



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



Christina R. Victor^{a,*}, Annabelle Rogers^b, Alison Woodcock^c, Carole Beighton^d, Derek G. Cook^b, Sally M. Kerry^e, Steve Iliffe^f, Peter Whincup^b, Michael Ussher^b, Tess J. Harris^b

^a Department of Clinical Sciences, College of Health and Life Sciences, Brunel University London, Middlesex, UB8 3PH, UK

^b Population Health Research Institute, St George's University of London, SW17 0RE, UK

^c Independent Psychology Research Consultant, Southampton, UK

^d Faculty of Health, Social Care & Education, Kingston & St George's, University of London, SW17 0RE, UK

^e Pragmatic Clinical Trials Unit, Queen Mary's University of London, E1 2AT, UK

^f Research Department of Primary Care & Population Health, University College, London NW3 2PF, UK

ARTICLE INFO

Article history:

Received 13 October 2015

Received in revised form 7 June 2016

Accepted 8 June 2016

Available online 11 June 2016

Keywords:

Physical activity
Walking intervention
Couples
Older people
Behaviour change

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, handbooks 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.

© 2016 The Authors. Published by Elsevier Ireland Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

It is well established that physical activity (PA) is an important determinant of health and well-being in later life (Holme & Anderssen, 2015; Meisner, Dogra, Logan, Baker, & Weir, 2010; Sun, Norman, & While, 2013). National guidelines on desirable PA levels for older adults propose a minimum of 150 min of moderate intensity activity weekly which may be broken down into 10 min bouts and is achievable by walking (Chief Medical Officers, 2011). Objective assessment of PA levels by accelerometry consistently

* Corresponding author at: College of Health and Life Sciences, Department of Clinical Sciences, Brunel University London, Uxbridge, UB8 3PH, UK.

E-mail addresses: christina.victor@brunel.ac.uk (C.R. Victor), rogersac@hotmail.com (A. Rogers), alison.woodcock@chalto.co.uk (A. Woodcock), C.Beighton@sgul.kingston.ac.uk (C. Beighton), sgjd250@sgul.ac.uk (D.G. Cook), s.m.kerry@qmul.ac.uk (S.M. Kerry), s.iliffe@ucl.ac.uk (S. Iliffe), pwhincup@sgul.ac.uk (P. Whincup), musscher@sgul.ac.uk (M. Ussher), christina.victor@brunel.ac.uk (T.J. Harris).

demonstrates that the vast majority (95%) of people aged 65 and older do not achieve this target level (Davis & Fox, 2007; Harris et al., 2009): self-reported achievement is more favourable, with approximately 15% reporting achievement of the target (Joint Health Surveys Unit, 2009). 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 (Breen, 2015; Costello, Kafchinski, Vrazel, & Sullivan, 2011; Justine, Azizan, Hassan, Salleh, & Manaf, 2013; Franco et al., 2015; McKee, McKerney, & Kenney, 2015).

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 (Troost, Owen, Bauman, Sallis, & Brown, 2002), 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 (Koeneman, Verheijden, Chinapaw, & Hopman-Rock, 2011).

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 (El-Khoury, Cassou, Charles, & Dargent-Molina, 2013; Underwood et al., 2013). The methods for delivery of PA interventions are varied: individual or group based; using expert or peer leaders and located in health or recreational venues (Chase, 2013). 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' (Chase, 2013). Monitoring activity levels via pedometers has demonstrated that adults can increase their daily step counts over a period of 3–6 months (Kolt et al., 2010; Williams & French, 2011) and emerging evidence for older adults that these devices can support PA increases when embedded within a broader based PA intervention (Kolt et al., 2010; Mutrie et al., 2012).

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 (Harris et al., 2013). 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 min/week 95% CI 36–96) compared with a control group at 3 months, with between-group differences persisting at 12 months (Harris et al., 2015).

To tailor future trials more effectively, we explored why potential PACE-Lift participants declined to participate in the trial (Rogers et al., 2014) and the experience of nurses involved in delivering the intervention (Beighton et al., 2016). 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.

2. 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 min 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).

3. 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 61–75); 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).

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*” (18F) and “*it was encouraging*” (9F). 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

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

| Characteristics | Improvers ^a (n = 19) | Non-improvers ^a (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 (3869–12,357) | 7012 (3925–9799) |
| Mean 12 month average daily steps (range) | 8794 (4790–13184) | 5382 (2243–11253) |
| Mean change in average daily steps from baseline to 12 months (range) | 1792 (311–4201) | –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 (1 missing) |
| Retired | 13 yes 6 no | 9 yes 2 no |
| Average number of chronic diseases ^b (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 ^c | 3 obese 9 overweight 7 normal | 3 obese 4 overweight 4 normal |

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

^b Chronic disease score is the sum of different self-reported chronic diseases (e.g. heart disease, diabetes, chronic obstructive pulmonary disease etc.) (Mutrie et al., 2012).

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

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 <i>Actually it was quite a revelation. You don't realise how much you walk and umm ... uhh how many steps you take." (7F)</i> | n = 3 <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> | n = 10 <i>It was encouraging 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> | n = 4 <i>And then, towards the end, I was doing things over and over again and it all got a bit sort of the same ... (30 M)</i> |
| Accelerometer | n = 10 <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> | n = 8 <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> | n = 11 <i>... There was no problem there with the accelerometer ... Well I rather used to forget that I had it on, so ... (27 M)</i> | n = 2 <i>but ... a bit bewildered, you didn't know how many ... what was the ... what it was reading did? (23F)</i> |
| Handbook & diary | n = 14 <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> | n = 15 <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. (18 M)</i> | n = 8 <i>That (diary) was good as well ... it focused me on positively going out and doing something ... having a goal, having clear aims and objectives ... I had to go out (22 M)</i> | n = 11 <i>Oh yes, I ... I really ... but I'm afraid I didn't really take that much notice of it. (30 M)</i> |
| Nurse consultation | n = 19 <i>Yes. ... She was just very positive. If we'd had a bad week or ... it 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> | n = 7 <i>Umm ... no I don't think so. It was ... I don't know, it was alright having her there, you know.(12F)</i> | n = 11 <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> | n = 7 |
| Goal setting | n = 14 <i>Well ... the fact we had a goal, uhh, I had a goal, has been critical. (16 M)</i> | n = 1 <i>No. ... I didn't, I didn't really set any goals and targets. It was ... it wasn't easy to do. (21 M)</i> | n = 6 <i>Yes to do what I could and set my own targets (23F)</i> | n = 6 <i>... it was something that we started on and very quickly fell by the wayside ...?I'm of a certain disposition and I don't easily umm ... work to targets ... (21 M)</i> |
| Individual nature of consultation | n = 15 <i>Yes, but I prefer one to one, and I walk on my own, (13F)</i> | n = 2 <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> | n = 8 <i>I wouldn't have come (if it had been a group)(30F)</i> | n = 3 <i>More group discussion, you know ... I suppose it's peer pressure to a certain extent ... (22 M)</i> |
| Walking is easy & age appropriate | n = 19 <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> | n = 0 | n = 10 <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> | n = 0 |
| Social support | 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 together, because we are generally umm ... we are generally doing most things together ... And therefore one would drag the other along, or not, as the case may be! (6 M)</i> | n = 1 <i>I think it was just down to me. (21F)</i> | n = 3 <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 think it helped motivate one another. (28F)</i> | n = 5 <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 would like to have met other people that were doing it (21 M)</i> |
| Walking constraints | 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> | n = 0 | n = 10 <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 <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> | n = 0 | n = 7 <i>... just motivation that's. I still walk a bit (30 M)</i> | n = 0 |

'repetitive' and limited nature of the feedback from the pedometer and a lack of confidence in the feedback it gave, rather than introducing new factors.

4. 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 (Harris et al., 2015). 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 (Guest, Bunce, & Johnson, 2006).

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 (Gellert et al., 2015). 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 (Jackson, Steptoe, & Wardle, 2015). 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 behaviour 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 (Cohen-Mansfield, Marx, & Guralnik, 2003) 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 (Tu, Stump, Damush, & Clark, 2004).

5. 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 walking. 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.

Conflict of interest

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.

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).

Acknowledgements

This project was funded by the National Institute for Health Research (NIHR) through the Research for Patient Benefit Programme (RFPB) (PB-PG-0909-20055) (PACE-Lift trial). The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the RfPB programme, NIHR, National Health Service or the Department of Health. The funding body was not involved in the study design, collection of data, analysis, interpretation of data, writing of the manuscript or the decision to submit the manuscript for publication.

We would like to thank the Thames Valley Primary Care Research Network, the three general practices who supported this study (Sonning Common Health Centre, Oxfordshire, United Kingdom and Balmore Park Surgery and Priory Avenue Surgery, Reading, Berkshire, United Kingdom), the nurses who delivered the interventions (Rika Adams, Maria Cook, Ann Smith and Pamela Alcorn) and all the patients who participated. We would also like to thank our supportive Trial Steering Committee: Janet Peacock (Chair), Denise Kendrick (GP representative), Cameron Swift (older people's health representative), Paul Cann (patient and public involvement representative). We also thank Ulf Ekelund for his role as trial investigator.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.archger.2016.06.006>.

References

- Beighton, C., Victor, C. R., Normansell, R., CookD'Kerry, S., Iliffe, S., Ussher, M., et al. (2016). It's not just about walking, it's the practice nurse that makes it work: a qualitative exploration of the views of practice nurses delivering complex physical activity interventions in primary care. *BMC Public Health*, *15*, 1236.
- Breen, C. (2015). Keeping active for better ageing. *Centre for Ageing Research and Development in Ireland (CARDI) Report* [Available at: <http://www.cardi.ie/sites/default/files/publications/CARDI%20Keeping%20Active%20Report%20%5Bweb%5D.pdf>].
- Chase, J. A. (2013). Physical activity interventions among older adults: a literature review. *Research and Theory for Nursing Practice*, *27*, 53–80.
- Chief Medical Officers (2011). *Start active, stay active: a report on physical activity for health from the four home countries*. London: UK Department of Health.
- Cohen-Mansfield, J. S., Marx, M., & Guralnik, J. M. (2003). Motivators and barriers to exercise in an older community-Dwelling population. *Journal of Aging & Physical Activity*, *11*, 242–253.
- Costello, E., Kafchinski, M., Vrazel, J., & Sullivan, P. (2011). Motivators, barriers, and beliefs regarding physical activity in an older adult population. *Journal of Geriatric Physical Therapy*, *34*, 138–147.
- Davis, M. G., & Fox, K. R. (2007). Physical activity patterns assessed by accelerometry in older people. *European Journal of Applied Physiology*, *100*, 581–589.
- El-Khoury, F., Cassou, B., Charles, A.-M., & Dargent-Molina, P. (2013). The effect of fall prevention exercise programmes on fall induced injuries in community dwelling older adults: systematic review and meta-analysis of randomised controlled trials. *BMJ*, *f6234*.
- Franco, M. R., Tong, A., Howard, K., Sherrington, C., Ferreira, P. H., Pinto, R. Z., et al. (2015). Older people's perspectives on participation in physical activity: a systematic review and thematic synthesis of qualitative literature. *British Journal of Sports Medicine*. <http://dx.doi.org/10.1136/bjsports-2014-094015>.
- Gellert, P., Witham, M. D., Crombie, I. K., Donnan, P. T., McMurdo, M., & Sniehotta, F. F. (2015). The role of perceived barriers and objectively measured physical activity in adults aged 65–100. *Age and Ageing*. <http://dx.doi.org/10.1093/ageing/afv001>.
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Method*, *18*, 59–82.
- Harris, T. J., Owen, C. G., Victor, C. R., Adams, R., & Harris, D. G. (2009). What factors are associated with physical activity in older people, assessed objectively by accelerometry? *British Journal of Sports Medicine*, *43*, 442–450.
- Harris, T., Kerry, S., Victor, C., Ekelund, U., Woodcock, A., Iliffe, S., et al. (2013). Randomised controlled trial of a complex intervention by primary care nurses to increase walking in patients aged 60–74 years: protocol of the PACE-Lift (Pedometer Accelerometer Consultation Evaluation – Lift) trial. *BMC Public Health*, *4*, 5.
- Harris, T., Kerry, S. M., Victor, C. R., Ekelund, U., Woodcock, A., et al. (2015). A primary care nurse-Delivered walking intervention in older adults: PACE (Pedometer accelerometer consultation evaluation)-Lift cluster randomised controlled trial. *PLoS Medicine*, *12*, 2.
- Holme, I., & Anderssen, S. A. (2015). Increases in physical activity is as important as smoking cessation for reduction in total mortality in elderly men: 12 years of follow-up of the Oslo II study. *British Journal of Sports Medicine*, *49*, 743–748.
- Jackson, S., Steptoe, A., & Wardle, J. (2015). The influence of partner's behavior on health behavior change: the english longitudinal study of ageing. *JAMA Internal Medicine*, *175*, 385–392.
- Joint Health Surveys Unit (2009). *Health survey for england 2008 physical activity & fitness*. London: The NHS Information Centre for Health and Social Care.
- Justine, M., Azizan, A., Hassan, V., Salleh, Z., & Manaf, H. (2013). Barriers to participation in physical activity and exercise among middle-aged and elderly individuals. *Singapore Medical Journal*, *54*, 581–586.
- Koeneman, M. A., Verheijden, M. W., Chinapaw, M. J. M., & Hopman-Rock, M. (2011). Determinants of physical activity and exercise in healthy older adults: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *8*, 142.
- Kolt, G. S., Schofield, G. M., Kerse, N., Garrett, N., Schluter, P. J., Ashton, T., et al. (2010). Healthy Steps trial: pe-dometer-based advice and physical activity for low-active older adults. *Annals of Family Medicine*, *3*, 206–212.
- McKee, G., McKerney, P. M., & Kenney, R. (2015). The factors associated with self-reported physical activity in older adults living in the community. *Age and Ageing*, *44*, 586–592.
- Meisner, B. A., Dogra, S., Logan, A. J., Baker, J., & Weir, P. L. (2010). Do or decline? Comparing the effects of physical inactivity on biopsychosocial components of successful ageing. *Journal of Health Psychology*, *15*, 688–696.
- Mutrie, N., Doolin, O., Fitzsimons, C. F., Grant, P. M., Granat, M., Greal, M., et al. (2012). Increasing older adults' walking through primary care: results of a pilot randomized controlled trial. *Family Practice*, *29*, 633–642.
- Rogers, A., Harris, T., Victor, C., et al. (2014). Which older people decline participation in a primary care trial of physical activity and why? Insights from a mixed methods approach. *BMC Geriatrics*, *14*, 46.
- Sun, F., Norman, I., & While, A. (2013). Physical activity in older people: a systematic literature review. *BMC Public Health*, *13*, 449.
- Trost, S. G., Owen, N., Bauman, A. E., Sallis, J. F., & Brown, W. (2002). Correlates of adults' participation in physical activity: review and update. *Medicine & Science in Sports & Exercise*, *34*, 1996–2001.
- Tu, W., Stump, T. E., Damush, T. M., & Clark, D. O. (2004). The effects of health and environment on exercise-Class participation in older, urban women. *Journal of Aging & Physical Activity*, *12*(4), 480–496.
- Underwood, M., Lamb, S. E., Eldridge, S., Sheehan, B., Slowther, A., Spencer, A., et al. (2013). Exercise for depression in older care home residents: a cluster randomised controlled trial. *Lancet*, *382*, 41–49.
- Williams, S. L., & French, D. P. (2011). What are the most effective intervention techniques for changing physical activity self-efficacy and physical activity behaviour—and are they the same? *Health Education Research*, *26*, 308–322.