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TITLE PAGE

Facilitating Activity and Self-management for people with Arthritic knee, hip or lower back pain (FASA): a cluster randomised controlled trial.

Nicola Walsh PhD[1], Louise Jones MCSP[1], Sonia Phillips MCSP[1], Rachel Thomas MCSP[1], Lang'o Odondi PhD[2], Shea Palmer PhD[1], Fiona Cramp PhD[1], Jon Pollock PhD[1], Mike Hurley PhD[3]

[1]Faculty of Health and Applied Sciences, University of the West of England, Bristol, UK

[2]Division of Cardiovascular Medicine, University of Nottingham, UK

[3]Faculty of Health, Social Care and Education, Kingston University, London, UK

Address for Correspondence: Professor Nicola Walsh

Faculty of Health and Applied Sciences

Glenside Campus

Blackberry Hill

Bristol, BS16 1DD

0117 328 8801

Nicola.walsh@uwe.ac.uk

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ABSTRACT

Background: Chronic musculoskeletal pain including osteoarthritis (OA) can significantly limit the functional independence of individuals. The spine and peripheral joints of the lower limb are predominantly affected; management guidelines for each recommend exercise and education to support self-management.

Objectives: This study investigated the effectiveness of a generic exercise and self-management intervention for people over-50 with lower limb OA and/or lower back pain compared to continued GP management.

Design: Single blind, cluster randomised controlled trial

Method: Participants who had previously consulted with lower limb OA and/or chronic lower back pain were recruited from 45 GP practices in SW England. Practices were randomly allocated to receive continued GP care (control) or continued GP care and a 6-week group exercise and self-management intervention facilitated by a physiotherapist and located in a community-based physiotherapy department. The primary outcome measure was the Dysfunction Index of the Short Musculoskeletal Functional Assessment (DI-SMFA) measured at six month post-rehabilitation.

Results: 349 participants were recruited and allocated to the intervention (n=170) or control (n=179) arms; the attrition rate was 13% at the 6 month primary end-point. One minor adverse event in the intervention group that required no medical input was reported. Intervention arm participants reported better function at 6 months compared with continued GP management alone (-3.01 difference in DI-SMFA [95%CI -5.25, -0.76], p=0.01).

Conclusions: A generic exercise and self-management intervention was safe and resulted in statistically significant changes in function after six months compared with GP management alone, although the translation to the clinical significance of these findings is less clear. This generic approach may be an effective way of managing group interventions for lower limb OA and chronic lower back pain.

INTRODUCTION

As the population increases and people live longer, diseases associated with older age pose a considerable public health issue [1]. Demands on already compromised health services are likely to grow as individuals seek medical assistance to retain independence and quality of life. Chronic musculoskeletal pain including osteoarthritis (OA) can significantly limit the functional independence of individuals, and given that 25% of the population experience these problems [2], the socioeconomic impact is immense and the personal impact significant – musculoskeletal disorders are the single largest cause of years lived with disability in the UK [3]. Pressure on the older individual to remain healthy will intensify in association with the expectations to remain economically active and continue working into the seventh decade.

Within primary care approximately one third of general practitioner (GP) consultations are related to musculoskeletal disorders [4] the most prevalent of which are OA and chronic low back pain [5]. These conditions are not life-threatening per se, but the effects of pain-induced immobility and reduced function can contribute to the development and progression of other serious comorbidities common in the older population (e.g. diabetes and hypertension) [5]. Furthermore associated anxiety and depression are recognisably higher in this group [6]. As such, from a public health perspective, reducing the impact of these conditions is an important component of maintaining a healthy older population.

Although disabling chronic musculoskeletal pain and OA can present in any joint, the hip, knee and lumbar spine are predominantly affected [7]. Previous research has demonstrated the effectiveness of exercise and self-management [8], but most trials tailor interventions for

specific joints (e.g. hip or knee or back). In order to deliver evidence-based treatments clinicians have either to manage patients on an individual basis or refer to joint-specific group interventions. Neither option is ideal – the former incurs significant time and financial cost, whilst the latter often requires patients to wait for appropriate numbers of people to be referred to allow groups to run. Furthermore, epidemiological data demonstrate that many older people with degenerative joint problems experience pain and functional difficulty in other joints, seeking further healthcare input as these present [9].

Managing multiple joint presentations simultaneously may reduce the need for repeat visits to healthcare professionals as advice is frequently similar for differing site presentations. In addition, widening therapy to cover patients with multiple joint involvement would attract more patients, enable classes to run more frequently (thus reducing waiting times) and potentially have a prophylactic effect, as people would be more proactive in exercising the whole musculoskeletal system.

NICE guidelines recommend exercise and education to promote self-management of the condition [10]. Long-term engagement with exercise, like many lifestyle change interventions, is generally limited, particularly in the presence of chronic musculoskeletal pain. Many patients stop exercising once formal interventions cease because of loss of interest, lack of time and/or facilities, and minimal benefits to pain or function [11]. Symptoms often return and re-referral for further intervention is common at considerable cost to health services [9]. Previous work has demonstrated that for chronic knee pain/OA, a six-week exercise and self-management intervention (ESCAPE-knee pain) facilitated by a physiotherapist resulted in

clinically and statistically significant improvements in function, pain and self-efficacy six months post-intervention [12], which were still apparent 2½ years later [13].

The current trial was undertaken to determine whether a modified version of the ESCAPE programme, FASA – Facilitating Activity and Self-management in Arthritic Pain, based on social cognitive theory, [14], was beneficial to people with lower limb OA, chronic low back pain, or a combination of these presentations. The primary hypothesis was that participation in the FASA intervention would improve function more effectively than continued GP management alone.

METHODS

This trial was conducted and analysed according to a pre-specified protocol [15] (ISRCTN registration 66190737). Ethical approval was received from South West 4 Research Ethics Committee: Reference number 11/SW/0053. Recruitment, intervention and follow-up was completed in 2016, analysis was completed in 2018.

Design: A pragmatic, assessor blinded, cluster randomised controlled trial (CRCT) compared usual GP-led primary care management to a physiotherapist-facilitated exercise and self-management intervention.

Study sample and recruitment

Broad inclusion criteria were adopted to reflect typical populations in primary care, and participants were recruited from urban and rural GP practices in South West England. Individuals were invited to participate if they were aged 50 years and over; and had a clinical or radiographic diagnosis of hip and/or knee OA, and/or chronic lower back pain of at least

six months duration. Participants were excluded if they had received physiotherapy in the preceding 6 months; had lower limb arthroplasty; had unstable medical or psychiatric disorders; or their level of spoken English would prohibit group participation.

GP practices were recruited via the Clinical Research Network and were asked to perform a database search and send an invitation letter to all potential participants. Subsequently, practices were 4-block randomised to either the intervention arm or GP-led management arm, using random sequence generation by a researcher located remotely who was not involved in recruitment, assessment, data collection or analysis. Potential participants were asked to return a reply slip or to telephone the Trial Co-ordinator who responded to participant queries, screened potential participants, received written consent and arranged assessment appointments, but was not involved in outcome assessment and remained blind to individual outcome data. Patient groups were formed from the recruiting practices and individuals attended at a site local to them.

The Trial Assessor, a physiotherapist blind to participant allocation, conducted the baseline assessment at a local community-based out-patient physiotherapy department. The assessment included administration of all outcome measures, collecting anthropometric data and a physical assessment to eliminate any serious pathology that would exclude individuals from participating.

Sample size calculation: Taking $p<0.05$ as significant, the study sample size of n=352 was calculated to have 80% power to detect a 5.7 point absolute difference in the primary outcome measure, the Dysfunction Index of the Short Musculoskeletal Functional Assessment (DI-SMFA) [16] score at 6 months post intervention, between the group intervention and

standard care arms. Calculations assumed a mean score of 38 (SD=18) would be observed in standard care, which is taken from Ponzer et al [17] in a sample of 30 patients with chronic OA in the hip/knee.

As interventions were randomised at the GP practice level, sample size calculations accounted for this design, assuming an average of 8 patients would be recruited per GP practice (based on response of the original ESCAPE trial [11] with cluster size standard deviation (SD) of 5.11 (taken from the findings of Hurley at al [11]). Variable cluster sizes were accommodated using the formula of Eldridge et al [17] anticipating an attrition rate of 20% at the individual level by the primary end point, assumed to be independent of response and cluster size. We used the same intra-cluster correlation co-efficient (ICC) =0.036 as was reported by Hurley et al [11] and assumed an overall response SD = 15.0 (in both arms).

Intervention arm

The FASA intervention was derived from the ESCAPE-knee programme [12], with amendments made to account for the involvement of multiple joints. It consisted of an exercise and self-management intervention lasting 6-weeks (twice weekly), and was delivered by a physiotherapist (blinded to assessment data) to closed groups of approximately eight participants. In brief, each session lasted for 60-minutes and included approximately 20-25 minutes of physiotherapist-facilitated group discussion and problem-solving session (with a supporting handbook) regarding issues of self-management. Topics included activity-rest cycling, use of ice and heat for pain relief, goal-setting and action plans, exercise recommendations, healthy eating and managing changes in pain. After each discussion, participants undertook approximately 30-35 minutes of exercise, based on stations of strengthening, aerobic and co-ordination activities. Further to the exercises, in collaboration

with the physiotherapist, each individual completed an action plan regarding exercise/activities they aimed to achieve over the following week. This was reviewed after each week, to determine adherence to the plan, problem-solving if the goal had proved unachievable, or progressed if it was achieved. Each participant was provided with a supplementary patient booklet that contained educational materials and self-completed tasks to monitor their progress. Patients in this arm were also permitted to continue on GP management and all other treatments as prescribed except physiotherapy. Further details of the specific behavioural change techniques employed in this intervention can be found elsewhere [19].

All groups were located within typical community-located physiotherapy out-patient departments, no additional equipment was required, and all were integrated into standard working hours. Groups were sequentially populated from recruited GP sites, so were routinely formed from a single GP practice.

Control arm

Participants allocated to the control arm continued GP-led management, and were permitted to continue any current pharmacological or non-pharmacological treatment strategies. New referrals to all other services (e.g. physiotherapy) were also permitted.

Outcome measures

The primary outcome measure was the Dysfunction Index of the Short Musculoskeletal Functional Assessment (DI-SMFA) [16]. This validated, self-administered questionnaire was developed for use in any patients with musculoskeletal dysfunction, recording resultant

actual physical limitation. The 34-item questionnaire asks patients to rate their functional performance from 1 – 5 with lower scores indicating improved function. This measure was chosen as it was not joint-specific, and therefore appropriate to use simultaneously in lower limb and lumbar spine musculoskeletal presentations. The primary analysis related to the whole patient sample irrespective of site of pain. Efficacy is the overall effect size obtained from analysis using a mixed model with combined data, not partitioned as per site of pain. Sub-group analyses of site-specific outcomes were undertaken as secondary analyses.

Secondary outcomes consisted of: Self-efficacy and exercise health beliefs questionnaire [20]; Hospital Anxiety and Depression scale (HADS) [21]; Short Form McGill Pain questionnaire [22]; Aggregated Functional Performance Time (AFPT) (a combined measure of walking, stair ascent and descent) [23].

All outcomes were collected at baseline and 6 months follow up. All self-completed outcome measures were also collected post-intervention (and the 6-week equivalent for the control arm). Baseline assessments were undertaken close to the time of pre-planned class commencement to prevent significant discrepancy between time period at follow-up between the control and intervention arms.

Statistical Analysis

The data analysis plan was based on an a priori protocol [15] and based on Intention to Treat with no interim analyses. For the primary analysis, individual patient responses were modelled using a mixed effects linear regression, allowing for the clustering of outcomes within GP practices (control arm) and exercise classes (intervention arm) by incorporating a random effects term. The mixed model was sufficiently robust to handle potential missing

data on the response variable. Differences in mean outcomes from the mixed effects linear regression were used to estimate the effect on the primary outcome of the intervention. To increase the precision of estimates, there was an adjustment for the baseline DI-SMFA score as a covariate in the regression. Participants expressed their primary diagnostic site at baseline (hip/knee/low back pain) which was also included as a covariate to account for variations in the outcome that may be associated with diagnosis.

The analysis of all other continuous secondary endpoints followed the same structure as the primary analysis. Whilst the trial was powered to detect a main effect of intervention, a secondary analysis examined the evidence for a difference in the effect of intervention between diagnostic groups, by testing whether an interaction term added to the mixed effects regression model used for the primary analysis was different from zero.

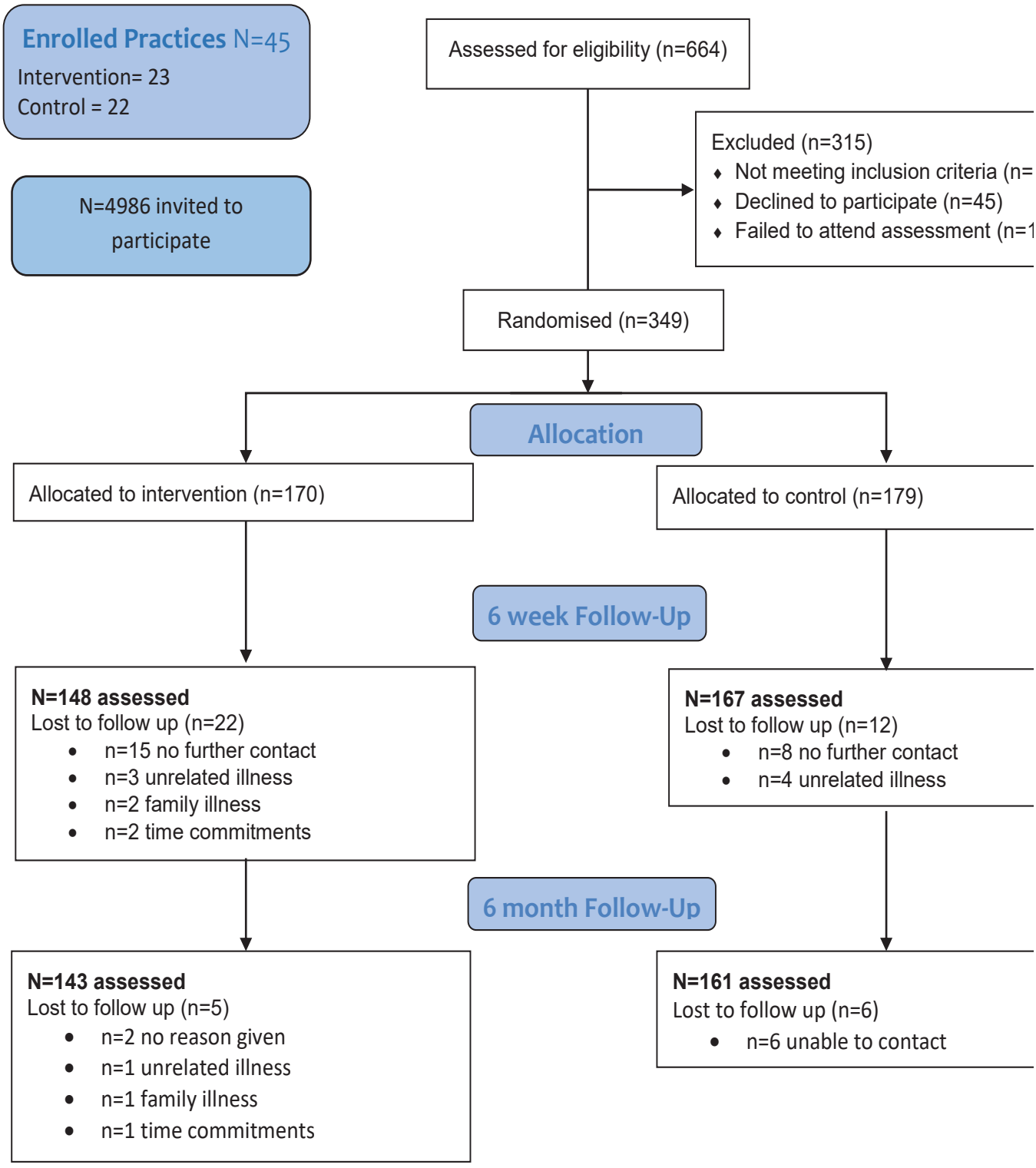
To better understand its potential benefits, an estimate of the efficacy of the intervention in those patients who were able and willing to comply using a complier averaged causal effect (CACE) approach [24] was undertaken. Here, compliance was measured by attendance at the 12 scheduled exercise classes, and compliers considered as those attending six or more sessions. This *a priori* decision was taken based on 'typical' class durations in practice whereby most interventions consist of one session per week over a six-week period. The CACE approach compared the mean outcome in compliers on the intervention arm with the mean outcome of a comparable, but unobserved, group of patients on the standard care arm who would have complied with the intervention had they been randomised to do so.

RESULTS

Recruitment

In total 56 practices expressed an interest in participating, and 45 consented to take part, n=23 practices were randomly allocated to the intervention arm, n=22 practices allocated to the control arm. Database searches identified 4986 potential participants who were sent information packs. No data are available for those who were invited but declined to participate as the study team did not have ethical permission to access those data. 664 responded and were assessed for eligibility, 232 did not meet the broad inclusion criteria and a further 45 declined to participate after discussing the trial further. 387 people were invited for baseline assessment. A further 25 were screened out at this stage as they did not meet the inclusion criteria or other pathology was suspected and 13 did not attend their initial assessment or respond to alternative appointments. N=349 of the initial 664 respondents were recruited onto the trial (52.3%). Figure 1 shows the recruitment flow chart for the study.

Figure 1: CONSORT diagram showing patient recruitment


Enrolled Practices N=45
Intervention= 23
Control = 22
N=4986 invited to participate
Assessed for eligibility (n=664)
Excluded (n=315)
Not meeting inclusion criteria (n=
Declined to participate (n=45)
Failed to attend assessment (n=1
Randomised (n=349)
Allocation
Allocated to intervention (n=170)
Allocated to control (n=179)
6 week Follow-Up
N=148 assessed
Lost to follow up (n=22)
n=15 no further contact
n=3 unrelated illness
n=2 family illness
n=2 time commitments
N=167 assessed
Lost to follow up (n=12)
n=8 no further contact
n=4 unrelated illness
6 month Follow-Up
N=143 assessed
Lost to follow up (n=5)
n=2 no reason given
n=1 unrelated illness
n=1 family illness
n=1 time commitments
N=161 assessed
Lost to follow up (n=6)
n=6 unable to contact

One hundred and seventy participants randomly allocated to the intervention arm and 179 to GP-led care (control arm) were broadly similar at baseline (see table 1). At the 6 months primary end point 27 (16%) participants had withdrawn from the intervention arm and 18 (10%) from the control arm. Total attrition was 13% at the primary end point. No participants reported withdrawal due to exacerbation of symptoms, although one participant attended the first six sessions but did not attend remaining sessions due to pain exacerbation which settled down with rest. She did not however withdraw from the study. One adverse event was reported in the intervention arm when a participant fell whilst alighting an exercise bike; no immediate first aid or further intervention was necessary for this incident.

Table 1: Summary of baseline characteristics (means, SD)

		Control (n=179)	Intervention (n=170)
Gender, number (Male: Female/% male)		75:104/42%	58:112/34%
Age (years)		66.5 (8.4)	66.3 (8.1)
Height (cm)		167.1 (9.3)	165.8 (9.7)
Weight (kg)		81.0 (15.6)	77.6 (14.0)
DI-SMFA (Irrespective of site of pain)		60.5 (17.2)	60.4 (16.1)
Pain site (DI-SMFA)	Hip/Kn only (n=108)	59.1 (15.7)	56.8 (12.2)
	LBP only (n=108)	55.8 (15.7)	58.5 (15.4)
	LBP & hip/kn (n=133)	65.5 (18.4)	64.8 (18.3)
AFPT (secs):	50ft walk	13.2 (4.0)	16.5 (7.9)
	Stair ascent	12.2 (9.5)	13.3 (10.4)
	Stair descent	5.7 (6.0)	5.6 (6.5)
	TUAG	9.9 (3.8)	9.9 (3.7)
McGill Pain Questionnaire		2.3 (2.1)	2.2 (2.0)
HADS	Anxiety	5.7 (3.7)	5.6 (3.7)
	Depression	4.2 (3.1)	3.9 (2.7)
Self-Efficacy		77.7 (9.4)	78.4 (8.9)
Pain/discomfort		2.4 (0.8)	2.4 (0.8)
Weekly duration on intervention* (mins)		274.4 (17.5)	310.9 (21.3)

DI-SMFA – Dysfunction Index Short Musculoskeletal Functional Assessment; AFPT – Aggregate Functional Performance Time; HADS – Hospital Anxiety and Depression Scale. *intervention arm patients reported significantly more activity than those in the control arm

Analysis

Statistical analysis was performed according to the pre-specified data analysis plan and based on intent-to-treat with no interim or post hoc analyses and no data imputation. Statistical significance is set at the nominal p-value of 0.05. The means and corresponding standard deviations were essentially similar for both the treatment and standard arms, although of note, on average patients in the intervention arm spent more self-reported time per week (approximately 36 minutes) exercising than control participants.

Primary and secondary outcomes measured at 6 months primary end point

Results from analysis using the mixed model adjusted for baseline DI-SMFA scores and pain sites (lower limb, lower back and combined lower back and lower limb) indicate a statistically significant effect of the intervention on DI-SMFA response measured after 6 months irrespective of pain site (-3.01; 95%CI: -5.25, -0.76, p=0.01) (Table 2). Specifically, the DI-SMFA score was 3 units lower for a patient on generic exercise and self-management arm compared with a patient on standard GP care arm, adjusting for both baseline DI-SMFA scores and pain site. The significance of this finding will be presented in the discussion.

Table 2: Efficacy of exercise on primary and secondary outcomes at primary end point

Analysis	Mean outcome (SD)		Efficacy*	p-value	95% CI
	Control	**Intervention**			
A. Primary outcome (DI-SMFA) measured at 6 months					
Combined pain sites n=304					
Overall efficacy	59.0 (17.9)	56.8 (16.7)	-3.01	0.01	-5.25, -0.76
Pain site					
Hip/kn only (n=108)	55.7 (14.9)	55.8 (13.0)	-2.28	0.15	-5.64, 0.89
LBP only (n=108)	56.3 (20.4)	55.7 (16.7)	-4.17	0.16	-10.00, 1.66
LBP & hip/kn (n=133)	62.2 (18.1)	60.2 (14.0)	-3.77	0.02	-6.92, -0.61
B. Secondary outcomes measured at 6 months (combined pain sites)					
McGill	2.6 (2.1)	2.3 (2.0)	-0.23	0.28	-0.65, 0.19
HADS					
Anxiety	5.3 (3.8)	5.0 (3.4)	-0.21	0.78	-0.91, 0.68
Depression	3.9 (2.9)	3.7 (2.8)	0.05	0.84	-0.42, 0.52
Self-Efficacy	79.2 (9.8)	80.5 (9.3)	1.69	0.09	-0.27, 3.65
AFPT					
50ft walk	13.2 (4.0)	12.5 (2.9)	-0.81	0.10	-1.76, 0.15
Stairs ascend	12.7 (9.7)	13.4 (10.77)	0.52	0.97	-2.00, 3.08
Stairs descend	5.8 (6.3)	4.9 (4.7)	-1.14	0.12	-2.58, 0.30
TUAG	9.6 (3.5)	8.9 (2.7)	-0.82	0.04	-1.61, -0.04

*Efficacy: effect size obtained from mixed model analysis

DI-SMFA – Dysfunction Index Short Musculoskeletal Functional Assessment; AFPT – Aggregate Functional Performance Time; HADS – Hospital Anxiety and Depression Scale

Considering each pain site, the efficacy of the intervention on the DI-SMFA scores measured at 6 months was statistically significant among patients presenting with combined LBP and hip/knee pain (-3.77; 95% CI: -6.92, -0.61; p=0.02) (Table 2). Despite substantial efficacy from the intervention among patients with both LBP only, and lower limb hip/knee pain only, these results were not statistically significant (-4.17; 95%CI: -10.0, 1.66; p=0.16 and –2.28; 95%CI: -5.64, 0.89; p=0.15 respectively) (Table 2), but this is to be expected as the study was not powered for these sub-group analyses and are presented for interest only.

The results indicate no statistically significant effect of the intervention for all the secondary outcomes measured at 6 months except for AFPT with respect to Timed Up and Go (TUAG). Here AFPT scores indicated an improvement of about 1 unit for those patients in the intervention arm relative to those on control, adjusting for baseline AFPT and baseline type of pain (-0.82; 95%CI: -1.61, -0.04; p=0.04) (Table 2), but this is unlikely to have clinical significance. Table 3 shows the means (SD) for the secondary outcomes at each pain site sub-group at 6 months.

Table 3: Secondary outcomes (means, SD) measured at 6 months for each pain site

Outcome	Hip/knee only (n=108)		LBP only (n=108)		LBP and hip/knee (n=133)	
	Control	Intervtn.	Control	Intervtn.	Control	Intervtn.
McGill	1.9 (1.5)	1.6 (1.6)	2.6 (2.3)	2.2 (2.0)	3.2 (2.3)	2.9 (2.2)
HADS						
Anxiety	4.7 (3.5)	3.9 (3.3)	5.8 (4.0)	5.7 (3.8)	5.5 (3.9)	5.3 (3.1)
Depression	3.5 (2.8)	3.6 (2.6)	3.7 (2.99)	4.1 (2.6)	4.3 (3.1)	3.5 (3.1)
Self-Eff.	78.5 (9.8)	79.9 (9.0)	80.2 (9.3)	80.8 (9.2)	77.7 (9.9)	80.8 (9.8)
AFPT						
50ft walk	12.5 (3.0)	12.7 (3.2)	12.6 (3.6)	11.7 (3.0)	14.2 (4.9)	12.9 (2.5)
Stairs ascend	12.2 (7.3)	13.4 (12.4)	12.2 (9.8)	12.0 (7.0)	13.7 (11.5)	14.7 (11.7)
Stairs descend	5.7 (5.6)	4.7 (4.1)	5.3 (6.0)	5.2 (5.2)	6.2 (6.8)	4.9 (4.8)
TUAG	9.2 (2.6)	8.9 (3.0)	8.6 (3.1)	8.3 (2.3)	10.4 (4.3)	9.4 (2.6)

Analysis of secondary outcomes at 6 weeks

Analysis of secondary outcomes measured at 6 weeks, adjusted for baseline outcome and baseline pain sites showed a statistically significant improvement on the McGill pain questionnaire, Self-efficacy for exercise and the anxiety sub-domain of the HAD (Table 4).

The results show evidence of statistically significant effects of the intervention on the McGill Pain Questionnaire measured at 6 weeks (-0.78; 95%CI: -1.30, -0.26; p=0.01): expected McGill score is about 1 unit lower for patients on exercise and self-management compared with patients on standard GP care, but this is unlikely to be clinically significant [(22)]. Similarly, there is evidence of a statistically significant effect of intervention on self-efficacy measured at 6 weeks (3.53; 95%CI: 1.45, 5.62; p=0.01): improvement in expected self-efficacy score of about 3.5 units for patients on exercise and self-management compared with patients on GP care (Table 4).

At 6 weeks, there is a statistically significant effect of intervention on HADS with respect to depression (-0.58; 95%CI: -1.01, -0.14; p=0.01) but not for anxiety (-0.29; 95%CI: -0.92, 0.35; p=0.38) (Table 4). However, HADS scores (both anxiety and depression) were lower at 6 weeks for patients on treatment compared with patients on GP care, this was not retained at six months.

Table 4: Secondary outcomes analysis at 6 weeks

Outcome	Baseline Mean (SD)	6 weeks Mean (SD)	Efficacy	p-value	95% CI
McGill	3.0 (2.5)	2.3 (2.0)	-0.78	<0.01*	-1.30, -0.26
HADS					
Anxiety	5.7 (4.1)	5.4 (3.4)	-0.29	0.38	-0.92, 0.35
Depression	4.1 (3.2)	3.5 (2.6)	-0.58	<0.01*	-1.01, -0.14
Self-Efficacy	77.6 (10.0)	80.9 (8.6)	3.53	<0.01*	1.45, 5.62

Compliance

For the 23 GP surgeries randomised to the experimental intervention, there were 166 records (56 males, 110 female) of compliance with treatment allocation, where a complier was defined as one who attended at least six (50%) of the scheduled sessions of exercise. Compliance was considered for most of the patients (83%, 137/166). On average patients attended 8 sessions of exercise and self-management (Table 5).

Table 5: Distribution of attendance to intervention for the 12 scheduled sessions

Att. 0	1	2	3	4	5	6	7	8	9	10	11	12
No. 7	7	4	4	4	3	6	13	16	15	31	31	25

NB. data not available for 4 participants

Causal effects of intervention

A complier average causal effect (CACE) analysis provided a measure of the causal effect of exercise and self-management for patients who received the intervention as intended by the original group allocation. Under the potential outcomes framework, CACE analysis compares the mean outcome for compliers in the intervention arm with the mean outcome of similar (but unobserved) group of patients in the control arm who would have complied with intervention had they been randomised to do it (counterfactuals).

We applied the two-stage instrumental variable regression model adjusting for baseline DI-SMFA scores and pain site (as before) and used baseline diagnosis as instruments. Results for the CACE estimate suggested an improvement in expected DI-SMFA score of about 5.4 units for patients on the intervention (exercise and self-management) compared with patients on control (standard GP care).

The CACE estimate is evidently larger than the ITT estimates, demonstrating a greater benefit of exercise and self-management among participants who complied with the intervention, i.e. attended at least half (6) of the scheduled sessions (12).

Primary Outcome / Effectiveness for FASA RCT

In the main effectiveness analyses, the difference in the primary outcome (DI-SMFA score) was positive, indicating a positive treatment effect associated with intervention participants, with a difference in score of 3 units (lower) for the intervention participants.

DISCUSSION

This study determined whether FASA, a generic exercise and self-management intervention delivered to participants with hip and knee OA and/or chronic lower back had better clinical outcomes than continued GP-led management. The results demonstrated that participants on the intervention had statistically significantly better function at six months compared to those on continued GP care as measured by the Dysfunction Index of the Short Musculoskeletal Functional Assessment (DI-SMFA).

To our knowledge this is the first rigorous, pragmatic trial, conducted and analysed according to a pre-specified protocol [15] investigating a combined intervention for hip, knee and/or degenerative lower back pain. The trial recruited participants from primary care with a variety of socio-demographic profiles, and with co-morbidities typical of an older population affected by chronic, degenerative musculoskeletal disease. The group intervention was integrated into out-patient physiotherapy departments, was delivered by Chartered Physiotherapists, and consisted of simple exercises and an interactive educational self-management programme based on behaviour change theory.

The novelty of this trial was the participant cohort presented with hip, knee or lower back degenerative pain or a combination of these, and were treated with a generic programme. Trials typically recruit individuals with either one of these presentations, or in some cases with hip and knee OA pain. This approach is unlikely to reflect typical presentation, when many patients with chronic, degenerative joint pain either experience concurrent dysfunction in multiple joints, or over time develop such dysfunction [25, 26]. Furthermore, management guidelines for each of these presentations recommend similar approaches, namely exercise, education and self-management, so combining patient presentations seems an appropriate use of resources.

The results demonstrated that participating in the FASA intervention had a statistically significant beneficial effect at the 6-month primary end point on function (DI-SMFA). Whilst the study was not powered to detect significant changes within sub-groups, it is interesting to note that those participants who appeared to benefit most from the intervention had both low back pain and peripheral joint pain and a higher DI-SMFA score. Our previous work with healthcare professionals to determine the acceptability of the generic FASA intervention, highlighted professionals had some concerns that it may not be suitable for people with LBP [27]. This may indicate that professionals' perceptions are in some cases over-cautious regarding their management of people with low back pain when generic approaches to activity may be appropriate. This does not detract from evidence regarding benefits of stratified management of low back pain, which supports tailored care according to biopsychosocial presentation [28], but does highlight the benefit of simple self-management approaches.

Whilst the results demonstrated participants in the FASA intervention showed statistically significant improvements in function at 6 months post-intervention, the clinical implications are less clear due to limited definitive evidence on the minimum clinically important difference (MCID) for the DI-SMFA.

Some authors have suggested that the MCID for quality of life measures (e.g. SF-36) are either 3-5 points change in score (based on a 0-100 scale) [29], whilst others suggest approximately half of a standard deviation [30], but there is no conclusive evidence to this effect for the DI-

SMFA. A recent paper reported use of the Dutch version of the SMFA, which according to the authors has the same item content but a 'different factor structure' [31], in a cohort of minor to life-changing trauma patients. The authors reported the minimum important change (MIC) in the disaggregated sub-scales, suggesting an MIC of 8-25 points. The changes seen within FASA whilst statistically significant may not readily translate into clinical significance.

The FASA intervention showed limited sustained impact on psychosocial variables. This may be explained by the low levels of anxiety and depression present in the cohort before the intervention, thus resulting in a reduced likelihood of meaningful impact on psychosocial function.

The strengths of this study were its robust methodology, safety, *a priori* analysis plan and pragmatic design, which included participants typically presenting in primary care, and interventions delivered within NHS physiotherapy departments. The study was limited by the availability of a widely used musculoskeletal outcome measure that was suitable for widespread pain presentations. Whilst the SMFA was validated and appropriate for the study population, the lack of widespread use meant that the MCID was not possible to determine. However, a supplementary qualitative study did document patient reported benefit of the intervention (results to be reported separately). This issue is likely resolved now with the development of the Musculoskeletal Health Questionnaire, which is gaining momentum, and likely to be used ubiquitously in the near future [32].

A further limitation may be the duration of the proposed intervention. NHS services are under immense pressure to cope with increasing demands on musculoskeletal services with limited

resources, so interventions that require 12 contact sessions may place unmanageable demand on staff and location resources. However of note is that the original ESCAPE intervention for lower limb OA has undergone widespread implementation in the UK [33], suggesting that such programmes are supported if associated clinical effectiveness is established. CACE analysis did suggest that patients who attended at least six sessions achieved a significant improvement in their function, so consideration could be given to reducing the number of sessions to facilitate implementation within the NHS, but this would necessitate further robust investigation, and require patients to attend all sessions of a reduced programme with minimal leeway for missed appointments. Health economic data collected within this study (to be presented elsewhere), may provide further insight into the utility of a reduced intervention.

In summary the FASA intervention resulted in statistically significant functional improvements, six months post-intervention in a cohort of patients with degenerative lower limb and/or low back pain. No other statistically significant benefits of the intervention were noted. We are unable to conclusively suggest that this equates to clinically meaningful difference.

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