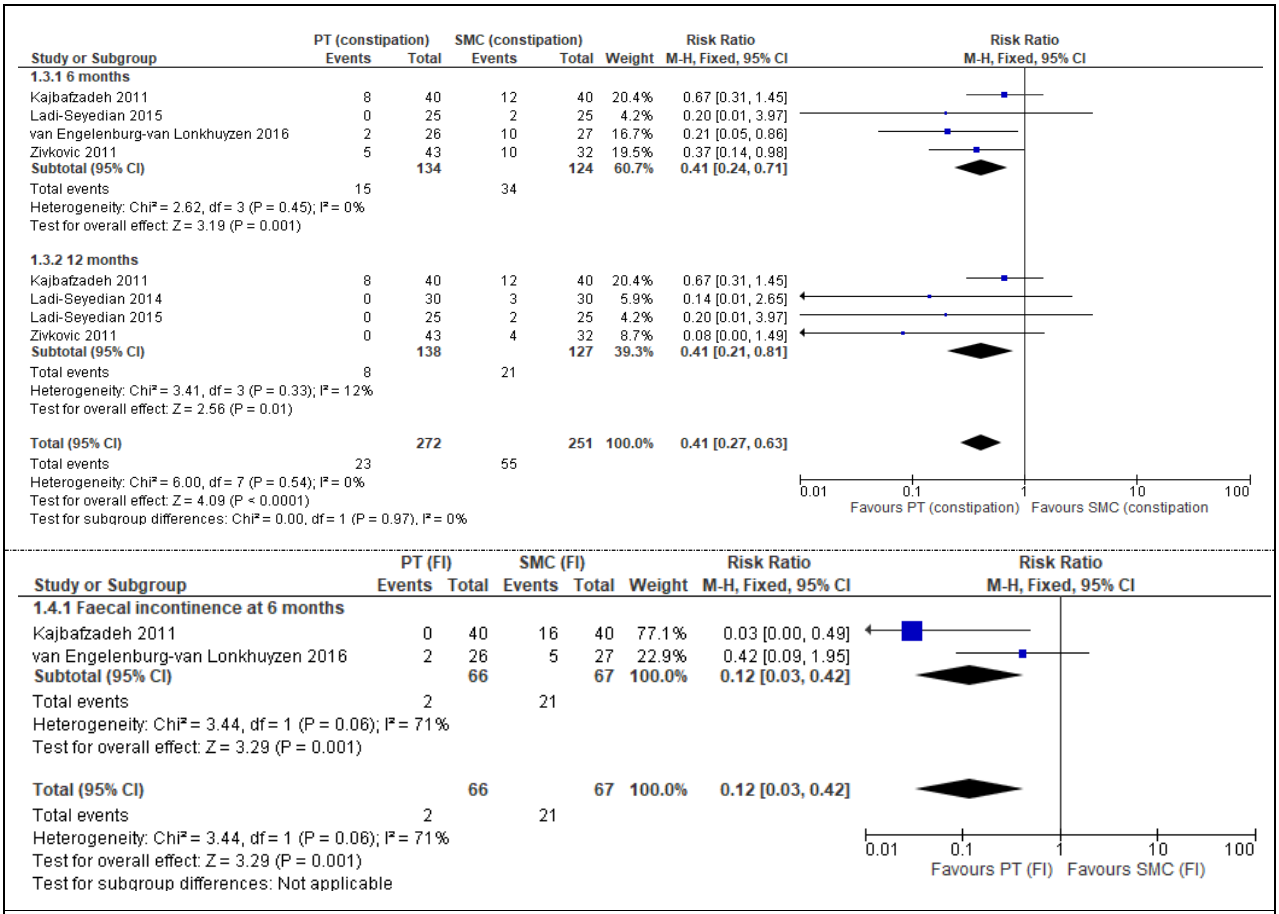

Figure 3 Physiotherapy compared to Standard Medical Care

Outcomes: Constipation at 6 and 12 months.

Faecal incontinence (FI) at 6 months. At 12 months, no appropriate data available.

Abbreviations PT: physiotherapy; SMC: standard medical care; M-H: Mantel-Haenszel.

Table 3 Summary of findings Physiotherapy compared to Standard Medical Care in children with bladder or bowel dysfunctions

Outcomes (follow-up)	Anticipated absolute effects (95CI)		Relative effect (95%CI)	No of participants (studies)	Certainty of the evidence (GRADE)
	Risk with SMC	Risk with Physiotherapy			
Daytime urinary incontinence (6 months)	77 per 1.000	77 per 1.000 (23 to 253)	RR 1.00 (0.30 to 3.29)	130 (2 RCTs)	⊕◯◯◯ Very low
Daytime urinary incontinence (12 months)	275 per 1.000	94 per 1.000 (52 to 443)	RR 0.53 (0.14 to 1.99)	276 (4 RCTs)	⊕⊕◯◯ Low
Enuresis (6 months)	123 per 1.000	78 per 1.000 (27 to 223)	RR 0.63 (0.22 to 1.81)	130 (2 RCTs)	⊕◯◯◯ Very low
Enuresis (12 months)	212 per 1.000	123 per 1.000 (89 to 170)	RR 0.58 (0.42 to 0.80)	329 (5 RCTs)	⊕⊕◯◯ Low
Urgency (12 months)	71 per 1.000	22 per 1.000 (9 to 58)	RR 0.31 (0.12 to 0.81)	140 (2 RCTs)	⊕⊕⊕◯ Moderate
Urinary tract infections (6 months)	185 per 1.000	61 per 1.000 (20 to 179)	RR 0.33 (0.11 to 0.97)	130 (2 RCTs)	⊕⊕⊕◯ Moderate
Urinary tract infections (12 months)	326 per 1.000	124 per 1.000 (75 to 205)	RR 0.38 (0.23 to 0.63)	276 (4 RCTs)	⊕⊕⊕◯ Moderate
Constipation (6 months)	274 per 1.000	112 per 1.000 (66 to 195)	RR 0.41 (0.24 to 0.71)	258 (4 RCTs)	⊕⊕⊕◯ Moderate
Constipation (12 months)	58 per 1.000	24 per 1.000 (12 to 47)	RR 0.41 (0.21 to 0.81)	302 (4 RCTs)	⊕⊕⊕⊕ High
Faecal incontinence (6 months)	313 per 1.000	38 per 1.000 (9 to 132)	RR 0.12 (0.03 to 0.42)	133 (2 RCTs)	⊕⊕⊕◯ Moderate

Patient or population: *children with bladder or bowel dysfunctions.* ***Setting:*** *primary, secondary and tertiary healthcare.* ***Intervention:*** *Physiotherapy* ***Comparison:*** *SMC*

****The risk in the intervention group*** *(and its 95% confidence interval) is based on the assumed risk in the comparison group and the* ***relative effect*** *of the intervention (and its 95%CI).*

CI: *confidence interval;* ***RR:*** *risk ratio*

GRADE ***Working Group grades of evidence***

High certainty: *we are very confident that the true effect lies close to that of the estimate of the effect.*

Moderate certainty: *we are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.*

Low certainty: *our confidence in the effect estimate is limited: the true effect may be substantially different from the estimate of the effect.*

Very low certainty: *we have very little confidence in the effect estimate: the true effect is likely to be substantially different from the estimate of effect.*

Objective measures

We found three studies from the same research centre reporting on uroflowmetry outcomes. Two trials allowed—for pooled analyses at 6 months[58,59] and three at 12 months[33,58,59].

Normal voiding pattern using uroflowmetry.

At baseline, all children showed an *abnormal voiding pattern* during micturition. Based on these trials, significantly more children receiving physiotherapy were seen with normal voiding pattern during micturition at six months [(RR 0.21, 95%CI (0.06-0.68); P=0.010] and at 12 months [(RR 0.31, 95%CI (0.20-0.49); P<0.00001]. (Figure 4.)

Pelvic floor muscle function during voiding

At baseline, all children showed abnormal electromyography (EMG)-activity during micturition. Significantly more children receiving physiotherapy had normal EMG-activity during micturition at six months [(RR 0.33, 95%CI (0.16-0.68); P=0.003] and at 12 months [(RR 0.51, 95%CI (0.34-0.76); P=0.001]. (Figure 4.)

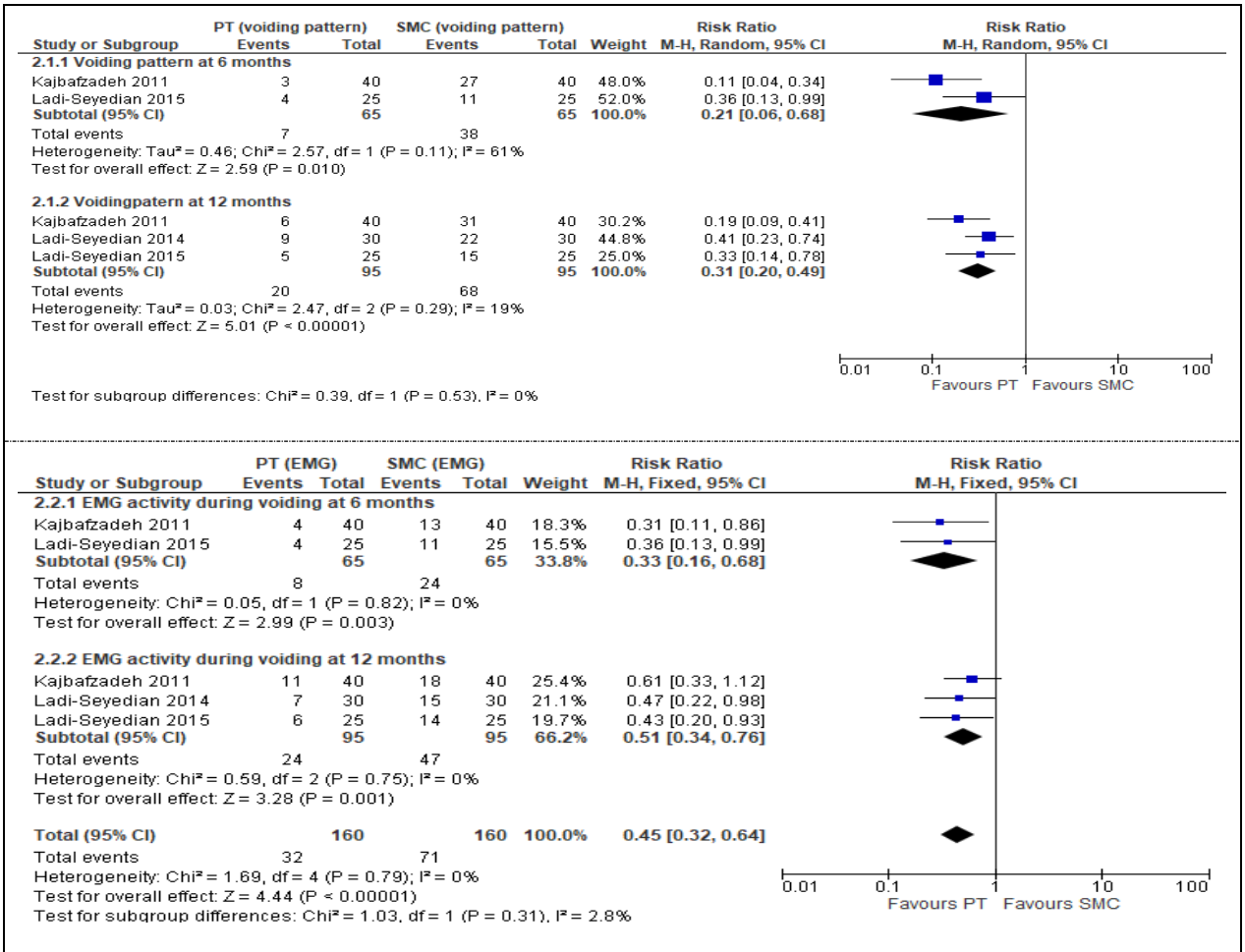

Figure 4 Objective measure using uroflowmetry: normal voiding pattern and electromyography

Abbreviations PT: physiotherapy; SMC: standard medical care; EMG: electromyography; M-H: Mantel-Haenszel.

COMPARATOR INTERVENTIONS

PHYSIOTHERAPY + BIOFEEDBACK AND PHYSIOTHERAPY + ELECTROTHERAPY

We retrieved eight studies where physiotherapy included biofeedback (PT+BFB) or electrotherapy (PT+ET) or PT+BFB+ET as intervention. Vasconcelos compared PT to PT+BFB[32] and Kajbafzadeh and Ladi-Seyedian PT to PT+ET[45,48]. Abd El-Moghny[64] and Abdelrahman[65] conducted 3-armed trials where both BFT and ET were part of the interventions. They also compared BFT to ET. Samhan[60] and Sharifi-Rad[49] compared PT+ET with PT+SHAM-ET and Ladi-Seyedian[47] PT+BF with PT+BFB+ET. None of these studies were used for meta-analyses, due to the lack of matching studies and/or unsuitable outcome data (Table 4).

Table 4 Physiotherapy compared to physiotherapy added with biofeedback and or electrotherapy

Study	n	Interventions	6 months	12 months
Abd El-Moghny 2018	90	PT versus PT+BFB	P<0.0001*[1]	-
		PT versus PT+ET[2]	P<0.0001*	-
		PT+BFB versus PT+ET[2]	P<0.0001*	-
Abdelrahman 2021	102	PT versus PT+BFB	P<0.0001*[3]	-
		PT versus PT+ ET[2]	P<0.0001*	-
		PT+BFB versus PT+ET[2]	P<0.0001*	-
Kajbafzadeh 2015	36	PT versus PT+ET[4]	-	DUI: P=0.074 Enuresis: P=0.086 Constipation: P=0.145
Ladi-Seyedian 2019	46	PT+BFB versus PT+ ET[4]	DUI P=0.03* Enuresis: P=0.177 UTI: P=0.177 Constipation: P=0.576	DUI: P=0.05 Enuresis: P=0.210 UTI: P=0.08 Constipation: P=0.576
Ladi-Seyedian 2020	34	PT versus PT+ ET[4]	DES: P<0.3* DUI: P= 0.007* Enuresis: P=0.287 Urgency: P= 0.419 UTI: P=0.02* Constipation: P=0.151 FI: P=0.310	-
Samhan 2020	62	PT+ SHAM versus PT+ ET[4]	-[6]	-[6]
Sharifi-Rad 2018	90	PT+ET[4] (SHAM) versus PT+ET[4]	Constipation: P=0.002*	-
Vasconcelos 2006	56	PT versus PT+BFB	DUI: P=0.90 Enuresis: P=0.07 Constipation: P=0.35	DUI: P=0.80 Enuresis: P=0.16 Constipation: P=0.35

Abbreviations PT: physiotherapy; BFB: biofeedback; ET: electrical stimulation; DUI: daytime urinary incontinence; UTI: urinary tract infection: FI: faecal incontinence: DES: dysfunctional elimination syndrome.

[1]Frequency of wet nights; [2]Functional Electrical stimulation; [3]Vaizey score; [4]Interferential functional electrical stimulation; [5]According to Rome III-criteria; [6]Outcome data were unsuitable to analyse.

**Significant at the P-level <0.05*

PER-PROTOCOL PHYSIOTHERAPY

Bladder problems

Daytime urinary incontinence

Four trials provided information on the number of children, treated with physiotherapy, cured from daytime urinary incontinence at 6 months[32,48,58,59] and at 12 months' six studies[32,33,45,58,59,63]. At 6 months significantly more children were cured from DUI compared to baseline [RR:0.29, 95%CI (0.17-0.49; P=<0.00001)] just as at 12 months [RR:0.20, 95%CI (0.12-0.32); P=<0.00001)]. (Figure 5.)

Enuresis

Four studies reported on cured enuresis at 6 months[32,48,58,59] and seven studies at 12 months[32,33,46,58,59,61,63]. At 6 months and 12 months significantly, more children were cured from enuresis [RR 0.48, 95%CI (0.33-0.70); P=0.0002)]and [RR 0,46, 95%CI (0.36-0.59); P=<0.00001)]. (Figure 5.)

Urgency

Two studies[33,58] reported significantly more children cured from urgency at 12 months. [RR 0,16, 95%CI(0.07-0.39); P=<0.00001)]. (Figure 5.)

Urinary tract infections

Two trials presented data on number of children cured from UTI at 6 months[58,59] and four at 12 months. [33,58,59,63] Significant differences were found at 6 months [RR 0.16, 95%CI (0.06-0.43); P=0.0003)] and at 12 months [RR 0.27, 95%CI (0.17-0.44); P=0.0002)]. (Figure 5.)

Bowel problems

Constipation

Seven studies[32,41,45,48,49,58,63]at 6 months and six studies[32,33,58,59,63] at 12 months presented data on number of children cured from constipation. Significant differences were found at 6 months [RR 0.34, 95%CI (0.23-0.47); P=<0.00001)] and at 12 months [RR 0.26, 95%CI (0.16-0.41); P=<0.00001)]. (Figure 6.)

Faecal incontinence

Four trials presented data on number of children cured from faecal incontinence at 6 months.[41,48,49,58] Significant differences were found [RR 0.40, 95%CI (0.29-0.55); P=<0.00001)]. (Figure 6.)

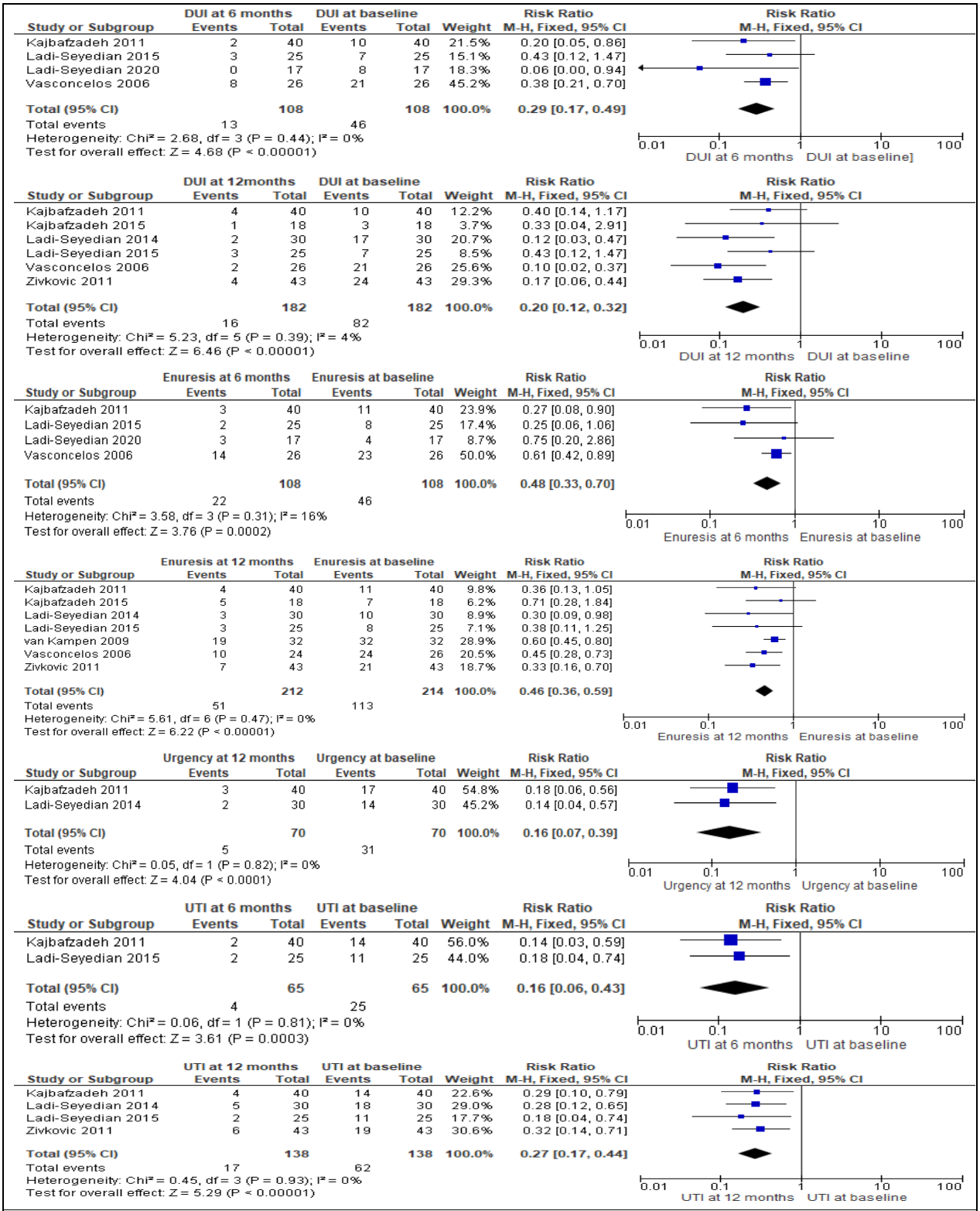

Figure 5 Per protocol analyses: bladder problems

Outcomes: Daytime urinary incontinence (DUI), enuresis, urgency and urinary tract infections (UTI) at 6 and 12 months. Urgency at 12 months. At 6 months, no appropriate data available.

Abbreviations PT: physiotherapy; SMC: standard medical care; M-H: Mantel-Haenszel.

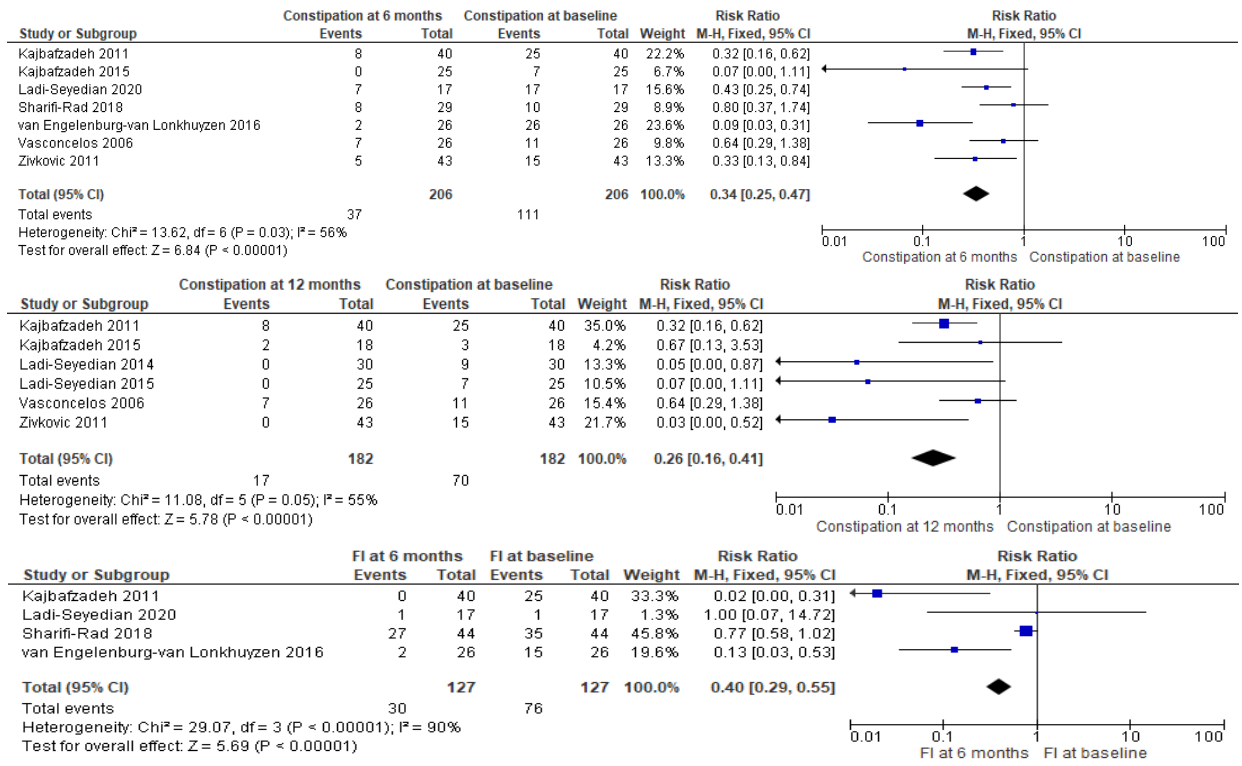

Figure 6 Per protocol analyses: bowel problems

Outcomes: Constipation at 6 and 12 months.

Faecal Incontinence (FI) at 6 months, at 12 months, no appropriate data available.

Abbreviations PT: physiotherapy; SMC: standard medical care; M-H: Mantel-Haenszel.

WHICH TYPE OF PHYSIOTHERAPY INTERVENTION IS PREFERABLE?

Two studies, Abd El-Mogny[64] and Abdelrahman[65], were 3-armed trials where both biofeedback (BFB) and electrotherapy (ET) were part of the interventions. They also compared BFB to ET. Abd El-Moghny evaluated 'cured from enuresis' according to the ICCS-standardisation, Abdelrahman used an incontinence score (St' Mark's score). Both studies showed significant differences in interventions. Both, motor control interventions (MCI) versus MCI+BFB (P<0.0001, in favour of MCI+BFB), MCI versus MCI+ET (P<0.0001 in favour of MCI+ET) and MCI+BFB versus MCI+ET (P<0.0001 in favour of MCI+ET). (Table 4).

DISCUSSION

In this systematic review the available evidence of randomised controlled trials assessing the effect of physiotherapy in the management of childhood bladder and bowel dysfunctions in neurologically normal and otherwise healthy children is presented. To the best of our knowledge, this is the first systematic review to synthesise all data from randomised controlled trials (RCTs) relating to physiotherapy, including add-on interventions as biofeedback or non-invasive electrotherapy.

The main review question was whether physiotherapy compared to standard medical

care or urotherapy has beneficial effects on CBBD in children aged 4-18 years. Comparing physiotherapy to standard medical care or urotherapy at 6 months, no differences were found for DUI and enuresis but there was a trend seen towards improvement in favour of physiotherapy in enuresis. Significantly more children were cured from UTI, constipation and FI in favour of physiotherapy. At 12 months significantly more children were cured from all bladder dysfunctions and constipation when receiving physiotherapy.

To answer the question whether physiotherapy has any effect in treating CBBD at all, we sub-grouped the primary outcomes (at 6 and 12 months) in a per-protocol analysis. We found significant differences in number of cured children compared to baseline for DUI, enuresis and constipation, at six months for faecal incontinence and at 12 months for urgency, indicating that physiotherapy is a meaningful treatment option in children with CBBD.

Included studies did not yield sufficient data to determine which aspects of physiotherapy are preferable in case of beneficial effects of physiotherapy. So, no substantiated statements about added biofeedback or electrotherapy are available.

Based on these results physiotherapy should certainly be considered as a viable treatment option in children with various bladder and bowel dysfunctions. physiotherapy is considered to be patient-tailored and the sequence and intensity of physiotherapy depends on the child's age and motivation, parents` motivation, co-morbidity and cognition. Exercises, and materials and methods must be presented in a playful manner and in accordance with the children's age, loco motor skills and perceptions.

We included children from the ages of 4 years, according to ICCS and Rome IV and assuming, basically, they are potty trained then. We did not sub-group on ages, although the natural progression of symptoms may have influenced outcomes. This applies especially to the studies containing children of seven years and under.

Biofeedback as described in the literature, is an umbrella term. The aims for the use of biofeedback differ considerably, per healthcare group and bladder or bowel dysfunction. Major differences exist in the feedback equipment and methods used (pneumohydraulic perfusion pump, electromyography recorders (visually and aurally), uroflowmetry, peri-anal surface electrodes, intra-anal probes, anal manometry, balloons etc.). Biofeedback in physiotherapy resembles each other and is always supportive to motor control interventions not a stand-alone intervention. Physiotherapists generally use the physiotherapy biofeedback equipment, specific developed to support physiotherapeutic motor control interventions. Biofeedback-treatments are therefore reasonably comparable with each other. So, we chose, to avoid confusion, to investigate the effect of solely physiotherapy and added aspects of physiotherapy inventions as biofeedback or electrotherapy in children.

Limitations

A limitation when evaluating effectiveness of the included studies is the variation in physiotherapy interventions, although each study was based on motor control interventions of which 12 out of 16 studies practiced pelvic floor and abdominal muscle training too. In addition, there is a great heterogeneity in CBBD complaints, whereby the authors sometimes have their own, non-consensus-based, definitions.

Next, seven trials (43.8%) were conducted at the same research centre in Iran, with overlapping time spans. They are the only ones who have reported on uroflowmetry findings. It makes it difficult to make statements when estimating the results of using uroflowmetry.

Another important limitation was the lack of descriptions of adverse events. Children suffering from CBBD can be thought of as 'vulnerable' with problems in an intimate area of the body. Yet a description of the adverse events was found in only eight (50.0%) studies. This seems to hint at underreporting, because many interventions, especially electrotherapy, but also the approach of the pelvic floor with hands (or eyes) of the healthcare professional or use of the electrodes in biofeedback can be considered threatening, both for child and parent.

Some trials reported outcome data, not based on intention-to-treat (ITT). Although we requested protocols and information, not all authors responded or provided adequate information. In that case, where ITT analyses and further information was lacking, we considered the drop-out children as 'not cured'.

It is thought that physiotherapists, as musculoskeletal experts might play an important role in CBBD treatment. The evidence in this review seems to indicate that physiotherapy is effective compared to other active interventions, especially in treating bowel dysfunctions. Next, the use of flowmetry as added biofeedback also may support physiotherapy treatment compared to standard medical care or urotherapy. Flowmetry can be used to teach proper toilet posture and adequate pelvic floor muscle use (including proper relaxation during micturition). Physiotherapists are trained to assess posture, and especially, to intervene when problems arise in one way or another, rand to use alternatives and other exercises to achieve success.

The amount and quality of evidence is insufficient to reach a robust conclusion. There were no studies fully free of risk of bias. Nine of 16 (56.3%) of the included studies were judged as of 'low quality'. Due to the nature of the interventions, adequate blinding was impossible, thus all studies were judged as high risk of bias (participants and personnel). Although the lack of blinding of participants and care providers may have introduced performance bias, this is a generally recognized limitation and due to the pragmatic designs.

Potential biases in the review process

The evidence for this review came from a detailed search process, which included published and unpublished papers and held

no language restrictions. It is possible that potentially eligible studies conducted in journals not easy to access have been published and could not be identified by this search strategy. We performed a comprehensive search in several electronic databases; however, we did not search for conference abstracts. We included only RCTs, as we felt that the benefit of including non-randomised studies did not outweigh the risk of including them, as non-randomised studies are likely to suffer from high risk of bias.

We specifically included only physiotherapy, although there are more RCT's on the effect of biofeedback or electrotherapy. The major limitation when evaluating effectiveness of the included studies is the large variation in physiotherapy interventions.

Another potential bias could be the prepossessed attitude as some of the authors of this review were also authors of one of the trials included in this review. To overcome this problem, we have described in detail the terms and conditions for assessing risks of bias. Next, we have contacted all the trial authors to gain their trial protocols and additional information. Unfortunately, only a few responded.

Agreements and disagreements with other studies or reviews

When translating the results of the review to generalisability, some comments must be made. Standardised outcome measures provide a basis for comparing outcomes of different clinical trials. Although consensus exists on bladder dysfunctions (ICCS-recommendations[8] and bowel dysfunctions[14]) inconsistency in definitions and outcome measures appear. Therefore, generalisation of our findings may be hampered. Finally, healthcare systems and referral pattern differ per country, as does education level of the health professionals.

Implications for research

Physiotherapy compared with standard medical care (SMC) or urotherapy in CBBD shows promise. Due to the nature of the profession, physiotherapy was offered as a package focusing on various treatable components and therefore generalisability is difficult. As physiotherapy might be of benefit in children with CBBD, it is advocated to consider implementing physiotherapy in addition to SMC as well as integrating this intervention in (inter)national guidelines to improve CBBD patient care.

At the same time, to be able to meet the demand worldwide, more physiotherapists should undertake appropriate consensus-based courses to become specialised physiotherapists (SPTs), according to definitions of the World Confederation for Physical Therapy.[69] Dissemination of knowledge regarding the rationale, specific content and added value of SPT interventions is recommended.

Further research is required. There is a need to design rigorous trials to discover the most effective elements of physiotherapy, when possible. Although consensus exists on terminology of BBD[8,13] it is not always used, which makes comparisons among trials and making statements more difficult.

Despite the number of identified trials (16), the quality of evidence of 10 (62.5%) studies is low. That makes it difficult to reach a robust conclusion regarding the effectiveness of physiotherapy in CBBD. There were no studies that were judged to be fully free of risk of bias. To raise the quality of evidence and to prevent inconsistent reporting and assessment, any trialist should follow the recommendations and principles of the CONSORT statement (www.consort-statement.org). Trials should include a range of primary and secondary outcomes which are most suitable, including subjective and objective data, questionnaires of psychometric sufficient quality (according to COSMIN[70,71]) and finally quality of life assessments, patient satisfaction, complications and costs. Adverse events should be reported.

CONCLUSION

Physiotherapy in children over 4 years, with functional bladder and bowel problems seems to be justified for all bladder dysfunctions (daytime urinary incontinence, enuresis, urgency and urinary tract infections) and bowel dysfunctions (constipation and faecal incontinence). Compared to standard medical care or urotherapy, significantly more children were cured from all bladder dysfunctions and constipation when receiving physiotherapy at 12 months. physiotherapy has any effect in treating bladder and bowel dysfunctions. Significant differences in number of cured children compared to baseline for daytime urinary incontinence, enuresis and constipation, at six months for faecal incontinence and at 12 months for urgency, indicating that physiotherapy is a meaningful treatment option in children with bladder and bowel problems. No substantiated statements about added biofeedback or electrotherapy are possible.

It is imperative that further research is required. Just because physiotherapy (including biofeedback or electrotherapy, when needed) is considered to be patient-tailored, pragmatic designs must be developed by physiotherapists as motor control professionals, following the recommendations and principles of the CONSORT statement.

Studies should be more tailored to specific age groups, taken in account the natural attrition of symptoms and developmental differences.

Methods should include a range of primary and secondary outcomes which are most suitable, including questionnaires of psychometric sufficient quality. Following existing consensus on terminology and definitions of bladder and bowel dysfunctions is recommended. Next, clarity about the purpose and use of type of biofeedback devices and biofeedback parameters used is necessary. Adverse and side events should be reported because the target group consists of vulnerable (young) children with problems in an intimate part of the body.

Corresponding author:
Marieke L van Engelenburg – van Lonkhuyzen
Department of Epidemiology,
School for Public Health and Primary Care (CAPHRI), Maastricht University Medical Centre, Maastricht, Netherlands
E-Mail:
m.vanengelenburg@maastrichtuniversity.nl

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