

# 'Real world' effectiveness of the Falls Management Exercise (FaME) programme: an implementation study

Elizabeth Orton<sup>1</sup>, BSc, MPH, PhD, 0000-0002-2531-8846

Sarah Audsley<sup>1</sup>, BSc, MSc, MRes, PhD, 0000-0002-0372-6881

Carol Coupland<sup>1</sup>, BSc, MSc, PhD, 0000-0002-2327-3306

John RF Gladman<sup>1-4</sup>, BMedSci, MBChB, DM, 0000-0002-8506-7786

Steve Iliffe<sup>5</sup>, BSc, MBBS, FRCGP, FRCP, 0000-0003-2806-3997

Natasher Lafond<sup>1</sup>, BSc, DPhil

Philippa Logan<sup>1</sup>, PhD,

Tahir Masud<sup>2</sup>, MBBS, MA, MSc, FRCP

Dawn A Skelton<sup>6</sup>, BSc, PhD 0000-0001-6223-9840

Clare Timblin<sup>1</sup>, BA, MPH, 0000-0001-9121-1484

Stephen Timmons<sup>1</sup>, BA, MA, MSc, PhD, 0000-0002-3731-1350

Derek Ward<sup>7</sup>, BA, MA, MPH, 0000-0003-1400-841X

Denise Kendrick<sup>1</sup>, BM, MSc, DM, FRCGP, MFPH. 0000-0003-3603-6542

## Affiliations:

<sup>1</sup>University of Nottingham, Nottingham, UK

<sup>2</sup>Nottingham University Hospitals NHS Trust, UK

<sup>3</sup>NIHR Nottingham Biomedical Research Centre (BRC), UK

<sup>4</sup>NIHR East Midlands Applied Research Centre (ARC), UK

<sup>2</sup>Division of Rehabilitation and Ageing, School of Medicine, University of Nottingham, Nottingham, UK

<sup>5</sup>Research Department of Primary Care & Population Health, University College London, UK

<sup>6</sup>School of Health and Life Sciences, Glasgow Caledonian University, Glasgow, UK

<sup>7</sup>Lincolnshire County Council, Lincolnshire, UK

## Correspondence to

Elizabeth Orton, Division of Primary Care, School of Medicine, Floor 13, Tower Building, University Park, University of Nottingham, Nottingham, NG7 2RD, UK.

Email: [elizabeth.orton@nottingham.ac.uk](mailto:elizabeth.orton@nottingham.ac.uk)

Telephone: 0115 8466930

## Keywords

Aged People, Exercise Promotion, Primary Health Care, Falls, Physical Activity,

Abstract word count=250/250

Manuscript word count = 2497

Number of tables = 4

Number of figures = 1

## **Keypoints**

The incidence of falls increases with age and is exacerbated by poor strength, balance and physical function. The Falls Management Exercise (FaME) programme is an evidence based strength and balance programme that in randomized controlled trials in primary care reduces the risk of falls in older adults, although evidence of the effectiveness of this programme in 'the real world' is lacking. This study demonstrates that FaME can be implemented successfully in the community with modest translation of efficacy into effectiveness. When commissioning strength and balance programmes as part of a falls prevention pathway, commissioners, should ensure adherence and exercise maintenance strategies are in place as part of the programme.

## **Competing interests**

Professor Dawn Skelton is a director of Later Life Training, a not for profit training provider, delivering training to PSIs in delivery of the FaME programme. All other authors have declared no competing interests. All authors contributed to the design of the study, interpretation of results and writing of the manuscript. EO led the data collection and analysis which was undertaken by EO, TH, NL and CC.

## **Acknowledgements**

The study team would like to acknowledge the Patient Public Representatives and Steering Group members for the oversight of the study and support with the interpretation of the research findings. We would also like to thank the local authorities involved in this study and the Leicester, Leicestershire and Rutland Active Partnership for their support with data collection.

# 'Real world' effectiveness of the Falls Management Exercise (FaME) programme: an implementation study

## **Abstract**

### **Background**

Falls incidence increases with age alongside declines in strength and balance. Clinical trials show that the Falls Management Exercise (FaME) programme, improves strength and balance, can reduce falls and improve physical functioning.

### **Objective**

To determine if the clinical trial efficacy of FaME translates into effectiveness in non-research settings.

### **Design and setting**

An implementation study of FaME in ten local authorities across the East Midlands region of England.

### **Subjects**

Adults aged 65 and over enrolled on a FaME programme.

### **Method**

Anonymised outcome data collected by the FaME providers were compared at baseline, end of programme and six months follow-up using univariate and multivariate analyses.

### **Results**

For 361 adults enrolled in programmes, the mean age was 76.8, 73% were female and 143 (41%) completed  $\geq 75\%$  of classes. Overall confidence in balance, fear of falling, functional reach and timed-up-and-go (all  $p < 0.001$ ), and turn  $180^\circ$  ( $p = 0.008$ ) improved significantly at programme completion versus baseline, but improvements were not maintained 6 months later. Falls risk (FRAT score) and total minutes of physical activity did not change significantly though minutes of strength and balance activity increased by 55% at programme completion and was maintained at 6 months. The falls incidence rate ratio (IRR) was non-significantly lower at programme completion (IRR 0.76, 95% Confidence Interval (CI) 0.48, 1.21) and follow-up (IRR 0.82 95% CI 0.48, 1.39) versus baseline.

## **Conclusions**

There is modest translation of FaME efficacy into effectiveness, but not all effects persist after completion. Strategies to aid adherence and exercise maintenance are important to maximise benefits.

## **Introduction**

Falls in older adults result in injury, functional impairment, loss of independence and confidence to engage with normal activities of daily living [1]. Falls incidence rises with increasing age [2]; approximately one-third of adults over 65 years old, and over half aged over 80, experience a fall each year [3]. In the UK, falls are estimated to cost the National Health Service over £2.3 billion per year, with costs expected to rise alongside the ageing population [4].

Age-related decline in muscle strength, balance and physical function increase falling and fracture risk [5, 6]. However, physical activity, specifically strength and balance exercise, helps to remedy such impairments and reduce falls risk in older adults [7-9]. The Falls Management Exercise (FaME) programme is a 24-week structured exercise programme combining home-based and supervised exercise classes provided by Postural Stability Instructors (PSIs)[10]. FaME's exercise components include functional floor and gait skills, endurance, flexibility and strength and balance exercise [11]. A multicentre randomised trial comparing FaME, the home-based Otago Exercise Programme (OEP) and usual care found FaME significantly increased physical activity levels, and reduced falls incidence compared to OEP and usual care at 12 months [10]. On this basis, national and international clinical guidelines recommend strength and balance exercise for falls prevention [4, 12].

Whilst this clinical trial evidence shows the efficacy of FaME, its effectiveness in 'real world' conditions is unknown. [13] Ascertaining whether FaME confers similar clinical benefits in routinely-commissioned services as in trials is key to understanding how best to influence its adoption. This paper describes the effectiveness of FaME when delivered in routinely commissioned and provided programmes.

## **Methods**

### **Study design**

We undertook a multi-site, mixed methods implementation study using a triangulation multi-level design. [14] This paper reports the quantitative analysis of routinely-collected data from 10 FaME programmes implemented in 7 district councils, one county council, one city council and one community football trust within the East Midlands from May to December 2016.

### **Data collection methods**

Anonymised quantitative outcome data routinely collected by FaME service providers from all participants in FaME classes were included in the analyses. Functional and self-reported clinical outcomes were collected at baseline, end of the 24-week programme and 6 months

after completion of the programme. Attendance data were collected at baseline and throughout the 24-week programme. Demographic and health data were collected at baseline.

Functional measures were: Functional Reach[15] measuring balance and falls risk, The Turn 180°[16] measuring dynamic postural stability and falls risk and Timed get-up and go (TUG)[17] measuring balance, mobility and falls risk. Self-reported clinical outcome measures were: Falls Risk Assessment Tool (FRAT)[18] measuring falls risk; ConfBal scale[19] measuring confidence in carrying out basic activities without falling; Short Falls Efficacy Scale-International (FES-I)[20] measuring concern about falling when carrying out basic activities; and Phone-FITT[21] measuring physical activity and number of falls within the last three months. Demographic and health information included gender, age, ethnicity, preferred language, deprivation (Index of Multiple Deprivation 2010 (IMD-10) score), living circumstance (e.g. living alone), employment status, smoking status, number of co-morbidities and number of prescribed medications.

## **Data analysis**

Outcome measures were described using frequencies, percentages, means and standard deviations (SDs), medians and interquartile ranges as appropriate. Functional reach, Turn 180°, TUG, FRAT, ConfBal scale, Short FES-I, total minutes of physical activity, moderate to vigorous physical activity (MVPA) and strength and balance exercise per week were compared using paired t-tests or Wilcoxon Signed Rank test (for non-normal variables). The proportion of participants with high fear of falling (FES-I score  $\geq 11$ ), high risk of falls (FRAT score  $\geq 3$ ) and reaching the government target of at least 30 minutes of MVPA activity at least five times per week[22] were compared using McNemar's Chi<sup>2</sup> test.

We undertook multi-level logistic regression of binary outcomes, adjusting for clustering at the individual and class level, to calculate odds ratios and 95% confidence intervals (95%CI) and multilevel linear regression adjusting for clustering and the individual and class level for continuous outcomes. Where necessary, variables were log transformed to improve the model fit if assumptions were not met. We were unable to model the continuous variable of total minutes of moderate to vigorous activity. Falls incidence in the previous three months was estimated using the incidence rate command in Stata and we used negative binomial regression, adjusting for clustering at class and individual levels, to calculate incidence rate ratios and 95%CI. All comparisons were made (a) between values at the end of the 24-week FaME programme and baseline values and (b) between values 6 months post FaME and baseline values. We assessed differential effects by age (less than 75 years/ $\geq 75$  years), ethnicity, study site and sex by adding interaction terms to multi-level models. Multiple

imputation with chained equations was used to generate 20 imputed datasets replacing missing values at baseline or follow-up. Analyses of multiply imputed data were compared with complete case analyses. Analyses were conducted using StataSE V15 (StataCorp, College Station, Texas, USA).

## **Sample size**

It was estimated that up to 650 participants would take part in the FaME programme. Based on a previous FaME clinical trial [10], this number of participants provided at least 80% power (5% significance) to detect the following differences before and after the 24 week FaME programme:

An increase in the proportion of participants doing at least 150 minutes of MVPA per week from 40% to 45%, assuming the proportion of discordant pairs is 0.15.

A reduction in the mean ConfBal score of 0.5, assuming SD of 4.0.

A difference of 0.1 in the FRAT score, assuming SD of 0.9.

A falls incidence rate ratio of 0.75 based on a negative binomial distribution.

## **Declaration of Sources of Funding**

This work was supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care East Midlands (CLAHRC EM). The views expressed are those of the author(s) and not necessarily those of the NIHR or the Department of Health and Social Care. The intervention was part funded by Leicestershire County Council and Rutland County Council. The funders played no role in the design, execution, analysis or interpretation of data or writing of the study.

## **Ethical approval**

This study received a favourable opinion from London – Chelsea Research ethics committee reference 16/LO/0396.

## **Results**

Results were obtained for 361 people that participated in FaME programmes. Of these, 13 were excluded from analyses because they did not have baseline data (n=5) or class register data (n=8), leaving 348 participants in the analyses.

## **Characteristics of the participants**

The characteristics of participants are shown in Table 1. Most participants were female (73%), of White British ethnicity (93.9%) with English as a first language (96.8%). The mean age was 76.8, most were retired (96.4%) and two fifths lived in the most affluent quintile (41.4%). Just

under half of the participants lived alone (45.2%) and two thirds were educated to primary school age (66.4%). Only 4.3% were current smokers and the median number of co-morbidities was 3 (interquartile range 1-4) with just under half of participants prescribed 4 or more medications (47.7%).

## **Programme completion**

Overall 143 (41%) people attended 75% or more of classes, classifying them as programme completers (Figure 1).

## **Outcome data**

For all participants, there were significant improvements in confidence in balance (Confbal mean score  $p<0.001$ ), fear of falling (FES-I mean score  $p<0.001$ ), Functional Reach ( $p<0.001$ ), Turn 180° ( $p=0.008$ ) and Timed Up and Go ( $p<0.001$ ) at the end of the programme compared to baseline. However, for those outcomes also measured at 6 months follow-up, improvements were not maintained (Table 2). The proportion of people with a high concern about falling (FES-I) significantly decreased at the end of the programme ( $p=0.019$ ) but this was not maintained at 6 months follow-up. The total minutes of MVPA was significantly higher at 6-month follow-up compared to baseline ( $p=0.047$ ), but there were no significant differences in other outcome measures at either time point.

Outcomes for people that did, and did not, complete the programme are shown in Appendix 1 and Appendix 2. Compared to baseline, completers showed significant improvements in Confbal ( $p<0.001$ ), FES-I score ( $p<0.001$ ), total minutes of physical activity per week ( $p=0.023$ ), Functional Reach ( $p<0.001$ ) and Timed Up and Go ( $p<0.001$ ) by the end of the programme, but there were no significant differences in other outcomes and none of the improvements were maintained at the 6 month follow-up point. Similar improvements were found amongst non-completers as amongst completers at both time points.

## **Multivariate analysis**

The odds of achieving the government target for physical activity, having a high/low fear of falling (FES-I) and high/low FRAT score are presented in Table 3. For all participants, those under 75 were significantly more likely to achieve the government target at 6 months follow-up than at baseline (odds ratio (OR) 2.54, 95%CI 1.14, 5.65) but this finding was no longer significant in the multiple imputation analysis (Appendix 3). Participants were significantly less likely to have high concern about falling at end of FaME than at baseline (OR 0.38 95% CI 0.23, 0.65) though this difference was not maintained at follow-up. There were no significant differences for any other outcomes.



Findings were similar for those who did not complete the programme as for all participants. Those under 75 were more likely to meet government targets on physical activity at the 6-month follow-up (OR 3.59, 95% CI 1.10, 11.68) but this finding was no longer significant in the multiple imputation analysis (Appendix 3). They were less likely to have a high concern about falling at the end of FaME (OR 0.33, 95% CI 0.15, 0.73) and there was no significant differences for any other outcomes. The only significant difference found for those that completed the programme was that follow-up they were less likely to have a high concern about falling at the end of FaME (0.46 95% CI 0.23, 0.94) but this finding was no longer significant in the multiple imputation analysis (Appendix 3).

For all participants, there was significant improvement in all functional tests and confidence in balance at the end of FaME compared to baseline (Table 3), although finding was no longer significant in the multiple imputation analysis (Appendix 4). There was a 55% increase in strength and balance activity between baseline and end of FaME, which remained significant at 6 months follow-up. Findings for the multiple imputation analysis were significant at 6 months follow-up (1.54 (0.94, 2.52)). There was no significant increase in total minutes of physical activity at either time point.

There was a reduction in the incidence of falls from 1.43 (95% CI 1.19, 1.70) per person year at the beginning of FaME to 1.08 (0.81, 1.40) at the end and 1.09 (0.77, 1.49) at 6 months follow-up, but the reductions were not significant. Men had a significantly higher falls incidence than women at baseline (men 2.63 (2.03, 3.36); women 0.98 (0.73, 1.23)) and at 6 months follow-up (men 2.45 (1.38, 3.53); women 0.64 (0.33, 0.96)) but not at the end of FaME (men 1.59 (0.89, 2.29) women 0.91 (0.60, 1.21)). There were no significant differences in the rate of falls for all participants, completers, non-completers, men or women at either time point (Table 4) and this was consistent in the multiple imputation results (Appendix 5).

## **Discussion**

### **Summary**

We show that a 24-week FaME programme implemented in “real world” settings resulted in small but statistically significant improvements in functional measures, strength and balance activity, balance confidence and concern about falling at the end of the FaME programme compared to baseline. Most improvements were not maintained 6 months after the end of FaME, except minutes of strength and balance activity. Statistically significant improvements in functional measures, balance confidence, concern about falling and minutes of physical activity were seen in those attending at least 75% of FaME classes and in those attending fewer classes. The incidence of falls was lower at the end of the programme and 6 months

after the end of the programme than at baseline, but this difference was not statistically significant.

## **Strengths and limitations**

Our study is the first to report the implementation of the FaME programme in the “real world” setting. Programmes were geographically, ethnically and socio-demographically diverse, enhancing study generalisability.

Participants were community-dwelling adults, who mostly self-referred, with minimal exclusion criteria. Participants were older, more likely to be female, with a higher number of comorbidities and medications, poorer functional measures, lower balance confidence, more concern about falling and were less physically active than those in previous FaME trials. [23, 24] This suggests the programmes reached the intended population and may have reached those with a greater potential to benefit than in previous trials.

As an implementation study, we were reliant on sufficient participants being enrolled on the programme and PSIs collecting outcome data as part of routine service provision. However only 361 participants were recruited. This is well below the expected 650 participants used in the sample size calculation and will have limited the power of our study to detect significant differences for some outcomes, including all falls and injurious falls incidence. In addition, whilst we analysed a wide range of outcomes, we were not able to use objective measures of physical activity (e.g. pedometers, accelerometers) because these were not in routine service use, nor were we able to classify participants according to frailty status (e.g. using the Clinical Frailty Scale) as this was not assessed by instructors. In addition, only 41% of participants completed the programme which is lower than expected from previous trials where data were collected by researchers. [23, 24]

Although we found statistically significant improvements in functional measures, balance confidence and concern about falling, absolute differences between groups were relatively small, though minimal clinically important differences have not been established in populations similar to our study population for the measures we used. We also undertook multiple statistical tests, hence a small number of our findings may be due to type 1 error.

## **Comparison with existing literature**

We found a similar, but non-significant, reduction in the rate of falls as the much larger ProAct65+ trial (IRR 0.91 (95%CI 0.54, 1.52) during the 24-week FaME programme and IRR 0.74 (95% CI 0.55, 0.99) 12 months after the programme). Our findings may not have reached statistical significance due to a smaller than expected sample size. We also found significant

improvements in functional measures, balance confidence and concern about falling whilst the ProAct65+ trial found only a significant (and smaller) improvement in balance confidence. These differences may have been due to our study population being older, with more comorbidities and poorer functional measures than the ProAct65+ study population, and hence greater potential for change in these measures within our study.

## Conclusions

Our findings show that implementing the FaME programme in a “real world” setting can achieve outcomes similar to those from randomised controlled trials. Significant improvements seen by the end of the 24-week programme were not maintained after programme completion, and less than half of the participants completed the programme. Although challenging to achieve in this more vulnerable population, to maximise benefits, FaME providers should support programme completion and promote the maintenance of physical activity afterwards.

## References

1. Haagsma JA, Graetz N, Bolliger I, Naghavi M, Higashi H, Mullany EC, et al. The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013. *Inj Prev*. 2016 Feb;22(1):3-18.
2. Gribbin J, Hubbard R, Smith C, Gladman J, Lewis S. Incidence and mortality of falls amongst older people in primary care in the United Kingdom. *QJM*. 2009 Jul;102(7):477-83.
3. Campbell AJ, Reinken J, Allan BC, Martinez GS. Falls in old age: a study of frequency and related clinical factors. *Age Ageing*. 1981 Nov;10(4):264-70.
4. NICE. Falls in Older People: Assessing Risk and Prevention. In: Department\_of\_Health, editor. London2013.
5. Myers AH, Young Y, Langlois JA. Prevention of falls in the elderly. *Bone*. 1996 Jan;18(1 Suppl):87S-101S.
6. Yeung SSY, Reijnierse EM, Pham VK, Trappenburg MC, Lim WK, Meskers CGM, et al. Sarcopenia and its association with falls and fractures in older adults: A systematic review and meta-analysis. *J Cachexia Sarcopenia Muscle*. 2019 Jun;10(3):485-500.
7. Sherrington C, Tiedemann A, Fairhall N, Close JC, Lord SR. Exercise to prevent falls in older adults: an updated meta-analysis and best practice recommendations. *N S W Public Health Bull*. 2011 Jun;22(3-4):78-83.
8. Sherrington C, Michaleff ZA, Fairhall N, Paul SS, Tiedemann A, Whitney J, et al. Exercise to prevent falls in older adults: an updated systematic review and meta-analysis. *Br J Sports Med*. 2017 Dec;51(24):1750-8.
9. Sherrington C, Fairhall NJ, Wallbank GK, Tiedemann A, Michaleff ZA, Howard K, et al. Exercise for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2019 Jan 31;1:CD012424.
10. Iliffe S, Kendrick D, Morris R, Masud T, Gage H, Skelton D, et al. Multicentre cluster randomised trial comparing a community group exercise programme and home-based exercise with usual care for people aged 65 years and over in primary care. *Health Technol Assess*. 2014 2014/08/07;18(49).

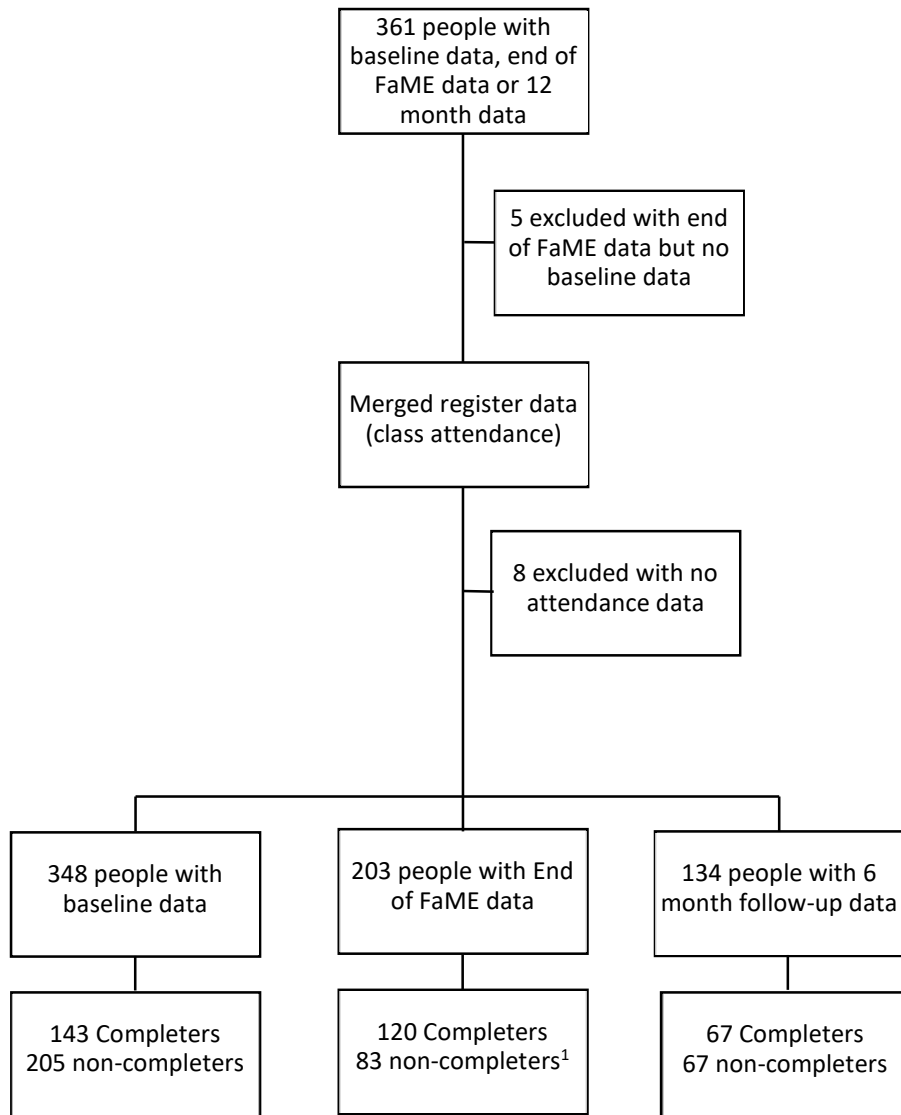
11. Skelton D, Dinan S, Campbell M, Rutherford O. Tailored group exercise (Falls Management Exercise -- FaME) reduces falls in community-dwelling older frequent fallers (an RCT). *Age Ageing*. 2005 Nov;34(6):636-9.
12. World Health Organization. WHO global report on falls prevention in older age. Geneva: World Health Organization; 2008.
13. Better. CfA. Raising the bar on strength and balance: the importance of community-based provision. Manchester: University of Manchester, 2019.
14. Tashakkori A, & Teddlie, C.,. Mixed methodology: combining qualitative and quantitative approaches. Thousand Oaks, Calif: Sage; 1998.
15. Duncan PW, Weiner DK, Chandler J, Studenski S. Functional reach: a new clinical measure of balance. *Journal of gerontology*. 1990 Nov;45(6):M192-7.
16. Simpson JL, Worsfold C, Reilly E, Nye N. A standard Procedure for Using TURN180: Testing dynamic postural stability among elderly people. *Physiotherapy*. 2002;88(6):342-53.
17. Podsiadlo D, Richardson S. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. *Journal of the American Geriatrics Society*. 1991 Feb;39(2):142-8.
18. Nandy S, Parsons S, Cryer C, Underwood M, Rashbrook E, Carter Y, et al. Development and preliminary examination of the predictive validity of the Falls Risk Assessment Tool (FRAT) for use in primary care. *Journal of Public Health*. 2004 Jun;26(2):138-43.
19. Simpson JM, Worsfold C, Hawke J. Balance confidence in elderly people. The CONFbal Scale. *Age and Ageing*. 1998;27(Supplement 2):Abstract 123.
20. Kempen GI, Yardley L, van Haastregt JC, Zijlstra GA, Beyer N, Hauer K, et al. The Short FES-I: a shortened version of the falls efficacy scale-international to assess fear of falling. *Age and Ageing*. 2008 Jan;37(1):45-50.
21. Gill DP, Jones GR, Zou GY, Speechley M. The Phone-FITT: a brief physical activity interview for older adults. *Journal of aging and physical activity*. 2008 Jul;16(3):292-315.
22. Department of Health. Start Active, Stay Active: A report on physical activity from the four home countries' Chief Medical Officers. In: Team PA, editor. 2011.
23. Iliffe S, Kendrick D, Morris R, Griffin M, Haworth D, Carpenter H, et al. Promoting physical activity in older people in general practice: ProAct65+ cluster randomised controlled trial. *British Journal of General Practice*. [10.3399/bjgp15X687361]. 2015;65(640):e731.
24. Skelton D, Dinan S, Campbell M, Rutherford O. Tailored group exercise (Falls Management Exercise -FaME) reduces falls in community-dwelling older frequent fallers (an RCT). *Age and Ageing*. 2005 Nov;34(6):636-9.

## Figures and Tables

**Table 1 – Baseline characteristics of participants**

<b>Characteristic</b>	<b>Number (%) unless otherwise stated n=348</b>
Gender	
Male	94 (27.0)
Female	254 (73.0)
Age (Mean, SD)	76.76 (8.27)
Age group	
Under 65	25 (7.2)
65-74	112 (32.2)
75-84	145 (41.7)
85+	66 (18.9)
Ethnicity [2]	
White British	325 (93.9)
Other ethnicity	21 (6.1)
First Language [5]	
English	332 (96.8)
Other	11 (3.2)
IMD Quintile [75]	
IMD quintile 1 (most deprived)	17 (6.2)
IMD quintile 2	45 (16.5)
IMD quintile 3	43 (15.8)
IMD quintile 4	55 (20.1)
IMD quintile 5 (least deprived)	113 (41.4)
Household status [54]	
Living alone	133 (45.2)
Other household status	161 (54.8)
Education [50]	
Primary school to age 11/12	198 (66.4)
Secondary/further/higher education	100 (33.6)
Employment status [46]	
Retired	291 (96.4)
Other employment status	11 (3.6)
Smoking Status	
Non-smoking	333 (95.7)
Smoking	15 (4.3)
Co-morbidities (median, IQR)	3 (1-4)
Co-morbidities	
0	33 (9.5)
1-4	253 (72.7)
5+	62 (17.8)
Medications [6]	
0-3	163 (47.7)
4+	179 (52.3)

[missing values]



**Figure 1 – consort diagram of FaME participants**

**Table 2 – Outcome measures at baseline, end of FaME and 6 months follow-up.**

<b>Outcome measure</b>	<b>Baseline (n=348)</b>	<b>End of FaME (n=203)</b>	<b>6 months after FaME ended (n=134)</b>	<b>End of FaME vs Baseline **</b>	<b>6 months after FaME vs Baseline **</b>
Confbal score Median (IQR)	[8] 16 (12-22)	[4] 14 (11-17)	[0] 15 (11-19)	P<0.001	P=0.168
FES-I Score Median (IQR)	[4] 10 (8-15)	[0] 9 (7-11)	[0] 9 (7-13)	P<0.001	P=0.571
FES-I categories (n,%) Low concern High concern	[4] 179 (52.0) 165 (48.0)	[0] 143 (70.4) 60 (29.6)	[0] 83 (61.9) 51 (38.1)	P=0.0195	P=0.873
FRAT Score Median (IQR)	[7] 2 (1-3)	[1] 1 (0-2)	2 (1-3)	P=0.626	P=0.158
FRAT (n,%) Low risk of falling High risk of falling	[7] 234 (68.6) 107 (31.4)	[1] 154 (76.2) 48 (23.8)	[7] 94 (74.0) 33 (26.0)	P=0.423	P=0.695
Total minutes of physical activity per week Median (IQR)	[0] 593.5 (175- 1183)	[7] 760.5 (328- 1276)	[0] 683.5 (253- 1377)	P=0.718	P=0.471
Total minutes of strength and balance per week Median (IQR)	[0] 57.75 (0-209)	[7] 108.5 (22- 238.5)	[0] 105 (21-328)	P=0.416	P=0.234
Total minutes of MVPA per week Median (IQR)	[0] 0 (0-149.5)	[7] 0 (0-184)	[0] 46 (0-161)	P=0.323	P=0.047
Meeting CMO guidelines for MVPA No Yes	[0] 261 (75.0) 87 (25.0)	[7] 141 (71.9) 55 (28.1)	[0] 96 (71.6) 38 (28.4)	P=0.466	P=0.317
Functional reach Mean(SD)	[2] 22.2 (9.4)	[11] 27.7 (8.7)	Not measured	P<0.001	n/a
Turn 180° Median (IQR)	[2] 5 (4-6)	[10] 4 (4-6)	Not measured	P=0.008	n/a
Timed Up and Go Median (IQR)	[0] 30.16 (10.56- 20.25)	[8] 11.36 (8.89- 16)	Not measured	P<0.001	n/a

[missing values]. \*\* Wilcoxon Signed Rank Test (non-normal) or paired T-test for continuous outcomes and McNemar's Chi<sup>2</sup> test for categorical (binary) variables

**Table 3 – Multivariate analysis of outcomes**

<b>Odds ratios and 95%CI for binary outcomes</b>		
<b>Outcome - all</b>	<b>End of FaME vs baseline</b>	<b>6 month follow-up vs baseline</b>
Meeting CMO guidelines*		
- <75	0.89 (0.44-1.80)	2.54 (1.14-5.65)
- 75+	1.53 (0.80-2.91)	0.64 (0.28-1.46)
Short FES-I high/low concern	0.38 (0.23-0.65)	0.72 (0.39-1.31)
FRAT high/low risk	0.65 (0.37-1.15)	0.88 (0.45-1.73)
<b>Outcome – non-completers</b>	<b>End of FaME vs baseline</b>	<b>6 month follow-up vs baseline</b>
Meeting CMO guidelines *		
- <75	0.54 (0.17, 1.73)	3.59 (1.10, 11.68)
- 75+	1.27 (0.52, 3.08)	0.42 (0.13, 1.31)
Short FES-I high/low concern	0.33 (0.15, 0.73)	0.74 (0.32, 1.73)
FRAT high/low risk	0.51 (0.24, 1.13)	0.83 (0.37, 1.88)
<b>Outcome - completers</b>	<b>End of FaME vs baseline</b>	<b>6 month follow-up vs baseline</b>
Meeting CMO guidelines*		
- <75	1.09 (0.44, 2.74)	1.72 (0.58, 5.10)
- 75+	1.90 (0.72, 4.99)	1.15 (0.33, 3.95)
Short FES-I high/low concern	0.46 (0.23, 0.94)	0.77 (0.33, 1.84)
FRAT high/low risk	0.98 (0.41, 2.39)	1.19 (0.38, 3.72)
<b>Differences between means and 95%CI for continuous outcomes</b>		
<b>Outcome</b>	<b>End of FaME vs Baseline</b>	<b>6 months after FaME vs Baseline</b>
Functional reach (cm)	4.80 (3.53, 6.53)	Not recorded
Turn 180° (number of steps)	-0.29 (-0.57, -0.003)	Not recorded
Timed up and Go**	0.87 (0.84, 0.91)	Not recorded
Confbal scale	-1.74 (-2.33, -1.14)	-0.20 (-0.90,0.49)
Total Physical activity (mins)	50.48 (-52.97, 153.94)	30.52 (-90.536, 151.57)
Total minutes of strength and balance activity***	1.55 (1.08-2.25)	1.45 (0.95-2.18)

\*Presented by age group as there was a significant interaction

\*\*Exponential of the log transformed outcome presented. This equates to a 13% reduction in timed up and go at the end of the intervention

\*\*\*Exponential of the log transformed outcome presented. This equates to a 55% increase in total minutes of strength and balance



**Table 4 – Incidence rate ratios and 95%CI for falls**

	<b>End of FaME vs baseline</b>	<b>6 months after FaME vs baseline</b>
All	0.76 (0.48-1.21)	0.82 (0.48-1.39)
Completed 75%+ of classes	0.64 (0.33-1.22)	0.64 (0.28-1.43)
Completed <75% of classes	0.99 (0.51-1.96)	1.03 (0.52-2.05)
Female	0.79 (0.43-1.44)	0.65 (0.31-1.35)
Male	0.74 (0.37-1.44)	1.31 (0.62-2.77)

**Appendix 1 – Measures over time - people that attended 75% or more of FaME classes (completers)**

<b>object category</b>	<b>Baseline (n=143)</b>	<b>End of FaME (n=120)</b>	<b>12 months after FaME ended (n=67)</b>	<b>End of FaME vs Baseline**</b>	<b>6 months after FaME vs Baseline**</b>
Confbal score (n=330) Mean(SD) Median (IQR)	[8] 16.2 (5.4) 16 (11-20)	[1] 14.5 (4.0) 14(11-17)	[0] 15.6 (5.1) 15 (11-18)	P<0.001	P=0.896
FES-I Score Mean(SD) Median (IQR)	[1] 11.1 (4.7) 10 (7-13)	[0] 9.7 (3.2) 9 (7-11)	[0] 10.6 (4.2) 9 (7-13)	P<0.001	P=0.431
FES-I Low concern High concern	[1] 85 (59.4) 57 (39.9)	[0] 84 (58.7) 36 (25.2)	[0] 45 (31.5) 22 (15.4)	P=0.068	P=0.819
FRAT Score Mean(SD) Median (IQR)	[3] 1.5 (1.3) 1 (0-2)	[0] 1.5 (1.3) 1 (0-2)	[3] 1.6 (1.1) 1.5 (1-2)	P= 0.823	P=0.671
FRAT Low risk of falling High risk of falling	[3] 106 (75.7) 34 (24.3)	[0] 91 (75.8) 29 (24.2)	[3] 49 (76.6) 15 (23.4)	P=1.00	P=0.705
Total minutes of physical activity per week Mean(SD) Median (IQR)	[0] 817.5 (659.4) 673 (252-1252)	[4] 941.0 (649.7) 851 (414-1408)	[0] 997.3 (726.7) 919 (375-1457)	p=0.023	P=0.664
Total minutes of strength and balance per week Mean(SD) Median (IQR)	[0] 165.7 (209.7) 92 (0-244)	[4] 225.6 (258.3) 134.5 (54.5-320)	[0] 255.8 (260.9) 161 (53-435)	P=0.198	P=0.121
Total minutes of MVPA per week Mean(SD) Median (IQR)	[0] 127.4 (240.8) 0 (0-180)	[4] 165.7 (309.7) 40.5 (0-253)	[0] 184.4 (351.0) 46 (0-199)	P=0.115	P=0.273
Meeting CMO guidelines for MVPA No Yes	[0] 105 (73.4) 38 (26.6)	[4] 79 (68.1) 37 (31.9)	[0] 46 (68.7) 21 (31.3)	P=0.178	P=0.433
Functional reach Mean(SD) Median (IQR)	[0] 22.5 (9.4) 22 (16-29)	[2] 27.2 (8.1) 26 (21-32)	Not measured	P<0.001	n/a
Turn 180° Mean(SD) Median (IQR)	[3] 5.2 (2.0) 5 (4-6)	[5] 5.2 (2.3) 4 (4-6)	Not measured	P=0.256	n/a
Timed Up and Go Mean(SD) Median (IQR)	[4] 16.7 (9.6) 13 (10.84-20)	[2] 14.2 (8.6) 11.65 (9-16.38)	Not measured	P<0.001	n/a

\*\* Wilcoxon Signed Rank Test (non-normal) or paired T-test for continuous outcomes and McNemar's Chi<sup>2</sup> test for categorical (binary) variables

**Appendix 2 - Measures over time - people that did not attend 75% or more of FaME classes (non-completers)**

<b>object category</b>	<b>Baseline (n=205)</b>	<b>End of FaME (n=83)</b>	<b>12 months after FaME ended (n=67)</b>	<b>End of FaME vs Baseline**</b>	<b>6 months after FaME vs Baseline**</b>
Confbal score (n=330) Mean(SD) Median (IQR)	[10] 17.6 (6.1) 17 (12-22)	[3] 14.3 (4.4) 13 (10-17)	[0] 16.0 (5.7) 15 (11-19)	P=0.013	P=0.062
FES-I Score Mean(SD) Median (IQR)	[3] 12.7 (5.4) 11 (8-16)	[0] 9.6 (3.1) 9 (7-11)	[0] 11.2 (4.7) 10 (7-13)	P=0.027	P=1.00
FES-I Low concern High concern	[3] 94 (45.9) 108 (52.7)	[0] 59 (28.8) 24 (11.7)	[0] 38 (18.5) 29 (14.1)	P=0.144	P=0.655
FRAT Score Mean(SD) Median (IQR)	[4] 1.9 (1.3) 2 (1-3)	[1] 1.5 (1.2) 2 (0-2)	[4] 1.9 (1.1) 2 (1-3)	P=0.626	P=0.144
FRAT Low risk of falling High risk of falling	[4] 128 (62.7) 73 (36.3)	[1] 63 (76.8) 19 (23.17))	[4] 45 (71.4) 18 (28.5)	P=0.225	P=0.819
Total minutes of physical activity per week Mean(SD) Median (IQR)	[0] 714.4 (710.3) 558 (120-1127)	[3] 723.3 (621.1) 644 (163.5-1158.5)	[0] 753.8 (786.1) 444 (217-1270)	P=0.046	P=0.128
Total minutes of strength and balance per week Mean(SD) Median (IQR)	[0] 136.7 (212.7) 46 (0-180)	[3] 145.6 (193.6) 78 (0-210.5)	[0] 165.2 (231.8) 69 (21-265)	P=0.807	P=0.868
Total minutes of MVPA per week Mean(SD) Median (IQR)	[0] 132.0 (291.4) 0 (0-138)	[3] 121.2 (256.8) 0 (0-103.5)	[0] 158.9 (361.0) 35 (0-157)	P=0.691	P=0.065
Meeting CMO guidelines for MVPA No Yes	[0] 156 (76.1) 49 (23.9)	[3] 62 (77.5) 18 (22.5)	[0] 50 (74.6) 17 (25.4)	P=0.655	P=0.532
Functional reach Mean(SD) Median (IQR)	[7] 21.9 (9.3) 21 (16-28)	[9] 28.6 (9.7) 28 (21-34)	Not measured	P<0.001	n/a
Turn 180° Mean(SD) Median (IQR)	[9] 5.5 (2.2) 5 (4-6)	[5] 4.4 (1.6) 4 (3-5)	Not measured	P=0.004	n/a
Timed Up and Go Mean(SD) Median (IQR)	[6] 18.7 (14.8) 13.38 (10.33-22.19)	[6] 13.4 (8.2) 11.13 (8.33-14.9)	Not measured	P=0.090	n/a

\*\* Wilcoxon Signed Rank Test (non-normal) or paired T-test for continuous outcomes and McNemar's Chi<sup>2</sup> test for categorical (binary) variables

**Appendix 3 – Logistic regression analysis of binary outcomes after adjusting for clustering at class level - Odds Ratios and 95% confidence intervals**

<b>Outcome - all</b>	<b>End of FaME vs Baseline</b>	<b>6 months after FaME vs Baseline</b>
Meeting CMO guidelines (Yes vs No)*		
- <75	0.99 (0.54 to 1.82)	1.69 (0.84 to 3.42)
- 75+	1.57 (0.84 to 2.93)	1.27 (0.63 to 2.56)
Short FES-I high/low concern	0.41 (0.26 to 0.65)	0.86 (0.48 to 1.52)
FRAT high/low risk	0.82 (0.49 to 1.38)	1.31 (0.58 to 2.95)
<b>Outcome – non-completers</b>	<b>End of FaME vs Baseline</b>	<b>6 months after FaME vs Baseline</b>
Meeting CMO guidelines (Yes vs No)*		
- <75	0.86 (0.34 to 2.17)	2.00 (0.84 to 4.77)
- 75+	1.49 (0.65 to 3.41)	1.20 (0.52 to 2.78)
Short FES-I high/low concern	0.36 (0.20 to 0.67)	0.83 (0.45 to 1.55)
FRAT high/low risk	0.72 (0.37 to 1.40)	1.11 (0.53 to 2.35)
<b>Outcome - completers</b>	<b>End of FaME vs Baseline</b>	<b>6 months after FaME vs Baseline</b>
Meeting CMO guidelines (Yes vs No)*		
- <75	1.13 (0.49 to 2.60)	1.38 (0.48 to 3.96)
- 75+	1.74 (0.75 to 4.07)	1.40 (0.50 to 3.91)
Short FES-I high/low concern	0.51 (0.26 to 1.01)	0.89 (0.34 to 2.32)
FRAT high/low risk	1.10 (0.52 to 2.32)	1.85 (0.49 to 7.02)

\*Presented by age group as there was a significant interaction

**Appendix 4 – Linear regression analysis of outcomes adjusting for clustering at class and individual levels: multiple imputation results**

<b>Outcome</b>	<b>End of FaME vs Baseline</b>	<b>6 months after FaME vs Baseline</b>
Functional reach (cm)	4.35 (3.08 to 5.62)	Not recorded
Turn 180 (number of steps)	-0.19 (-0.47 to 0.09)	Not recorded
Timed up and Go*	0.85 (0.80 to 0.90)	Not recorded
Confbal scale	-2.03 (-2.69 to -1.37)	-0.28 (-1.15 to 0.59)
Total MVPA**		
Total Physical activity (mins)	62.39 (-41.15 to 165.93)	64.54 (-99.98 to 229.06)
Total minutes of strength and balance activity**	1.69 (1.15 to 2.49)	1.54 (0.94 to 2.52)

\*Exponential of the log transformed outcome presented. This equates to a 15% reduction in timed up and go at the end of the intervention

\*\*Exponential of the log transformed outcome presented. This equates to a 69% increase in total minutes of strength and balance

**Appendix 5 – Negative binomial regression – falls incidence rate ratio and 95% confidence interval adjusting for clustering at class and individual levels: multiple imputation results**

	<b>End of FaME vs baseline</b>	<b>6 months after FaME vs baseline</b>
All	0.76 (0.48 to 1.22)	1.02 (0.60 to 1.74)
Completed 75%+ of classes	0.63 (0.33 to 1.19)	0.84 (0.37 to 1.90)
Completed <75% of classes	0.86 (0.45 to 1.65)	1.16 (0.63 to 2.15)
Female	0.87 (0.49 to 1.54)	0.99 (0.53 to 1.85)
Male	0.63 (0.32 to 1.26)	1.07 (0.53 to 2.16)