European Journal of Physiotherapy

ISSN: 2167-9169 (Print) 2167-9177 (Online) Journal homepage: http://www.tandfonline.com/loi/iejp20

Basic Body Awareness Therapy and patient education in hip osteoarthritis: a multiple case study

Liv Inger Strand, Aarid Liland Olsen, Heid Nygard, Ove Furnes, Liv Heide Magnussen, Hildegunn Lygren, Mary Anne Sundal & Liv Helvik Skjaerven

To cite this article: Liv Inger Strand, Aarid Liland Olsen, Heid Nygard, Ove Furnes, Liv Heide Magnussen, Hildegunn Lygren, Mary Anne Sundal & Liv Helvik Skjaerven (2016): Basic Body Awareness Therapy and patient education in hip osteoarthritis: a multiple case study, European Journal of Physiotherapy, DOI: 10.3109/21679169.2015.1135982

To link to this article: http://dx.doi.org/10.3109/21679169.2015.1135982

Published online: 06 Feb 2016.

EUROPEAN JOURNAL OF PHYSIOTHERAPY, 2016
http://dx.doi.org/10.3109/21679169.2015.1135982

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Basic Body Awareness Therapy and patient education in hip osteoarthritis: a multiple case study

Liv Inger Strand[a,b], Aarid Liland Olsen[b], Heid Nygard[b,c], Ove Furnes[c,d], Liv Heide Magnussen[a,e], Hildegunn Lygren[b,e], Mary Anne Sundal[a,e] and Liv Helvik Skjaerven[e]

[a]Physiotherapy Research Group, Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway; [b]Department of Physiotherapy, Haukeland University Hospital, Bergen, Norway; [c]Department of Orthopedic Surgery, Haukeland University Hospital, Bergen, Norway; [d]Department of Clinical Medicine, University of Bergen, Bergen, Norway; [e]Department of Occupational Therapy, Physiotherapy and Radiography, Bergen University College, Bergen, Norway

ABSTRACT

International guidelines recommend exercise and patient education (PE) in hip osteoarthritis. However, we need more in-depth evidence regarding the effect of different exercise modalities. The aim of this study was to examine short- and long-term outcomes of PE and Basic Body Awareness Therapy (BBAT). Seven patients (five men, two women) with moderate to severe osteoarthritis were recruited. Pain, function and quality of life were assessed at baseline and after 4 and 10 months, pain during walking being the main outcome. PE, aiming for patients' empowerment through information and counselling, was given in a 2 h group setting. BBAT, focusing on promoting movement quality and awareness in a variety of daily movements, was given weekly in groups over 12 weeks. Five patients participated in PE and BBAT, two in PE only. After 4 months all reported improvement. Less pain during walking was found in four patients, and after 10 months in three patients (one PE, two PE and BBAT, two missing). One patient (PE) reported being unchanged and one (PE and BBAT) worse and motivated for surgery, both with 0 mm joint space. BBAT and PE may be beneficial in hip osteoarthritis, but the supplementary effect of BBAT must be further examined.

ARTICLE HISTORY
Received 14 September 2015
Revised 14 December 2015
Accepted 21 December 2015
Published online 3 February 2016

KEYWORDS
BBAT; body awareness; hip school; movement quality; outcome study

Introduction

Musculoskeletal disorders are reported to be the second largest contributor to years lived with disability worldwide, and osteoarthritis of the hips and knees is among the most frequently reported.[1] A prevalence of 5.5% was reported in a Norwegian population, being higher in women, overweight and older people.[2] Both clinical and radiological features, such as osseous deformation and scleroses, shrinkage of the capsule, atrophy of muscles and synovitis, make up the diagnosis.[3] Major symptoms are pain, especially in weight bearing, reduced range of motion (ROM) [4] and muscle weakness,[3,5] as well as asymmetric gait,[6] decreased lumbar lordosis and thoracic kyphosis, and forward tilt of the body.[7]

Clinical guidelines for management of hip and knee osteoarthritis recommend patient information, lifestyle changes, work modification, exercise, weight loss, assistive technologies and footwear as the primary treatment.[8,9] A biopsychosocial approach and therapy that is adjusted to the preference of the individual are promoted. Neuromuscular training is recommended to restore optimal alignment, balance and motor control.[10] Although physiotherapy modalities are recommended, there has been an increase in hip arthroplasty over the years.[11] While the occurrence of revisions has decreased,[12] infection is still a challenge.[13] Taking into account the risk and costs of surgery [14] and the fact that the osteoarthritis condition may improve over time,[15] it may be advisable to choose physiotherapy as the first treatment option.

Empowering patients with information and counselling is an important element of an up-to-date physiotherapy plan. In Sweden, arthritis schools are implemented all over the country.[16] The scientific evidence for recommending therapeutic exercises has been examined in recent systematic reviews.[17,18] Roos and Juhl [17] concluded that education, exercise and weight loss are supported by research evidence and expert opinion, while Golightly et al. [18] found strong

CONTACT Liv Inger Strand liv.strand@uib.no Department of Global Public Health and Primary Care, University of Bergen, Kalfarveien 31, 5018 Bergen, Norway

support only for short-term effects of aerobic and strengthening exercise programmes in mild to moderate hip osteoarthritis. In a recent review, however, exercises were found to have little effect.[19]

More evidence is required on the long-term effects of different exercise programmes, especially in severe osteoarthritis. Basic Body Awareness Therapy (BBAT) may seem promising because of its multi-perspective approach to movement and health, and high patient involvement in the learning process.[20,21] Promoting movement quality through BBAT includes biomechanical, physiological, psychosociocultural and existential perspectives [22] in the learning of more healthy and functional movement habits.[20] To promote a dynamic interplay between a stable postural balance, free breathing and mental awareness, the physiotherapist directs attention to coordination of the whole moving person, not only to parts of the body. The patient's movement experiences, reflections and verbalization are important in the learning process.[21] Through BBAT, the patient integrates movement quality into a broad scope of daily life movements and activities. As BBAT has not yet been studied in a systematic way for patients with hip osteoarthritis, the purpose of the present study was to explore the short- and long-term outcome of BBAT combined with patient education (PE).

Methods

Design

A multiple case design was applied.[23] Data from self-report measures and physical tests were collected at baseline and after 4 and 10 months. Qualitative data of patient perspectives from interviews were also collected, but are not included here. Ethical approval from Health Region North was obtained.

Participants

Patients with hip osteoarthritis, referred from primary healthcare to be considered for arthroplasty by an orthopaedic surgeon, were eligible for the study. If the patients fulfilled the inclusion criteria, they were given verbal and written information about the study. They were recommended by the orthopaedic surgeon to participate in PE, and were also invited to take part in BBAT group therapy. If they agreed to participate in PE only, or PE combined with BBAT, they signed a written informed consent form.

Inclusion criteria were primary hip osteoarthritis based on radiological and clinical findings in line with the American College of Rheumatology Criteria for the classification and reporting of hip osteoarthritis of the hip,[24] and living in the city or within a travelling distance of 1 h. Exclusion criteria were pregnancy (fifth to ninth month) and not understanding Norwegian.

16 patients with hip osteoarthritis, based on the referral letter, were evaluated by the orthopaedic surgeon (OF) in the period January to February 2014. Eight patients fulfilled the inclusion criteria and were willing to participate, and seven were included (one was prevented because of travel). Reasons for not being included were caput necrosis ($n = 1$), hip pain not verified as hip osteoarthritis ($n = 4$), and having previously tried out physiotherapy with minor effect and being motivated for surgery ($n = 3$).

Interventions

Patient education

PE lasted for 2 h and was led by a specialist in orthopaedic physiotherapy (HN) in a hospital setting, and the content was in line with clinical guidelines.[8,9] The primary aim was empowerment of the patients. Information about the hip osteoarthritis condition and how to deal with it was communicated and discussed. Emphasis was placed on the dynamic nature of joint structures, the importance of optimal loading, avoiding prolonged postures and activities that overload the joint, and physical activity adjusted to functional limitations and pain. Mobility and balance training was recommended and demonstrated. Weight reduction was also a topic.

Basic Body Awareness Therapy

The BBAT group therapy was led by a specialist in psychomotor physiotherapy (MS), qualified in BBAT, and was offered once a week for 12–13 weeks. Each session lasted for 90 min, including movement practice for 70 min followed by 20 min of talking to let the group members share their experiences and reflections. The programme included movements carried out while lying, sitting, standing, walking and relational movements. The BBAT group was structured to promote a movement awareness learning process aiming towards more healthy and functional movement quality and movement habits in daily life.[21] Thus, the patients were invited to search for more optimal balance, core stability and free breathing. Movement coordination in the whole body as well as in the pelvic/hip region was addressed. Each participant was guided individually in movement awareness learning during the group sessions. Progression of the main themes implemented in the BBAT sessions is shown in Table 1. Between the BBAT

Table 1. Progression of the main themes implemented in the first to twelfth movement sessions of Basic Body Awareness Therapy (BBAT).

BBAT sessions	Themes focused according to progression of BBAT sessions to deepen movement quality and movement awareness
1st	Balanced, stable and free vertical axis integrated in the movements, finding the path and form in the movements
2nd	Flow, elasticity and rhythm integrated in the movements
3rd	Attentive and intentional direction in the movements
4th	Adjusting energy in the movements, appropriate to the task
5th	Let the movements originate from the centre in the trunk
6th	Congruent movements in the person as a whole, characterized by unity and integration
7th–12th	Integration of movement quality and movement aspects used in daily routine

sessions, the participants committed themselves to practising the movement awareness training programme at home, and to integrating the movement principles in daily life movements and actions. The participants wrote a log for personal use, describing [1] experiences from movements they included in the home training, and [11] experiences of how BBAT principles were integrated in life. The progress of the therapy was evaluated by the physiotherapist.

Assessments

Assessments at baseline and after 4 and 10 months included self-report measures and physical tests. In cases of bilateral osteoarthritis, the patient's more painful hip was chosen as the index joint. Demographic variables including gender, age, body mass index and X-ray findings were registered at baseline. Assessments were performed by one of three physiotherapists not involved in BBAT, but participating in PE after baseline assessments. The following self-report measures and physical tests were included:

Numeric rating scale (NRS): Pain intensity during the last week in walking, sitting and at night was rated on a 0–10-point NRS (0 = no pain, 10 = worst pain imaginable), and $\geq$2 points was considered a clinically important improvement.[25] Pain during walking was the primary outcome.

Hip disability and Osteoarthritis Outcome Score (HOOS 2.0): The HOOS subscales measure pain, symptoms, activities of daily living (ADL), sport/recreation and hip-related quality of life (QoL), with each question scored on a five-point scale, while each subscale is scored from 0 (extreme problems) to 100 (no problems).[26] An improvement of $\geq$15% was considered significant.[27]

Harris Hip Score (HHS): The HHS gives a sum score of different domains of hip disability, including pain, function, deformity, ROM and need for pain medication. The scores are graded as: $<$70 = poor, 70–79 = fair, 80–89 = good and 90–100 = excellent.[28]

University of California at Los Angeles (UCLA) Activity Score: This is a self-report measure of the level of physical activity and sport. It consists of a 10-point ordinal scale from 1 = being inactive and dependent on others to 10 = participating regularly in impact sports. The scale is recommended for monitoring the physical activity levels of patients with hip osteoarthritis.[29]

EuroQol 5 Dimensions (EQ-5D-5L): This generic health index comprises a five-part questionnaire and a 0–100 self-rating visual analogue scale (VAS).[30]

Timed Up and Go (TUG) test: The TUG, requiring both static and dynamic balance, is used to assess mobility. The time (seconds) it takes to rise from a chair, walk 3 m, turn around, walk back and sit down is measured.[31] Reference values according to age groups have been reported: 8.1 s (7.1–9.0 s) for 60–69-year-olds; 9.2 s (8.2–10.2 s) for 70–79-year-old.[32]

Range of motion (ROM): The ROM of both hip joints was measured following the guidelines of Norkin and White.[33] The degrees of flexion, extension, abduction, adduction, and medial and lateral rotation of each hip were recorded, and also added to a sum score. The minimal detectable change [34] is: flexion 8.2°, extension 11.0°, internal rotation 7.8°, external rotation 7.1° and abduction 7.3°.

Patient Global Impression of Change (PGIC): This scale was used to measure perceived change in hip pain and function after 4 and 10 months. The scoring alternatives on the ordinal scale were: 1 = very much improved, 2 = much improved, 3 = slightly improved, 4 = no change, 5 = slightly worse, 6 = much worse and 7 = very much worse.[25]

Analysis

Scores at baseline and after 4 and 10 months were presented in tables, and a graph was constructed of data from the main outcome. A change over time was called significant if it was above the minimal important change, smallest detectable change or minimal detectable change, as informed for the different tests.

Results

Five male and two female patients participated, ranging in age from 45 to 80 years. They had minimal joint space (MJS) of the index hip ranging from 0 to 2 mm. Patient characteristics and background variables are shown in Table 2. Two patients (patients 1 and 2) participated in PE only, while the others participated in PE and BBAT. Compliance was good in four patients taking part in 12 or 13 BBAT sessions, while patient 5 took part in only seven owing to particular health problems unrelated to the hip osteoarthritis. Her data were also missing at 10 months. Self-report and physical performance data for each patient at baseline and after 4 and 10 months are shown in Tables 3–7 and a summary for each patient is presented below. Change in the main outcome, pain during walking, is illustrated for each participant in Figure 1.

Patient 1

Patient 1 was in his forties and overweight, and worked full time as a carpenter. He was not motivated for BBAT but would exercise on his own (by hiking in the woods). His right hip problem had lasted for 8–9 months, and radiographic osteoarthritis severity by MJS was moderate (2 mm) as defined by Croft et al.[35] At baseline pain intensity during walking was 5 on NRS and most physical and functional measures indicated moderate to severe disability (Tables 4–6). After 4 months he reported on the PGIC to be much better in both pain and function (Table 7) and he had managed to reduce his weight by 4.5 kg (10 lb). He had also significantly improved on the ADL and sport/recreation subscales of HOOS (Table 4) and on UCLA activity and EQ-5D (Table 5). The HHS had changed from fair to good (Table 5) and hip ROM had improved above the minimal detectable change in flexion, internal rotation and abduction, but internal rotation had decreased (Table 6). Walking speed by TUG had not changed. Unfortunately, we were not able to obtain follow-up data after 10 months.

Patient 2

Patient 2 was in his early sixties and worked full time as a professional healthcare worker. He did not choose to participate in BBAT as walking on asphalt pavements to the training location would worsen his pain. He would rather use periods of less pain to go climbing, his favourite activity. The hip pain had lasted for 2 years, and he had severe hip osteoarthritis, MJS being 0 mm. At baseline he reported substantial pain during walking (NRS = 7.0) and substantial disability scores on several HOOS subscales, and HHS was poor (Tables 3–5). After 4 months he reported on PGIC to be somewhat better in both pain and function (Table 7). He had improved significantly in pain during walking (Table 3). The HHS had changed from poor to fair, the UCLA activity score improved, while most of the other measures tended to improve, but not significantly (Tables 3–6). After 10 months he reported on PGIC that the condition was rather unchanged (from the status at 4 months), which was more or less supported by scores on the other self-report and performance measures.

Patient 3

Patient 3 was in his fifties and sick-listed from a job as a plumber. He was highly motivated for PE and BBAT to improve his condition and return to work. The hip pain had lasted for 6 years and moderate hip osteoarthritis was indicated by MJS = 2 mm. At baseline pain during walking was 6 on NRS. He also reported substantial pain during sitting (NRS = 8) and at night (Table 3), as well as moderate to severe disability on HOOS subscale scores (Table 4). HHS was poor. After 4 months he had partly returned to work, and he reported on PGIC that pain was somewhat better and function very much better (Table 7). Pain and HOOS subscale scores and UCLA activity had improved to a clinically important extent (Tables 3–5). Scores on HHS had changed from poor to good. The ROM of internal and external rotation had improved significantly. At 10 months he worked full time. He had mainly kept his improved scores from the 4 month assessment, but most subscales on HOOS had deteriorated while the HHS was excellent (Table 5). He reported on PGIC to be much better in pain and somewhat better in function (Table 7).

Patient 4

Patient 4 was a pensioner in his late seventies who had worked previously as a dairy man. He was very motivated to try out 'any intervention that might be beneficial to [his] hip'. The hip pain had lasted for a year, and severe hip osteoarthritis was indicated by MJS = 1 mm. Pain during walking was rated 5.5 at baseline and HHS was 77 (fair). Scores on HOOS subscales were rather high (less disability), except for QoL being moderate (Table 4). After 4 months he reported on PGIC to be somewhat better in both pain and function (Table 7), but other pain and disability scores (Tables 3–6) were rather unchanged or tended to have changed in a negative direction (HOOS subscales). At 10 months he reported on PGIC that pain was much better, and function somewhat better than at 4 months.

Table 2. Patient characteristics and background variables at baseline.

Patient	Gender	Age group (years)	BMI (kg/m^2)	More affected hip	Hip pain duration	Joint space (mm)	Profession	Work status
1[a]	Male	45–50	36.4	Right	9 months	2	Carpenter	Working
2[a]	Male	60–65	23.5	Right	2 years	0	Physician	Working
3	Male	50–55	25.8	Left	6 years	2	Plumber	Sick leave
4	Male	75–80	20.9	Left	1 year	1	Dairy worker	Pensioner
5	Female	65–70	32.5	Right	8 months	2	Shop manager	Pensioner
6	Female	65–70	26.5	Left	12 years	1	Healthcare assistant	Disability pension
7	Male	65–70	26.3	Right	3 years	0	Teacher	Pensioner

[a]Participated in patient education only.
BMI: body mass index.

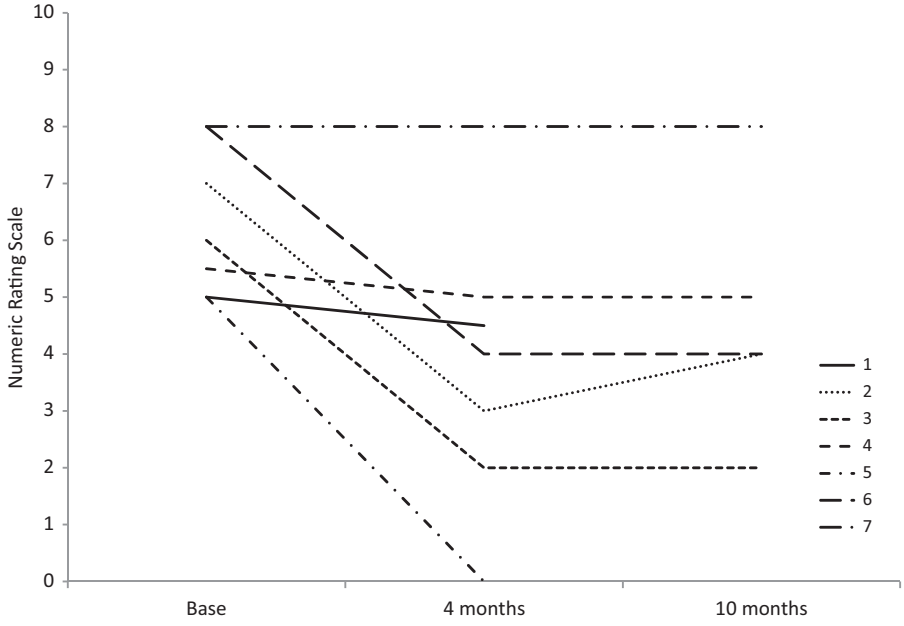

Figure 1. Change in pain during walking for participants 1–7.

Pain during walking was unchanged while pain at night had improved from NRS = 3 to 1. Scores on HHS were good (Table 5).

Patient 5

Patient 5 was a pensioner in her late sixties and a former shop manager. She considered herself too young for hip replacement and was motivated to try out PE and BBAT. Her hip problems had lasted for 8 months, and she had moderate hip osteoarthritis by MJS = 2 mm. Pain during walking was 5.0 on NRS at baseline (Table 3) and she reported substantial pain during sitting (NRS = 7) and at night (NRS = 8). Her QoL scores were low at baseline (Tables 4 and 5), and HHS was poor. After 4 months she reported on PGIC to be very much better in pain and much better in function (Table 7). Pain and QoL scores had improved significantly, as assessed by NRS, HOOS Pain subscale and EQ-5D (Tables 3–5). HHS was excellent. During the training period she had other health problems and was only able to attend seven BBAT sessions. Because of serious private matters, unrelated to the hip, she did not attend the 10 month assessments.

Patient 6

Patient 6 was in her late sixties and on disability pension, but had worked formerly as a healthcare assistant. She was motivated to participate in PE and BBAT to improve her physical fitness in case hip arthroplasty became necessary. Her hip problems had lasted for 12 years and she had severe hip osteoarthritis (MJS = 1 mm). At baseline she had high pain during walking (NRS = 8.0) (Table 3), substantial HOOS disability scores and low QoL scores (Tables 4 and 5). After 4 months she reported on PGIC that pain and function were somewhat better (Table 7). There was a significant improvement in pain during walking, in the HOOS subscale scores of symptoms, ADL, sport/recreation and QoL, and in QoL

Table 3. Pain intensity in connection with walking, sitting and at night, at baseline and after 4 and 10 months, assessed with a numeric rating scale (scale 0–10).

Patient	Assessments	Pain during walking	Pain during sitting	Pain at night
1[a]	Baseline	5.0	2.0	3.0
	4 months	4.5	1.0	1.0
	10 months[b]	–	–	–
2[a]	Baseline	7.0	4.0	2.0
	4 months	3.0	3.0	2.0
	10 months	4.0	3.0	3.0
3	Baseline	6.0	8.0	5.0
	4 months	2.0	1.0	2.0
	10 months	2.0	1.0	1.0
4	Baseline	5.5	1.0	3.0
	4 months	5.0	2.0	2.0
	10 months	5.0	1.0	1.0
5	Baseline	5.0	7.0	8.0
	4 months	0.0	0.0	0.0
	10 months[b]	–	–	–
6	Baseline	8.0	7.0	8.0
	4 months	4.0	3.0	2.0
	10 months	4.0	5.0	2.0
7	Baseline	8.0	0.0	0.0
	4 months	1.0–8.0[c]	0.0	0.0
	10 months	8.0	1.0	2.0

[a]Participated in patient education only; [b]missing; [c]varying pain during walking as scored.

Table 4. Subscales of Hip disability and Osteoarthritis Outcome Score (HOOS 2.0) assessed at baseline and after 4 and 10 months [scale 0–100 (best)].

Patient	Assessment	Pain	Symptoms	ADL	Sport/rec.	QoL
1[a]	Baseline	50.0	55.0	50.0	18.8	50.0
	4 months	67.5	70.0	88.2	62.5	68.8
	10 months[b]	–	–	–	–	–
2[a]	Baseline	40.0	35.0	64.7	25.0	31.3
	4 months	52.5	45.0	60.3	37.5	43.8
	10 months	52.5	45.0	67.7	37.5	50.0
3	Baseline	45.0	35.0	48.5	50.0	43.8
	4 months	80.0	55.0	95.6	93.8	62.5
	10 months	52.5	60.0	64.7	62.5	43.8
4	Baseline	75.0	80.0	92.7	93.8	56.3
	4 months	65.0	75.0	76.5	87.5	50.0
	10 months	50.0	75.0	83.8	75.0	56.3
5	Baseline	60.0	85.0	63.2	81.3	25.0
	4 months	87.5	70.0	73.5	62.5	43.8
	10 months[b]	–	–	–	–	–
6	Baseline	25.0	25.0	29.4	12.5	25.0
	4 months	42.5	55.0	66.2	50.0	37.5
	10 months	42.5	50.0	36.8	37.5	31.3
7	Baseline	57.5	35.0	63.2	25.0	18.8
	4 months	55.0	50.0	69.1	31.3	31.3
	10 months	37.5	35.0	36.8	12.5	18.8

[a]Participated in patient education only; [b]missing.
ADL: activities of daily living; rec.: recreation; QoL: quality of life.

assessed by EQ-5D (Tables 3–5). HHS had changed from poor to fair. At 10 months pain by NRS was still improved, and PGIC scores still indicated somewhat less pain and better functioning than at 4 months. Still, some HOOS subscale scores tended to worsen (Table 4) and the UCLA activity score was worse after 4 and 10 months as compared to baseline.

Table 5. Test scores of hip disability (Harris Hip Score), health-related quality of life [EuroQol 5 Dimensions (EQ-5D)], activity level [University of California at Los Angeles (UCLA) activity] and physical capacity [Timed Up and Go (TUG)], assessed at baseline and after 4 and 10 months.

Patient	Assessment	Harris Hip Score 0–100 (best)	EQ-5D 0–100 (best)	UCLA activity 0–10 (best)	TUG (s)
1[a]	Baseline	74	69	7	5.33
	4 months	86	75	8	6.30
	10 months[b]	–	–	–	–
2[a]	Baseline	57	70	6	5.48
	4 months	70	70	8	4.42
	10 months	59	80	8	3.92
3	Baseline	67	75	5	4.79
	4 months	86	75	9	5.00
	10 months	96	75	8	4.74
4	Baseline	77	70	6	7.00
	4 months	74	70	6	7.30
	10 months	81	60	6	5.65
5	Baseline	59	35	4	8.1
	4 months	95	75	3	7.0
	10 months[b]	–	–	–	–
6	Baseline	52	40	6	8.40
	4 months	76	75	4	6.80
	10 months	67	55	4	7.45
7	Baseline	59	50	8	5.60
	4 months	65	70	7	5.35
	10 months	56	60	5	7.23

[a]Participated in patient education only; [b]missing.

Patient 7

Patient 7 was a pensioner in his late sixties who had worked formerly as a teacher. His hip problems had lasted for 3 years and MJS = 0 mm. Having a history of heart disease he was motivated to participate in PE and BBAT as he wished to postpone hip replacement surgery for as long as possible. At baseline he had high pain during walking (NRS = 8) (Table 3), HHS and HOOS subscales indicated severe disability, and QoL scores were low (Tables 4 and 5). After 4 months he reported on PGIC to be much better, but had not improved significantly on the various measures, rather the opposite. After 10 months he reported on PGIC to be somewhat worse in both pain and function, and other measures had also deteriorated. He now considered surgery inevitable.

Discussion

According to MJS from X-rays and scores of symptoms from self-report and performance measures, the patients included in this study had moderate to severe hip osteoarthritis and were potential candidates for hip arthroplasty. Two patients were motivated to try out PE only, and five a combination of PE and BBAT.

Outcome at 4 and 10 months

The different assessment tools provided a broad picture of change over time. Pain during walking is a major

Table 6. Range of motion (ROM) of the hip in degrees of index joint at baseline and after 4 and 10 months, and comparison of total ROM between hips.

Patient, index hip	Assessment	Flex.	Ext.	Ext. rot.	Int. rot.	Abd.	Add.	Total, right/left
1[a], right	Baseline	90	5	25	15	15	15	165/220
	4 months	110	10	15	25	30	10	200/220
	10 months[b]	–	–	–	–	–	–	–
2[a], right	Baseline	100	5	10	10	10	15	150/230
	4 months	105	10	10	15	15	10	165/230
	10 months	105	0	10	5	15	5	140/195
3, left	Baseline	85	5	10	10	20	10	220/140
	4 months	90	5	20	25	20	10	185/170
	10 months	100	5	0	15	25	15	230/160
4, left	Baseline	90	0	5	10	10	5	170/120
	4 months	85	0	0	10	20	10	180/125
	10 months	95	5	20	0	15	10	195/145
5, right	Baseline	90	[a]	5	10	15	15	135/180
	4 months	95	10	15	10	25	15	170/200
	10 months[b]	–	–	–	–	–	–	–
6, left	Baseline	95	5	20	5	20	15	210/160
	4 months	95	5	10	10	25	15	185/160
	10 months	95	5	15	15	15	15	215/160
7, right	Baseline	95	10	25	10	20	25	185/210
	4 months	95	5	10	10	25	15	160/205
	10 months	95	5	15	15	15	15	160/205

[a]Participated in patient education only; [b]missing.
Flex.: flexion; Ext.: extension; Ext. rot.: external rotation; Int. rot.: internal rotation; Abd.: abduction; Add.: adduction.

Table 7. Perceived change in pain and function from baseline to 4 months (4 m) and from 4 months to 10 months (10 m), assessed with the Patient Global Impression of Change (PGIC).

Patient		Very much better	Much better	Somewhat better	Unchanged	Somewhat worse	Much worse	Very much worse
1	Pain[a]		4 m					
	Function[a]		4 m					
2	Pain			4 m	10 m			
	Function			4 m	10 m			
3	Pain		10 m	4 m				
	Function	4 m		10 m				
4	Pain		10 m	4 m				
	Function			4 m, 10 m				
5	Pain[a]	4 m						
	Function[a]		4 m					
6	Pain			4 m, 10 m				
	Function			4 m, 10 m				
7	Pain		4 m			10 m		
	Function		4 m			10 m		

[a]Missing values at 10 months.

problem in hip osteoarthritis,[36] and we chose this variable in advance as the main outcome. After 4 months there was a significant pain reduction in four patients (patients 2, 3, 5 and 6), while pain was maintained at the baseline level in the other three (Figure 1). Patient 2 had participated in PE only, while patients 3, 5 and 6 had participated in PE and BBAT. Patients 3, 5 and 6 also showed significantly less pain during sitting and at night, while patients 5 and 6 showed a remarkable improvement in QoL (EQ-5D). However, at the 4 month assessment all reported on PGIC to have improved more or less in pain and function. HHS, which was fair or poor at baseline, was now excellent in patient 5, good in patients 1 and 3, fair in patients 2, 4 and 6, and poor in patient 7.

The outcome 6 months later was of particular interest, as this would indicate whether the intervention could have lasting effects. Unfortunately, two patients were missing (for reasons unrelated to the hip problem), decreasing the long-term evidence from the study. The significant pain reduction during walking registered at 4 months was maintained after 10 months in patients 2, 3 and 6. The HHS was further improved in patients 3 (excellent) and 4 (good), but tended to be worse (poor) in patients 2, 6 and 7. On PGIC all patients reported being more or less improved from the 4 month assessment, but patient 2 was unchanged and patient 7 was worse, being the only one motivated to undergo surgery. One can speculate whether the rather bad outcome of these two patients was related to the lack of hip cartilage (MJS = 0 mm).

Comparison with results from other studies

Few case studies have been published regarding the short- and long-term effects of physiotherapy modalities in hip osteoarthritis. In a study by King,[37] the patients received treatment three times a week over 7 weeks, focusing on strength training of hip muscles and functional exercises including gait re-education. Pain was reported to be substantially decreased (not measured) and hip ROM increased. The long-term effect was, however, not recorded. In another study, the treatment of a woman involved warm-up and walking instructions, strengthening, stretching, flexibility and functional exercises given twice a week over 12 weeks.[5] Pain at baseline was rather low, at 22 on a VAS of 0–100, and decreased to 11 after 6 months. Some randomized controlled trials were not able to show a difference in long-term change in pain between patients who received PE combined with traditional exercises or manual therapy, and those who received PE alone [38,39] or sham therapy.[40] Svege et al. [41] demonstrated, however, that PE and exercises combined might postpone arthroplasty. Ageberg et al. [42] presented the share of patients who improved after neuromuscular training while they waited for total joint replacement. The percentage of responders on the HOOS subscales ($\geq$15%) was 55% in pain, 47% in symptoms, 42% in ADL, 61% in sport/recreation and 62% in QoL after a mean of 15 weeks. Comparable short-term responders on HOOS calculated in our study after 16 weeks were 71% on the pain, symptom, ADL and sport/recreation subscales, and 86% on QoL.

The outcome of our study may seem promising compared to other studies, especially over a longer period. So, why may BBAT be beneficial for patients with hip osteoarthritis? There is widespread use of strengthening exercises and manual therapy in the management of hip osteoarthritis,[43] but insufficient evidence for their effect.[40,44] BBAT may seem to have some similarities in its aims to neuromuscular training: 'to enhance appropriate muscle activation to obtain functional stabilization of joints, reduce joint load, and achieve quality and efficiency of movements and thereby optimize the patient's function'.[42] However, the methodology and process seem different. The BBAT group sessions focus on improving body and movement awareness and posture, and movement quality by physically practising and repeating more healthy and functional movements and postures, and by mentally exploring and conceptualizing movement and body experiences. After each movement session, the participants share experiences in the group, reflecting upon their own 'findings'. Home practice and integration of movement experiences in daily life may explain the long-term improvement in pain and functioning. The attention of the BBAT instructor is on the individual, building a relationship and looking for movement resources,[21] while learning is also enforced by participating in the group process.

Limitations and strengths

The different outcome measures give a broad picture of changes in the study. The design made it possible to study in depth the effect of therapy in multiple cases, looking for commonalities and differences. Still, the study is small, limiting its generalizability. Some patients made remarkable improvements, while others were unchanged or even worse over a longer period, possibly owing to a lack of cartilage in the hip joint. Also, using this design we cannot be sure whether the changes reported are due to the interventions or simply to variability in the condition over time. Two patients did not participate in BBAT. They worked full time, and may represent patients who are willing and able to make lifestyle changes on their own, given PE. A randomized controlled trial should be performed to examine the supplementary effect of BBAT.

Conclusion

Change in pain during walking was shown to differ among patients with moderate to severe hip osteoarthritis who participated in either PE only or PE and BBAT combined after 4 and 10 months. Significant improvement was seen in three out of five patients after 10 months. The promising long-term results in individual patients call for a randomized controlled trial with sufficient power to examine the supplementary effects of BBAT. Patients should probably have an MJS $>$ 0 mm to obtain an improvement that lasts over time.

Acknowledgements

Thanks to the physiotherapists Gyongyver Nagy Molvær and Marianne Allers at Haukeland University Hospital for patient assessments and education. Thanks also to Professor Rolf Moe-Nilssen who helped construct Figure 1.

Disclosure statement

The authors report no conflicts of interest.

Funding information

Thanks to the Health Region West and University of Bergen for funding support.

References

[1] Vos T, Flaxman AD, Naghavi M, et al. Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380:2163–2196.

[2] Grotle M, Hagen KB, Natvig B, et al. Prevalence and burden of osteoarthritis: results from a population survey in Norway. J Rheumatol. 2008;35: 677–684.

[3] Veje K, Hyllested JL, Ostergaard K. Osteoarthritis. Pathogenesis, clinical features and treatment. Ugeskr Laeger. 2002;164:3173–3179.

[4] Birrell F, Croft P, Cooper C, et al. Predicting radiographic hip osteoarthritis from range of movement. Rheumatology. 2001;40:506–512.

[5] Fernandes L, Storheim K, Nordsletten L, Risberg MA. Development of a therapeutic exercise program for patients with osteoarthritis of the hip. Phys Ther. 2010; 90:592–601.

[6] Zeni J , Pozzi F, Abujaber S, Miller L. Relationship between physical impairments and movement patterns during gait in patients with end-stage hip osteoarthritis. J Orthop Res. 2015;33:382–389.

[7] Truszczynska A, Rapala K, Gmitrzykowska E, et al. Postural stability disorders in patients with osteoarthritis of the hip. Acta Bioeng Biomech. 2014;16:45–50.

[8] Fernandes L, Hagen KB, Bijlsma JW, et al. EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis. Ann Rheum Dis. 2013;72:1125–1135.

[9] Hochberg MC, Altman RD, April KT, et al. American College of Rheumatology 2012 recommendations for the use of nonpharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee. Arthritis Care Res. 2012;64:465–474.

[10] Skou ST, Odgaard A, Rasmussen JO, Roos EM. Group education and exercise is feasible in knee and hip osteoarthritis. Dan Med J. 2012;59:A4554.

[11] Espehaug B, Furnes O, Engesaeter LB, Havelin LI. Hip arthroplasty in Norway 1989–2008. Tidsskr Nor Laegeforen. 2011;131:1543–1548.

[12] Fevang BT, Lie SA, Havelin LI, et al. Improved results of primary total hip replacement. Acta Orthop. 2010;81:649–659.

[13] Dale H, Skramm I, Lower HL, et al. Infection after primary hip arthroplasty: a comparison of 3 Norwegian health registers. Acta Orthop. 2011;82:646–654.

[14] Kozma CM, Slaton T, Paris A, Edgell ET. Cost and utilization of healthcare services for hip and knee replacement. J Med Econ. 2013;16:888–896.

[15] Danielsson LG. Incidence and prognosis of coxartrosis. Acta Orthop Scand. 1964;42(Suppl66):13.

[16] Klassbo M, Larsson G, Harms-Ringdahl K. Promising outcome of a hip school for patients with hip dysfunction. Arthritis Rheum. 2003;49:321–327.

[17] Roos EM, Juhl CB. Osteoarthritis 2012 year in review: rehabilitation and outcomes. Osteoarthritis Cartilage. 2012;20:1477–1483.

[18] Golightly YM, Allen KD, Caine DJ. A comprehensive review of the effectiveness of different exercise programs for patients with osteoarthritis. Phys Sportsmed. 2012; 40:52–65.

[19] Fransen M, McConnell S, Hernandez-Molina G, Reichenbach S. Exercise for osteoarthritis of the hip. Cochrane Database Syst Rev. 2009;8:CD007912.

[20] Skjaerven LH, Kristoffersen K, Gard G. An eye for movement quality: a phenomenological study of movement quality reflecting a group of physiotherapists' understanding of the phenomenon. Physiother Theory Pract. 2008;24:13–27.

[21] Skjaerven LH, Kristoffersen K, Gard G. How can movement quality be promoted in clinical practice? A phenomenological study of physical therapist experts. Phys Ther. 2010;90:1479–1492.

[22] Skjaerven LH, Gard G, Sundal MA, Strand LI. Reliability and validity of the Body Awareness Rating Scale (BARS), an observational assessment tool of movement quality. Eur J Physiother. 2015;17:19–28.

[23] Yin RK, editor. Case study research: design and methods. 3rd ed. London: Sage; 2003.

[24] Altman R, Alarcon G, Appelrouth D, et al. The American College of Rheumatology criteria for the classification and reporting of osteoarthritis of the hip. Arthritis Rheum. 1991;34:505–514.

[25] Farrar JT, Young JP, LaMoreaux L, et al. Clinical importance of changes in chronic pain intensity measured on an 11-point numerical pain rating scale. Pain. 2001;94:149–158.

[26] Nilsdotter AK, Lohmander LS, Klassbo M, Roos EM. Hip disability and Osteoarthritis Outcome Score (HOOS) – validity and responsiveness in total hip replacement. BMC Musculoskelet Disord. 2003;4:10.

[27] Ageberg E, Link A, Roos EM. Feasibility of neuromuscular training in patients with severe hip or knee OA: the individualized goal-based NEMEX-TJR training program. BMC Musculoskelet Disord. 2010;11:126.

[28] Nilsdotter A, Bremander A. Measures of hip function and symptoms: Harris Hip Score (HHS), Hip Disability and Osteoarthritis Outcome Score (HOOS), Oxford Hip Score (OHS), Lequesne Index of Severity for Osteoarthritis of the Hip (LISOH), and American Academy of Orthopedic Surgeons (AAOS) Hip and Knee Questionnaire. Arthritis Care Res (Hoboken). 2011;63Suppl11:S200–207.

[29] Terwee CB, Dekker FW, Wiersinga WM, et al. On assessing responsiveness of health-related quality of life instruments: guidelines for instrument evaluation. Qual Life Res. 2003;12:349–362.

[30] EuroQol Group. EuroQol – a new facility for the measurement of health-related quality of life. Health Policy. 1990;16:199–208.

[31] Podsiadlo D, Richardson S. The timed 'Up & Go': a test of basic functional mobility for frail elderly persons. J Am Geriatr Soc. 1991;39:142–148.

[32] Bohannon RW. Reference values for the timed up and go test: a descriptive meta-analysis. J Geriatr Phys Ther. 2006; 29:64–68.

[33] Norkin CC, White DJ. Measurement of joint motion. A guide to goniometry. 4th ed. Philadelphia, PA: F.A. Davis Company; 2009.

[34] Pua YH, Wrigley TV, Cowan SM, Bennell KL. Intrarater test–retest reliability of hip range of motion and hip muscle strength measurements in persons with hip osteoarthritis. Arch Phys Med Rehabil. 2008;89:1146–1154.

[35] Croft P, Cooper C, Wickham C, Coggon D. Defining osteoarthritis of the hip for epidemiologic studies. Am J Epidemiol. 1990;132:514–522.

[36] Hurwitz DE, Hulet CH, Andriacchi TP, et al. Gait compensations in patients with osteoarthritis of the hip and their relationship to pain and passive hip motion. J Orthop Res. 1997;15:629–635.

[37] King L. Case study: Physical therapy management of hip osteoarthritis prior to total hip arthroplasty. J Orthop Sports Phys Ther. 1997;26:35–38.

[38] Fernandes L, Storheim K, Sandvik L, et al. Efficacy of patient education and supervised exercise vs patient education alone in patients with hip osteoarthritis: a single blind randomized clinical trial. Osteoarthritis Cartilage. 2010;18:1237–1243.
[39] Poulsen E, Hartvigsen J, Christensen HW, et al. Patient education with or without manual therapy compared to a control group in patients with osteoarthritis of the hip. A proof-of-principle three-arm parallel group randomized clinical trial. Osteoarthritis Cartilage. 2013;21:1494–1503.
[40] Bennell KL, Egerton T, Martin J, et al. Effect of physical therapy on pain and function in patients with hip osteoarthritis: a randomized clinical trial. JAMA. 2014;311:1987–1997.
[41] Svege I, Nordsletten L, Fernandes L, Risberg MA. Exercise therapy may postpone total hip replacement surgery in patients with hip osteoarthritis: a long-term follow-up of a randomised trial. Ann Rheum Dis. 2015;74:164–169.
[42] Ageberg E, Nilsdotter A, Kosek E, Roos EM. Effects of neuromuscular training (NEMEX-TJR) on patient-reported outcomes and physical function in severe primary hip or knee osteoarthritis: a controlled before-and-after study. BMC Musculoskelet Disord. 2013;14:232.
[43] Cowan SM, Blackburn MS, McMahon K, Bennell KL. Current Australian physiotherapy management of hip osteoarthritis. Physiotherapy. 2010;96:289–295.
[44] Moe RH, Haavardsholm EA, Christie A, et al. Effectiveness of nonpharmacological and nonsurgical interventions for hip osteoarthritis: an umbrella review of high-quality systematic reviews. Phys Ther. 2007;87:1716–1727.