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What factors support older people to increase their physical activity levels? An exploratory analysis of the experiences of PACE-Lift trial participants.

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ABSTRACT

Background:

Physical Activity (PA) has significant health benefits for older adults, but nearly all UK over 60's are not achieving recommended levels. The PACE-Lift primary care-based walking intervention for 60-75 year-olds used a structured, theoretically grounded intervention with pedometers, accelerometers, hand-books and support from practice nurses trained in behaviour change techniques. It demonstrated an objective increase in walking at 3 and 12 months. We investigated the experiences of intervention participants who did (and did not) increase their walking, in order to explore facilitators to increased walking.

Methods:

Semi-structured telephone interviews used an interview schedule with a purposive sample of 30 intervention participants, 19 who had objectively increased their walking over the previous year and 11 who had not. Interviews were audio-recorded, transcribed and coded independently by researchers to generate a thematic coding framework.

Results:

Both groups confirmed that walking was an appropriate PA for people of 'their age'. The majority of those with increased walking participated in the trial as a couple, were positive about individualised goal-setting, developed strategies for maintaining their walking, and had someone to walk with. Non-improvers reported their attempts to increase walking were difficult because of lack of social support and were less positive about the intervention's behaviour change components.

Discussion:

Walking is an acceptable and appropriate PA intervention for older people. The intervention's goal-setting components were important for those who increased their walking. Mutual support between partners participating as a couple and having someone to walk with also facilitated increased walking.

Key words physical activity, walking intervention, couples, older people, behaviour change

Key points

Our nurse led primary care walking based physical activity (PA) intervention demonstrated increased step counts at both 3 and 12 months for the intervention group. We wanted to explore the factors that promoted this long-term behaviour change

We selected participants from our intervention group who increased physical activity and those who had not to explore the facilitators and barriers to behaviour change.

We expected the two groups to give contrasting narratives but these did not emerge. Rather the groups differed in the identification of a factor such as social support as either a facilitator or barrier

Participants who sustained increased walking participated in the trial as couple and had a companion to walk with. Those who did not improve lacked both these, had higher levels of chronic illness and were more skeptical of the goal setting element of the intervention.

Introduction

It is well established that physical activity (PA) is an important determinant of health and well-being in later life [1, 2,3]. National guidelines on desirable PA levels for older adults propose a minimum of 150 minutes of moderate intensity activity weekly which may be broken down into 10 minute bouts and is achievable by walking [4]. Objective assessment of PA levels by accelerometry consistently demonstrates that the vast majority (95%) of people aged 65 and older do not achieve this target level [5, 6]: self-reported achievement is more favourable, with approximately 15% reporting achievement of the target [7]. Factors associated with PA uptake for older people include the perceived health benefits, belief that exercise can promote/maintain health, enjoyment, social engagement, social support and personal benefits such as increased confidence. Key barriers include misunderstandings about the value of exercise in later life; the notion that people were 'too old' to benefit from exercise, and concerns about exercise exacerbating existing health problems and lack of social support [8-12].

Given the low PA levels and demonstrable health benefits for older people, there is a clear public health challenge to be addressed in terms of increasing PA. Factors such as health, psychological factors, social support and the physical environment are associated with PA in later life but only gender (males being more active), age (younger old adults being more active), body mass index and exercise self-efficacy are identified as potential PA determinants [13], although the poor methodological quality of many studies, the heavy reliance on self-reported measures to determine PA levels and the need for greater use of objective measures of activity has been reported [14].

A range of interventions have been developed to increase PA levels among older people aimed at those with specific risk factors such as falls or heart disease, those living in care homes or the general population (15-16). The methods for delivery of PA interventions are varied: individual or group

based; using expert or peer leaders and located in health of recreational venues [17]. Psychological theory has been used to develop components of interventions to support behaviour change including motivational techniques, goal setting and enhancing general and/or exercise self-efficacy; self-developing strategies for embedding activity within an individual's daily routine; monitoring achievement of goals and developing strategies for 'relapse prevention' [17]. Monitoring activity levels via pedometers has demonstrated that adults can increase their daily step counts over a period of 3-6 months [18,19] and emerging evidence for older adults that these devices can support PA increases when embedded within a broader based PA intervention [19, 20].

The PACE-Lift trial was a randomised controlled trial designed to evaluate the effectiveness of a primary care-based walking intervention using pedometer and accelerometer feedback combined with practice nurse PA consultations. To our knowledge, PACE-Lift is the largest pedometer-based walking intervention for older people recruited from a population-based sample and the first to measure objectively time spent in moderate to vigorous physical activity (MVPA), in line with national guidelines. Our aim was to see if this individual-based intervention increased PA levels as measured by step count and time in MVPA in 60-75 year olds over three months and whether any change was maintained at 12 months. Participants were recruited at the household level and where this consisted of a (married) couple, they had the option to take part as a couple or as individuals. We used walking as our PA, as this is safe and accessible for older people and can be embedded within daily routines. The practice nurse consultations were informed by behaviour change techniques and included goal-setting, building self-efficacy and relapse prevention, supported by handbooks and diaries for individuals. Pedometer step -counts and the accelerometer data provided feedback on activity frequency and intensity to participants. Full details of the trial protocol including the number, length, timing and content of nurse physical activity consultations are available elsewhere [21]. This primary care nurse-delivered pedometer-based walking intervention increased both steps (1037 steps/day 95% CI 513-1560) and time spent in MVPA (66 minutes/week 95% CI 36-96) compared with a control group at 3 months, with between-group differences persisting at 12 months [22].

To tailor future trials more effectively, we explored why potential PACE-Lift participants declined to participate in the trial [23] and the experience of nurses involved in delivering the intervention [24]. Despite the significant between-group differences, not all intervention group participants increased their PA. To explore the factors that supported the increase and maintenance of PA long-term following the three-month PACE-Lift intervention, we undertook a qualitative study with a sample of intervention group participants who did and did not increase levels of activity and maintain this at 12 months.

Methods

Approximately 90% of PACE-Lift participants confirmed on the initial trial consent form that they could be approached to participate in the qualitative study. After completion of their 12-month trial follow-up, potential interviewees from the intervention group were selected purposively, based upon changes in individual step-counts:

- 1) Increase on their baseline average daily step count at both 3 and 12 months
- 2) No increase on their baseline average daily step count at 3 or 12 months

We sought a sample broadly reflective of the gender and age profiles of trial participants. A key feature of PACE-Lift was the option for participants, where appropriate, to participate as either a couple or individuals and we sought to reflect this in our sample. We aimed to recruit approximately 15-20 participants with increased levels of PA and an approximately equal number of those who did not, continuing until we had reached data saturation in each group.

A female researcher (AR) conducted 20-30 minute telephone interviews due to the dispersed distribution of participants. Couples were interviewed separately. Participants were phoned at different times across the day to maximise participation and provided verbal informed consent prior to the start of the interview. We developed an open ended interview schedule tailored to the specific PA change

groups (improvers and non-improvers) focusing upon the facilitators and barriers to increasing and maintaining PA. The schedule was based around the key features of our intervention, informed by previous research examining facilitators and barriers to PA uptake and included core questions supported by probing follow-up questions to elicit further information when needed (See supplementary table 1). Interviews were transcribed verbatim and each coded using thematic analysis by a minimum of two researchers. Differences and discrepancies in theme identification were resolved by discussion at regular team meetings followed by re-coding before reaching consensus on a refined set of themes. Quotations have been chosen to illustrate the key themes and participants are identified in the text by an anonymized code (indicating respondent number and gender).

Results

We achieved data saturation with a sample of 19 participants with increased PA, and with 11 with decreased PA. Both groups included a range of activity level at baseline (average daily step-count range of 3000-12000 per day) and increases/decreases over the 12 month period showed similar variation (Table 1; supplementary table 2). The average change in daily step-count at 12 months was an increase of 1792 steps/day for the improvers and a decrease of 2120 steps/day for the non-improvers. Improvers and non-improvers were broadly similar across demographic and health parameters: a mean age of 68 years for both groups (range 61 to 75); most participants in both groups were retired, had low levels of pain and disability and were overweight or obese. However, compared with the non-improvers, the group with increased PA had a higher proportion of women, were more likely to have taken part as a couple (4 of the 11 non improvers and 12 of the 19 improvers) and had a lower number of chronic diseases (on average 1 per person compared with 2 on average in the non-improvers). In addition non improvers were less likely to have someone to walk with always or often compared with improvers (6 of 11 compared with 15 of 19).

Table 1 Summary of characteristics of improvers and non-improvers interviewed

Characteristics	Improvers ¹ (n=19)	Non-improvers ¹ (n=11)
Sex	6 male 13 female	6 male 5 female
Mean Age (range)	68 years (61-75)	68 years (62-75)
Took part as a couple	12 did 7 did not	4 did 7 did not
Mean baseline average daily steps (range)	7502 (3869 to 12,357)	7012 (3925 to 9799)
Mean 12 month average daily steps (range)	8794 (4790 to 13184)	5382 (2243 to 11253)
Mean change in average daily steps from baseline to 12 months (range)	1792 (311 to 4201)	-2120 (-104 to -7826)
Pain	3 none 12 mild 4 moderate 0 severe	3 none 2 mild 5 moderate 0 severe (1 missing)
Disability	12 none 7 mild 0 moderate 0 severe	6 none 3 mild 1 moderate 0 severe
Retired	13 yes 6 no	9 yes 2 no
Average number of chronic diseases ² (range)	1 (0-2)	2 (1-4)
Someone to walk with?	9 always 6 often 4 sometimes 0 never	4 always 2 often 3 sometimes 2 never
Body mass index ³	3 obese 9 overweight 7 normal	3 obese 4 overweight 4 normal

¹Groups were improvers and non-improvers who increased or decreased their average daily step-count between baseline and 12 month follow-up respectively.

²Chronic disease score is the sum of different self-reported chronic diseases (e.g. heart disease, diabetes, chronic obstructive pulmonary disease etc) [20]

³Body Mass Index = weight in Kg/(height in m)² Normal BMI=18.5-24.9, overweight=25-29.9, obese= ≥ 30 .

We assumed that 'improvers' and 'non-improvers' would present different themes in relation to their changed levels of PA. However the key themes were broadly similar across both groups, which enhances the credibility of our analysis, with the differentiation between the two groups demonstrated by differences in the strength of the themes and the balance between these perceived enablers or barriers to increased walking (Table 2). For example, social support was both a facilitator and a barrier: participating in the trial as a couple and having someone to walk with were enablers for the improvers group, whilst lack of social support were barriers to increasing walking for the non-improvers.

All of our 30 participants expressed strong support for the contribution of the nurses and perceived walking as a safe and age appropriate form of activity. They all offered narratives about difficulties of walking related to the weather and about their existing health problems. All but one interviewee made highly positive comments about the value of the pedometer in terms of its ability to provide motivation, feedback on target progression and how much more walking they needed to do. For example participants reported on the revelatory and motivation of the pedometer reading "*you don't realise how much you walk*" (7F) and "*it was encouraging*" (28F). Where negative comments were made about the pedometer, these emphasized practical limitations of the device and it was seen as being problematic for women due to clothing constraints.

Participants characterised by an improved activity profile were highly positive about the intervention, especially the use of the pedometer, the personalised goal setting, the support and monitoring provided by the nurse. Participating as a couple and the generation of strategies to continue their walking, such as embedding activity into daily life and having someone to walk with are the themes that strongly characterise the improvers. Those who did not improve largely made more negative comments about the themes raised, for example raising concerns about the 'repetitive' and limited na-

ture of the feedback from the pedometer and a lack of confidence in the feedback it gave, rather than introducing new factors.

Table 2; Facilitators of and Barriers to increased PA: use of themes by Improvers and Non-improvers, with illustrative quotations

Intervention features ↓	Improvers (n=19)		Non-Improvers (n=11)	
	Facilitators	Barriers	Facilitators	Barriers
Pedometer	n=19	n=3	n=10	n=4
	<i>Actually it was quite a <u>revelation</u>. You don't realise how much you walk and umm ... uhh how many steps you take..” (7F)</i>	<i>But for a woman, even the pedometer's great if you're wearing trousers, but it's absolutely hopeless if you're wearing a dress or a skirt (4F)</i>	<i>It was <u>encouraging</u> really, because you think, well I'll try to do a little more, so I've done so 'n' so steps today, I'm going to see if I can do a few more tomorrow. (28F)</i>	<i>And then, towards the end, I was doing things over and over again and it all got a bit sort of the same.... (30M)</i>
Accelerometer	n=10	n=8	n=11	n=2
	<i>Oh that was good, yes, yes, having that to sort of check up on the other one, yes, we thought they were good (13F).</i>	<i>It took a little while to get used to it actually. ... I found umm it would slip down or ride up.... Because I'm quite curvy... I did. But I've now lost 22 lbs (14F)</i>	<i>...There was no problem there with the accelerometer....Well I rather used to forget that I had it on, so ... (27M)</i>	<i>but ... a bit bewildered, you didn't know how many ... what was the ... what it was reading did I? (23F)</i>
Handbook & diary	n=14	n=15	n=8	n=11
	<i>Umm ... yes, that was very helpful because I did fill it in and it made me think about it and, yes, what I wanted to achieve. (4F)</i>	<i>I just wanted to do the walking. The material, what was in there, I can't remember what was in there to be honest. (18M)</i>	<i>That (diary) was good as well.....it focused me on positively going out and doing something... <u>having a goal, having clear aims and objectives...I had to go out</u> (22M)</i>	<i>Oh yes, I ... I really ... but I'm afraid I didn't really take that much notice of it. (30M)</i>
Nurse consultation	n=19	n=7	n=11	n=7

	<i>Yes. She was just very positive. If we'd had a bad week orit had gone down from the week before, she just said, 'Well look how well you're doing', you know, and that was really nice (8F)</i>	<i>Umm ... no I don't think so. It was ... I don't know, it was alright having her there, you know.(12F)</i>	<i>Yes, we covered everything thoroughly, yes, it was always ... you know, she gives you lots of encouragement, yes... You could understand why you were doing this survey and that, yes. (26F)</i>	
Goal setting	n=14	n=1	n=6	n=6
	<i>Well ... the fact we had a goal, uhh, I had a goal, has been critical. (16M)</i>	<i>No. I didn't, I didn't really set any goals and targets. It was ... it wasn't easy to do. (21M)</i>	<i>..Yes to do what I could and set my own targets (23F)</i>	<i>....it was something that we started on and very quickly fell by the way-side.....I'm of a certain disposition and I don't easily umm ... work to targets..... (21M)</i>
Individual nature of consultation	n=15	n=2	n=8	n=3
	<i>Yes, but I prefer one to one, and I walk on my own, (13F)</i>	<i>I think actually it might.(be better to be in a group) ... Umm.....it's the same as Weight Watchers, hearing other people's success, can sometimes spur you on....(8F)</i>	<i>I wouldn't have come (if it had been a group)(30F)</i>	<i>More group discussion, you know... I suppose it's peer pressure...to a certain extent...(22M)</i>
Walking is easy & age appropriate	n=19	n=0	n=10	n=0
	<i>Umm ... well I know walking is a good all-rounder..... I mean everybody can walk a few steps or ... most people can. (13F)</i>		<i>Oh no, no, no, any other sort of exercise would leave me stone cold I can tell you... Walking is absolutely fine. (21F)</i>	
Social support	n=5	n=1	n=3	n=5
	<i>I think it was a very helpful thing that we were able to go together, and we were able to uhh talk about it together, and umm and also to be active togeth-</i>	<i>I think it was just down to me. (21F)</i>	<i>(coming with husband) Yes, yes, most definitely. I think probably I might not have been so eager to take part.... I might have sort of said, oh no, you know ... I</i>	<i>Well I don't have any family. I don't have a wife....the only family I've got is my daughter, who lives 250 miles away with her mother... so I'm really on my own..... I</i>

	<i>er, because we are generally ummwe are generally doing most things together....And therefore one would drag the other along, or not, as the case may be! (6M)</i>		<i>think it helped motivate one another. (28F)</i>	<i>would like to have met other people that were doing it (21M)</i>
Walking constraints	n=0	n=10	n=0	n=10
		<i>Well, no, just the weather and if I wasn't feeling too good, you know, apart from that, no, not really. (24F)</i>		<i>You know when the weather is bad I don't go out... You know especially when it's icy and snow. (7F)</i>
Strategies for the future	n=19	n=0	n=7	n=0
	<i>If you carry on doing it, it becomes part of your life then....And then, you know, then you're alright..... yes, it becomes more of your daily routine basically.... (14F)</i>		<i>... just motivation that's..I still walk a bit (30M)</i>	

Discussion

PACE-Lift was the first trial demonstrating long-term (12 month) PA increases, objectively measured by both average daily step-count and MVPA, for older people, resulting from an intervention of four PA consultations with a practice nurse and focusing upon individualised activity goals supported by a pedometer. We sought to understand the factors that supported participants to achieve this [22]. We selected participants from the intervention group who had and had not increased their PA at our 12 month follow-up, as we hypothesized that they would present differing accounts of their experiences. Although our two groups were of different sizes, we are confident that we achieved data saturation, as no new themes emerged during the final few interviews in either group. Previous research has

shown that increasing interview numbers has only a marginal benefit in terms of new themes emerging and that saturation can be achieved with 6 interviews [25].

Unexpectedly all participants felt that they had benefited from taking part - even those who did not increase their PA and our research did not identify clear differences in the themes raised by our two groups.. Indeed both groups were broadly similar in their social, health and psychological characteristics, although the non-improvers group had more chronic diseases than improvers. The choice of walking as the means to enhance PA in PACE-Lift was validated by our participants' confirmation of this as age-appropriate because it minimised potential exercise-related health risks and is adaptable to existing health conditions. The devices used (the pedometer and course handbook) and nurse support were positively received by most participants. This raises the intriguing question of what were the features of the improvers group that meant that they were able to implement the skills and techniques provided by the intervention to increase levels of PA.

Key enablers to enhanced and sustained PA related to the behavioural techniques learnt during consultations with the practice nurse: predominantly goal setting and developing strategies to embed activity into their lives. A feature of the improvers was that they were more likely to have participated in the trial as a couple and to have had someone to walk with, demonstrating the importance of social support and other modifiable factors in promoting PA [26]. This may reflect the fact that those in couples were better able to use the behavioural change strategies, as they may have had the opportunity to discuss them with each other and to encourage each other to use them. Our findings resonates with a large UK study demonstrating the importance of partner involvement in successful behavioural change interventions [27]. Whilst social support has always been linked with behavioural change, the source and nature of the support needed to embed behavioural change into daily life remains unclear and would benefit from further research.

Our non-improvers' preferences for a group-based or peer-supported PA interventions and their stated lack of someone to walk with may reflect an increased need for support, given that they have increased levels of chronic diseases, their lack of a partner to participate with, a true preference for group based interventions, or some combination of these factors. However, walking in company is likely to be only one determinant of successful behavior change and thus there is further research needed to identify the other determinants and how specific barrier/facilitators link together to promote successful behaviour change. Non improvers also reported the weather as a barrier and this has been previously reported as a barrier to exercise and walking in older people [28] and adverse weather conditions in the hours before PA exercise programs designed specifically for older adults (≥ 70 years old) were associated with a lower likelihood of class attendance [29].

Conclusion

The PACE-Lift trial demonstrated that it is possible to increase PA levels in older adults and maintain them long-term via a theoretically grounded primary care based intervention based around goal setting and nurse led PA consultations. Although all participants in the intervention group received the same intervention, some participants increased their activity levels whilst others did not. Thus we sought to explore what factors promoted this behaviour change, with the view to being able to target future interventions more effectively. Those who increased and maintained activity described developing goals and strategies to increase and sustain PA supported by participation in the trial as a couple and having someone to walk with. However, these findings raise several further intriguing research questions focused upon what about participating in a behaviour change trial as a couple promotes change. Clearly there are a number of potential explanations such as mutual support, being readily able to discuss the content of the interventions and having a companion to participate in the change behaviour with-in this case waking. These require further investigation as well as considering how we can develop effective individually based behaviour change interventions for older people who do not have a partner to participate with, who may have additional needs for support resultant from disability/chronic illness, or who prefer group based interventions.

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Competing Interests

The authors declare that they have no competing interests.

Authors' contributions

CV, TH, AW, CB and AR designed the qualitative aspects of the study. AR conducted the interviews. AR, CV, AW, TH & CB carried out the analyses. The manuscript was prepared by CV with substantial input from TH, AW, CB and AR. TH, DC, CV and SK conceived the initial idea for the PACE-Lift trial. All of the author team reviewed and approved the manuscript prior to submission.

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Ethics

Ethical approval to conduct the interviews was gained within the main ethical approval for the PACE-Lift trial, from Oxfordshire Research Ethics Committee C (11/H0606/2).

Supplementary Table 1 interview guide-

Interview Guide

- 1) What things helped you to increase your walking by ___ steps?*
- 2) Did anything make it hard for you to do more walking?
- 3) Now I am going to read out some things that other people have said and would like you to comment as to whether or not these were helpful to your efforts to walk or not, and if so, how:

Cards: Setting my own goal and targets

The type of exercise

The weather/season of the year

The support of the nurse

Having to discuss progress with the nurse

The way I worked with the nurse

Family/friends/someone else in household

The PACE-Lift handbook

Wearing the accelerometer

Wearing the pedometer

The activity diary (keeping a record of your activity and steps)

- 4) So now we're going to have a look at the answers you kindly put in the questionnaire about the nurse sessions. I know this was a while ago so I will refresh your memory. So you indicated X, X and X can you tell me a bit more about this?
- 5) Thinking about your whole involvement in the PACE-Lift project, what was the most useful thing for you?
- 6) What was the least useful?

- 7) What in the PACE-Lift programme could we change in order to make it suit you better?
- 8) Has your involvement in the PACE-Lift programme had a knock-on effect for:
- a) Other aspects of your life
 - b) Other activities or diet
 - c) Family and friends
- 9) Were there any things outside the PACE-Lift research study that contributed to your success in increasing your walking?
- 10) **For those in a couple:** Some people like to work individually whereas some like to work with others. If PACE-Lift involved individual meetings with the nurse as opposed to attending with your partner, do you think that would have made a difference to your success in doing more walking?
- 11) **For those invited individually:** Some people like to work individually whereas some like to work with others. If PACE-Lift involved group meeting as opposed to individual meetings with the nurse, do you think that would have made a difference to your success in doing more walking?
- 12) Since you finished seeing the nurse, what has helped you to keep up your walking?
- 13) So that's all the questions I have for you. Is there anything more you wanted to add about walking or the PACE-Lift project itself?

- **Not asked to the non-improvers group.**

Supplementary table 2 Details of individual participants

IDNO	Group ¹	Base-line average daily steps	12 m average daily steps	Change in average daily steps (baseline to 12m)	Sex	Age	Took part as a couple	Pain	Disability	Retired	Chronic disease score ²	Some-one to walk with?	Body Mass Index ³
1	Improvers	8293	9076	783	Female	65	N	Moderate	None	Yes	0	Sometimes	Normal
2	Improvers	8784	11864	3080	Female	67	Y	None	Mild	Yes	0	Always	Normal
3	Improvers	4680	4991	311	Male	71	Y	Mild	None	Yes	1	Always	Obese
4	Improvers	6557	9403	2846	Female	69	N	Mild	Mild	No	1	Often	Normal
5	Improvers	9799	12926	3126	Female	67	Y	Mild	None	No	1	Often	Overweight
6	Improvers	4980	5813	834	Male	71	Y	Mild	None	Yes	0	Always	Overweight
7	Improvers	5047	6623	1576	Female	63	Y	Mild	None	Yes	1	Always	Overweight
8	Improvers	8550	10555	2005	Female	64	N	Moderate	Mild	Yes	1	Sometimes	Overweight
9	Improvers	6552	8183	1631	Female	73	N	Mild	None	Yes	0	Sometimes	Overweight
10	Improvers	9069	10806	1737	Male	64	Y	Mild	None	Yes	1	Often	Obese
11	Improvers	7343	8818	1475	Female	65	Y	Mild	Mild	No	1	Often	Normal
12	Improvers	4386	4790	403	Female	75	N	Mild	None	Yes	1	Always	Overweight
13	Improvers	3925	4880	955	Female	72	N	Moderate	Mild	Yes	1	Sometimes	Obese
14	Improvers	8243	10053	1810	Female	61	Y	Moderate	Mild	No	0	Often	Overweight
15	Improvers	6040	6145	105	Male	68	N	None	None	No	1	Often	Normal
16	Improvers	8984	13184	4201	Male	67	Y	None	None	Yes	1	Always	Normal
17	Improvers	5443	8910	3466	Female	62	Y	Mild	None	No	2	Always	Overweight
18	Improvers	7462	9803	2341	Male	73	Y	Mild	None	Yes	1	Always	Overweight
19	Improvers	8895	10254	1359	Female	69	Y	Mild	Mild	Yes	1	Always	Normal
20	Non-improvers	7277	3718	-3559	Male	67	N	Mild	None	Yes	1	Always	Overweight
21	Non-improvers	5286	4398	-888	Male	67	N	Moderate	None	Yes	4	Always	Overweight

22	Non-improvers	7043	5732	-1311	Male	62	N	None	None	Yes	2	Never	Obese
23	Non-improvers	10961	3136	-7826	Female	70	N	Moderate	Moderate	Yes	4	Always	Overweight
24	Non-improvers	3869	2243	-1626	Female	75	N	Moderate	Mild	No	2	Never	Normal
25	Non-improvers	12357	11253	-1104	Male	72	Y	Moderate		Yes	2	Often	Overweight
26	Non-improvers	7528	7424	-104	Female	71	Y		None	Yes	1	Always	Normal
27	Non-improvers	7990	6207	-1783	Male	66	Y	Mild	None	Yes	1	Sometimes	Normal
28	Non-improvers	4332	3414	-919	Female	67	Y	Moderate	Mild	Yes	1	Often	Obese
29	Non-improvers	8166	5956	-2210	Female	64	N	None	Mild	No	1	Sometimes	Normal
30	Non-improvers	7709	5721	-1989	Male	69	N	None	None	Yes	2	Sometimes	Obese

¹Groups were improvers and non-improvers who increased or decreased their average daily step-count between baseline and 12 month follow-up respectively.

²Chronic disease score is the sum of different self-reported chronic diseases (e.g. heart disease, diabetes, chronic obstructive pulmonary disease etc) [20]

³Body Mass Index = weight in Kg/(height in m)² Normal BMI=18.5-24.9, overweight=25-29.9, obese= \geq 30.