Psychology, Community & Health
pch.psychopen.eu | 2182-438X

Special Thematic Section on "Aging and Health in Different Sociocultural Contexts"

Increasing Physical Activity in Older Adults: Walking by Prescription in Primary Care

Vera Paisana Morais*[a], Jorge Encantado[a], Maria Isabel Santos[b], Pedro Almeida[a], Isabel Pereira Leal[a], Cláudia Carvalho[a]

[a] ISPA – Instituto Universitário de Ciências Sociais e da Vida, Núcleo de Psicologia da Saúde, Lisbon, Portugal. **[b]** NOVA Medical School – Faculdade de Ciências Médicas da Universidade Nova de Lisboa, Núcleo de Medicina Geral e Familiar, Lisbon, Portugal.

Abstract

Aim: The present study (PTDC/SAU-SAP/110799/2009) funded by the Portuguese Government (Fundação para a Ciência e Tecnologia – FCT) aimed to test the effectiveness of a behaviour based intervention combined with a cognitive based one, designed to increase physical activity levels in older adults at Primary Health Care Centres.
Method: A total of 108 participants aged over 65 years participated in the study. Participants were referred by their General Practitioner (GP) and randomized by gender and marital status at the moment they started the program (single vs. couple), and allocated into one of three conditions: goal intention, action planning, action planning and coping planning. All participants received a pedometer and a logbook and were asked to register their daily number of steps for a period of 24 weeks. Study follows a longitudinal design with five assessments over a 6-month after baseline.
Results: The test between subjects' effects revealed an interaction between condition and participating in the study as single vs. couple. Older adults participating as singles walked more steps on average in the condition goal intention plus action planning and coping planning, whereas participants that entered in the study with their spouse, goal intention without any other planning intervention was the most effective intervention.
Conclusion: The 24-week physical activity program based on the recent developments of behavioural-cognitive framework, has proven useful increasing older adults daily walking behaviour.

Keywords: older adults, physical activity, intervention

Psychology, Community & Health, 2017, Vol. 6(1), 128–140, doi:10.5964/pch.v6i1.217

Received: 2016-09-19. Accepted: 2017-01-22. Published (VoR): 2017-08-04.

Handling Editor: Sofia von Humboldt, William James Center for Research (WJCR), ISPA – Instituto Universitário, Lisbon, Portugal

*Corresponding author at: ISPA – Instituto Universitário de Ciências Sociais e da Vida. Rua Jardim do Tabaco, 34, 1149-041 Lisbon. E-mail: paisanamorais@gmail.com

In older adults, health benefits due to regular physical activity have critical importance, contributing to lower rates of all mortality causes, such as coronary heart disease, high blood pressure, stroke, type 2 diabetes, colon cancer and breast cancer (World Health Organization [WHO], 2011). Physical activity contributes to a lower risk of falling, less functional limitations, higher level of cardiorespiratory and muscular fitness, healthier body mass and composition, higher levels of functional health, and improves independence and social interactions which help preserve cognitive functions (WHO, 2011). Therefore, is highly important to focus on

education and interventions that can persuade older adults that they should change their behaviour because it has important consequences on their quality of life and longevity (Newsom, Kaplan, Huguet, & McFarland, 2004).

Physical inactivity has been considered one of the most important health problems in the 21st century (Blair, 2009) representing 1.5 to 3% of the total healthcare costs in the developed countries (Oldridge, 2008). Thus, increasing physical activity in older adults is a mandatory public health intervention that may result in individual, social, and economic benefits (Lamb, Bartlett, Ashley, & Bird 2002; WHO, 2011).

For the last few decades walking has been suggested as a particularly beneficial form of moderate physical activity that can easily be linked with primary care (Gusi, Reyes, Gonzales-Guerrero, Herrera, & Garcia, 2008; Orrow, Kinmonth, Sanderson, & Sutton, 2012), and as a more effective way of promoting physical activity for older adults comparing to the general adult population (Kassavou, Turner, & French, 2013). Intervention in Primary Health Care Centres is considered strategic for physical activity promotion among sedentary population (Garrett et al., 2011; Orrow et al., 2012). The main reason is that 70 to 80% of citizens from developed countries visit a General Practitioner (GP) at least once every twelve months (van Doorslaer et al., 2006). In addition, GP's recommendation for physical activity improves older adult's quality of life (Guallar-Castillón, Santa-Olalla Peralta, Ramón Banegas, López, & Rodríguez-Artalejo, 2004; King, Rejeski, & Buchner, 1998) and their interest in health (Gusi et al., 2008). However, people do not always follow the advice of their GP when it comes to physical activity (Burke & Dunbar-Jacob, 1995) thus, developing strategies to help people adhere to GP recommendations is needed (Atreja, Bellam, & Levy, 2005).

Physical activity behaviour change interventions should be based on theoretical models that explain and predict physical activity (Booth, Owen, Bauman, Clavisi, & Leslie, 2000), using techniques such as goal setting, planning, and self-monitoring (McMurdo et al., 2010). Social cognitive theories, like the theory of planned behaviour, assumes that a certain behaviour can be predicted by intention – the individual motivation to perform the behaviour (Ajzen & Fishbein, 1977). One of the main problems seems to be the link between intention and behaviour – people intend to perform the behaviour but do not act (Sheeran & Webb, 2016). According to Hardeman et al. (2002) "the theory of planned behaviour has rarely been applied to interventions (…), and it is most frequently used to measure process and outcome variables and to predict intention or behaviour (change), and less often to develop the intervention" (p. 148).

Recent interventions focused on volitional (post-intentional) processes (Koring et al., 2012). Planning interventions to increase health behaviour (Gollwitzer & Sheeran, 2006) have been suggested as an alternative to build the bridge between intention and behaviour by purposing more proximal factors that facilitate the translation of the intention into action (Schwarzer, 2008). The planning intervention distinguishes action planning and coping planning has components of a volitional phase (Schwarzer, 2008). Action planning allows to plan *when*, *where* and *how* to perform the behaviour (Norman & Conner, 2005; Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008; Sniehotta, 2009; Wiedemann, Lippke, Reuter, Ziegelmann, & Schüz, 2011), and coping planning allows addressing strategies to overcome behaviour maintenance barriers (Sniehotta, 2009; Sniehotta, Schwarzer, Scholz, & Schüz, 2005). Evidence supports physical activity behaviour change using these predictors (Gollwitzer & Sheeran, 2006; Hagger & Luszczynska, 2014; Koring et al., 2012; McEachan, Conner, Taylor, & Lawton, 2011). Van Stralen, De Vries, Mudde, Bolman, and Lechner's (2009) literature review shows that action planning predicted physical activity and that coping planning predicted long-term physical

activity initiation and maintenance. However, according to French, Olander, Chisholm, and Mc Sharry (2014), to plan or control behaviour may require more effort which in turn may explain the smaller results observed in physical activity interventions with older adults, possibly due to decreases in executive function in this specific age group. Additionally, goal setting and self-monitoring using a pedometer is a behavioural based intervention that seems to be associated with significant increases in physical activity (Bravata et al., 2007), long-term changes in physical activity behaviour (Chase, 2013), and working as a possible motivational strategy to maintain older adults in physical activity interventions (McMurdo et al., 2010). Moreover, despite that cognitive based interventions and the combination of behavioural and cognitive interventions were successful in changing physical activity behaviour (Chase, 2013), more research concerning action planning and coping planning influence on physical activity in healthy older adults is needed (van Stralen et al., 2009).

Social integration is one of the factors within the social factors that influence older adults' health and quality of life behaviours (Gellert, Ziegelmann, Warner, & Schwarzer, 2011). The spousal or intimate partner becomes especially relevant during ageing as spousal's tend to spend considerable more time together due to decreases in their social networks and connections because of retirement, loss of contact, and mortality (van Solinge & Henkens, 2005). Health behaviours, such as physical activity, are influenced by spouses, thus partners can encourage health promotion behaviours (Umberson, 1987) or influence health-damaging behaviours (Stimpson, Masel, Rudkin, & Peek, 2006). Few studies have examined the link between marital status and physical activity in longer-term marriages such has in older adults. Some studies reported higher levels of physical activity in older adults couples (Garcia & King, 1991; Irwin et al., 2004; Pettee et al., 2006; van Gool et al., 2006), other studies found no association between marital status and physical activity (Booth et al., 2000; King, 2001), and Hong et al. (2005) only found association when couples have similar levels of physical activity. When physical activity levels were different, the association was not found. Older adult couples seem to be more likely to adhere to physical activity programs than singles (Gellert et al., 2011; Wallace, Raglin, & Jastremski, 1995). In Gellert et al. (2011) intervention, couples substantially increased their physical activity levels, while for single older adults this did not change. Findings concerning spousal relevance for older adults' physical activity initiation and maintenance are inconsistent (Pettee et al., 2006) and there's a lack of intervention studies that include intimate partners and compare different types of partner status (Gellert et al., 2011).

The PTDC/SAU-SAP/110799/2009 project was a longitudinal study funded by the Portuguese Government (Fundação para a Ciência e Tecnologia – FCT) that aimed to test the effectiveness of a behaviour based intervention combined with a cognitive based intervention designed to increase older adults daily walking sessions in five Health Care Centres of a Group of Health Care Centres (ACES) in Oeiras, Portugal. In the present study, we tested three different behavioural and cognitive strategies: goal intention intervention (G), action planning intervention (AP) and action planning and coping planning intervention (CP). Based on recent research (Chase, 2013; van Stralen et al., 2009), we expect that the combined strategies will be more effective in increasing older adults' walking behaviour than single behavioural or cognitive strategies.

Method

Participants

The Oeiras' Center serves a population of 175,000 residents of which 32,543 (19% of the total population) have more than than 65 years old, 12,978 (7% of the total population) are males and 19,565 (11% of the total population) are females. We invited all patients over 65 years old that were registered at the five Primary Health Care Centres in which their assigned General Practitioners (GP) agreed to participate in the study. Inclusion criteria were community-dwelling aged 65 and older, identified by their GP as sedentary but with physical capabilities to increase physical activity levels by daily walking, and with absence of co-morbidities that would constitute contra-indications for participation. Participants were excluded if they were already engaged in 20 or more minutes per day of moderate or intense physical activity, had psychiatric morbidity, physical condition that prevents physical activity, illiteracy, moderate to severe cognitive impairment (less than 22 points for 1-11 school years or less than 27 points for more than 11 school years on the Mini-Mental State Examination – MMSE; Guerreiro et al., 1994), or had lack of interest in participating. The use of assisted devices to walk was not considered as an exclusion criterion.

Procedures

Study design, procedure, and informed consent were approved by the Ethics Committee of the Portuguese Health Department and carried out in accordance with the Declaration of Helsinki. Written informed consent was obtained from all participants prior to intervention.

The principal investigator (PI; C.C) met with GP's at all five Primary Health Care Centres to advertise, promote the study, and ask for GP's participation and referrals. At the end of the meeting GP's received the following documentation: leaflets advertising the study, written information with the inclusion and exclusion criteria for participation, and a form to insert contact information of the patients that agreed to participate. Weekly e-mails were sent to GP to remind them to continue referring participants to the study. Posters and leaflets advertising the study were posted in all patients' waiting rooms. GP handled the contact information of patients that agreed to participate, sending it to the researchers. Potential participants were contacted by phone by the researchers to double-check the inclusion and exclusion criteria and schedule a face-to-face session in which the study was explained in more detail and where the written informed consent was obtained. Participants were randomized using a computerized program (Research Randomizer) in advance by the PI. Randomization was revealed to experimenters and participants upon agreement to participate in the study and before the baseline assessment, taking into consideration the categories gender and marital status (single vs. couple). During baseline assessment, anthropometrical measures (weight, height, waist circumference, body mass index, and blood pressure) were collected, and a questionnaire about physical and mental health was filled. Pedometers (Yamax SW-200) were given to all participants and they were asked to record their daily number of steps during a week in a logbook that was also provided by the researchers. Explanation and training with the pedometer and how to log the daily number of steps was provided. This first session took approximately 90 minutes. One week after baseline, all participants met with the experimenters for a face-to-face interview in which the number of steps walked during that week was assessed and established as baseline. Participants then received one of the following instructions: participants allocated to the Goal Intention Intervention (G) were asked to set a goal in terms of number of steps for next 3 weeks taking in consideration their average number of steps at baseline.

Participant's allocated to the Action Planning Intervention (AP) received the same instruction and were also asked to specify where, when, how and with who would they walk. Participants allocated to the Action Planning and Coping Planning Intervention (CP) received the same instruction as participants in the Goal Intention Intervention (G) group, also they were asked to identify and write down the possible barriers to the achievement of the goal and how would they overcome those barriers. All participants were asked to gradually increase their daily number of steps but not surpass the WHO's recommendation of 10000 steps per day. Face-to-face follow-up sessions were then scheduled with the participants at the 4th, 8th, 16th and 24th week. Session's appointments were confirmed with a reminder phone call the day before. VM and JP guarantied baseline assessment, intervention, and follow-up sessions. Participation was voluntary and without payment. All sessions took place at the Health Care Centre in which participants were registered.

Measures

During baseline, interviews we obtained data on participants demographics (Table 1), including age, living status, comorbidities (cholesterol, diabetes, hypertension, heart disease, osteoarticular disease, and presence of pain) and lifestyle indicators (tobacco and alcohol consumption, time spend seated and watching television).

The primary outcome objectively measured was daily steps, through a pedometer Yamax SW-200. This instrument is considered a physical activity reliable measure for older adults (Tudor-Locke, Williams, Reis, & Pluto, 2002). Participants wore the pager-sized device on the waistband during all day (from the moment they woke up in the morning until the moment they went to bed at night) for one week in order to achieve the baseline number of steps average (Hilgenkamp, Van Wijck, & Evenhuis, 2012). After the randomization they wore it 7 days a week for another 23 weeks. Outcome measure was assessed before randomization at baseline and at 4, 8, 16 and 24 weeks by the experimenters.

Data Analysis

Statistical analysis were performed based on the Intention-to-Treat (ITT) and the Last Observation Carried Forward (LOCF) analysis, using data from the 108 randomized participants. Univariate analysis of covariance (ANCOVA) was used for mean comparisons made between the G, AP, and CP intervention groups at 24 weeks, controlling baseline values. Analyses were run using SPSS version 17 (SPSS, INC., Chicago, IL). Posteriorly to data insertion, a psychologist not involved on the research checked 100% data for primary outcome entered for errors. For the primary outcome, 100% of the data was checked.

Results

The study took place between September 2011 and April 2013. A total of 498 participants were referred by a GP and enrolled in the present study. Of these, participants 107 were not reachable by phone, whereas 391 were contact and assessed for eligibility. A total of 250 participants were excluded: 171 did not meet inclusion criteria, 79 were not interested in participating. We have randomized 141 participants, but 37 did not show up for baseline assessment session. A total of 108 participants had baseline assessment interviews and all returned for the intervention session one week later. To the Goal intention intervention we allocated 26 participants, 24 were allocated to the action planning intervention, and 28 were allocated to the action planning plus coping planning intervention. A total of 78 participants finished the six months' intervention. Figure 1 shows

the participant's flowchart through the study. Recruitment, retention and drop-out rates will be discussed elsewhere (Morais et al., 2017, submitted). At baseline, the three intervention groups were well balanced regarding age, gender, and marital status (Table 1). There were no significant differences between the three groups at baseline for living status, body mass index (BMI), waist circumference, systolic blood pressure, comorbidities, pain, or lifestyle indicators (p = .79). No significant differences were found at baseline in the average number of steps walked per day between participants gender (p = .117) and singles vs couples (p = .098).

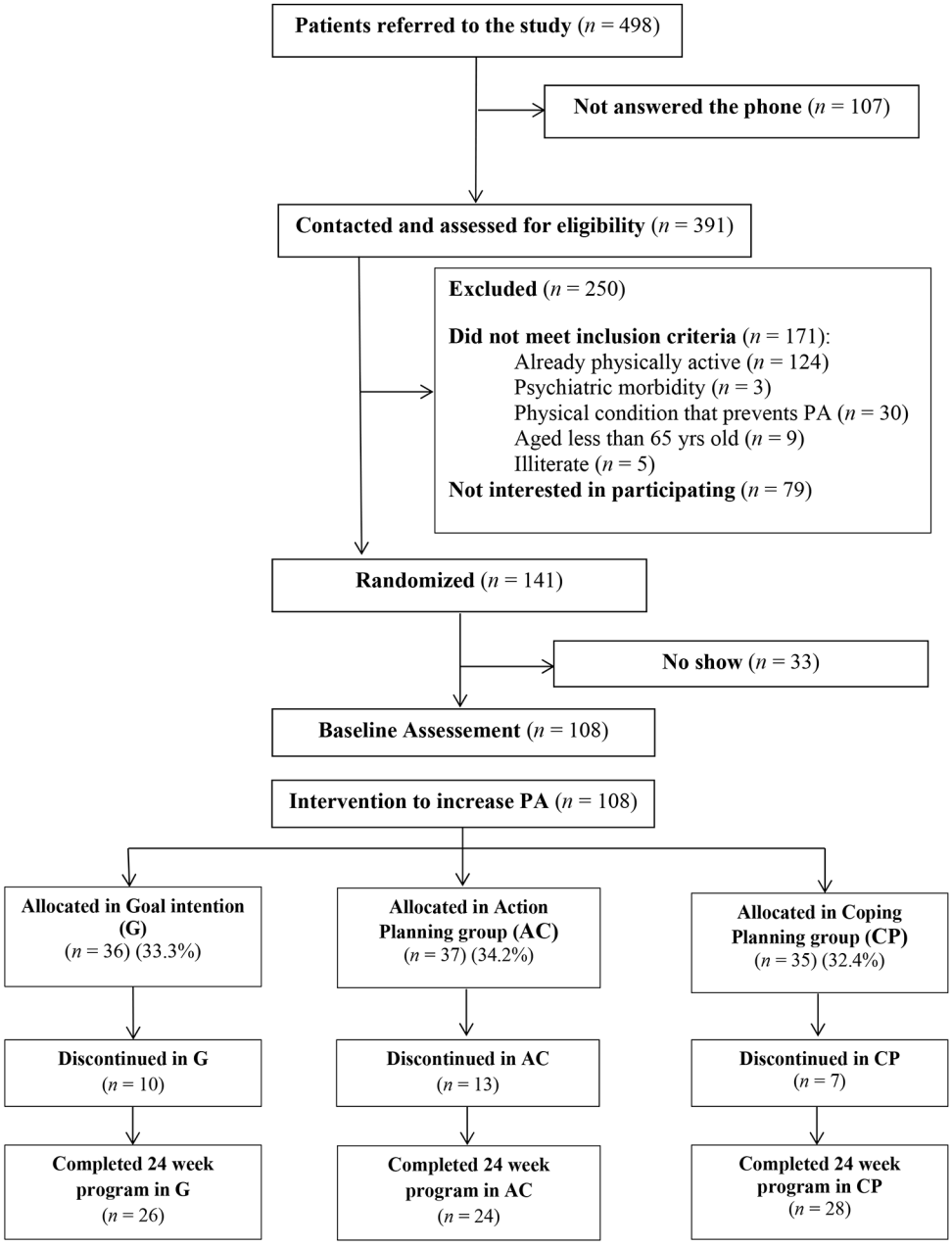

Figure 1. Participant's flowchart through the study

Table 1

Baseline Characteristics for Eligible Participants

Characteristic	Goal Intention Group (*n* = 36)	Action planning (*n* = 37)	Coping planning (*n* = 35)
Age, *M* ± *SD*	73.2 ± 5.6	71.4 ± 4.0	71.2 ± 4.2
Gender, *n* (%)			
Women	21 (58.3%)	20 (54.1%)	20 (57.1%)
Man	15 (41.7%)	17 (45.9%)	15 (42.9%)
Living Status, *n* (%)			
Alone	6 (16.7%)	6 (16.2%)	2 (5.7%)
With sons	1 (2.8%)	2 (5.4%)	3 (8.6%)
With a partner	24 (66.7%)	23 (62.2%)	24 (68.6%)
Partner and sons	2 (5.6%)	6 (16.2%)	5 (14.3%)
Partner or Sons and other relatives	3 (8.3%)	0 (0.0%)	1 (2.9%)
Body Mass Index (BMI), *M* ± *SD*	28.70 ± 4.71	29.82 ± 4.87	27.94 ± 4.76
Waist Circumference (WC) (cm), *M* ± *SD*	101.77 ± 11.52	105.81 ± 12.25	103.76 ± 10.86
Systolic Blood Pressure (mm hg), *M* ± *SD*	139.60 ± 19.65	140.76 ± 16.80	122.92 ± 15.59
Cholesterol, *n* (%)	17 (47.2%)	20 (54.1%)	22 (37.1%)
Hypertension, *n* (%)	20 (55.6%)	30 (81.1%)	24 (68.6%)
Diabetes, *n* (%)	5 (13.9%)	8 (21.6%)	6 (17.1%)
Hearth Disease, *n* (%)	7 (19.4%)	4 (10.8%)	7 (20.0%)
Osteoarticular disease, *n* (%)	23 (63.9%)	23 (62.2%)	25 (71.4%)
Pain, *n* (%)	26 (72.2%)	22 (59.5%)	27 (71.4%)
Tobacco consumption, *n* (%)	2 (5.6%)	1 (2.7%)	1 (2.9%)
Alcohol consumption, *n* (%)	17 (47.2%)	22 (59.5%)	15 (42.9%)
Time Spent Seated (TS) (hours), *M* ± *SD*	4.64 ± 1.80	4.62 ± 1.81	4.95 ± 2.54
Time Watching TV (TV) (hours), *M* ± *SD*	3.61 ± 2.04	3.55 ± 1.80	2.96 ± 1.52
Steps per day	3962.36 ± 1452.14	4552.38 ± 2046.58	3954.78 ± 1933.68

We did a 2x3 (marital status by treatment) ANCOVA, with number of steps walked after the intervention as the dependent variable, and number of steps walked at baseline as the covariate. The ANCOVA revealed an interaction between the experimental manipulation (goal intention, action planning, or action planning with coping planning) and participation in the study as single vs couple ($F(2, 101) = 6.209$, $p = .003$; Figure 2 shows details).

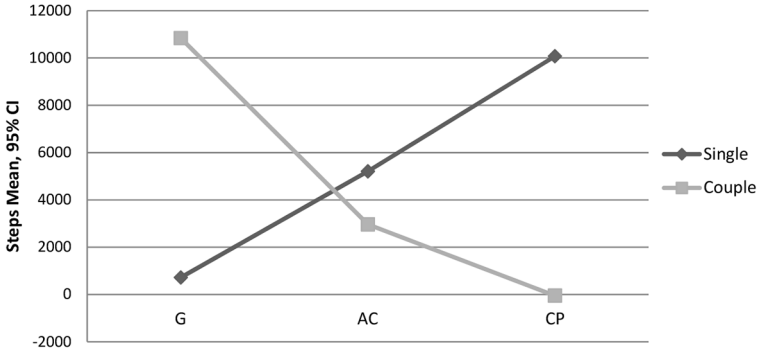

Figure 2. Interaction between subjects' effects for the experimental manipulation for intervention and participation in the study as single vs couple.

For the total sample, there were no differences between forming goal intention, forming action planning, and forming action planning with coping planning to overcome possible barriers to achieve the goal. All interventions were highly effective to increase daily walking behaviour until the 8th week (increase was 32.8% for the total sample).

Figure 3 shows how many steps participants walked per day, on average, in the different conditions, evaluated at five moments in time: baseline, after 4 weeks, after 8 weeks, after 16 weeks and after 24 weeks.

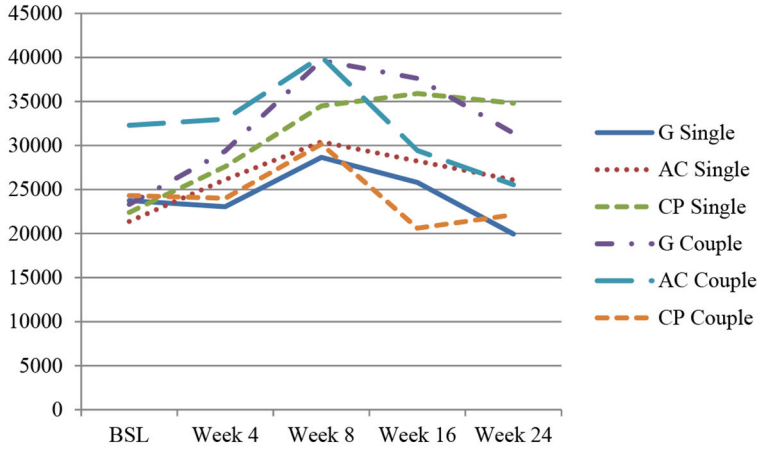

Figure 3. Total number of steps walked per week: Individuals vs couples by condition.

Discussion

This intervention achieved a considerable increment of 32.8% in daily physical activity for our older adults' sample. The mainly concern is how to maintain the achieved behaviour for a long run. The physical activity behaviour of walking seems to be very specific and therefore, for single older adults, the combined intervention of forming goal intentions with action planning and coping planning was effective for initiating and maintaining physical activity levels, as suggested in van Stralen et al. (2009) and Chase (2013) reviews. Contrary to findings in French et al. (2014) systematic review, in the absence of cognitive limitations older adults seem to benefit from planning when, where, and how to perform their daily walking behaviour, just has suggested by the Health Action Process Approach model (HAPA; Schwarzer, 2008).

Research concerning spousal relevance for older adults' physical activity initiation and maintenance are inconsistent (Pettee et al., 2006). Some studies reported higher levels of physical activity in older adult couples (Garcia & King, 1991; Irwin et al., 2004; Pettee et al., 2006; van Gool et al., 2006), other studies found no association between marital status and physical activity (Booth et al., 2000; King, 2001). Our findings suggest that the combined strategy (G+AP+CP) was detrimental for participants that entered in the study as couples. Although counter-intuitive, this result may have several explanations. It is possible that the members of couples that participated in the study had different levels of physical activity, and the least fit member may have limited the other, as suggested by Hong et al. (2005). However, given the complex and highly tailored intervention, it seems more likely that couples had different preferences concerning *when*, *where*, and *how* to perform their daily walking, and one of them or both may give up their own action planning. For couples, the simple behaviour based intervention (forming goal intention and using a pedometer to assess steps) had better results

concerning initiating and maintaining a higher level of physical activity. Future research could explore the possibility of applying behavioural strategy plus action planning and coping planning to both partners simultaneously.

The program accomplished the goal of increasing sedentary older adults' physical activity levels in the Primary Health Care context. Considering the arrival point at 24 weeks, participants walked more if they were participating in the study as singles in the condition pedometer plus action planning with coping planning, and if they were participating as couples using the pedometer without any other planning intervention. For couples, to set a goal of daily steps to achieve and to give them a pedometer seems to be the best strategy to increase daily walking behaviour.

Although we have also achieved some interesting findings by applying and testing behavioural-cognitive theoretical constructs and somehow contribute to increase the studies concerning spousal relevance for older adults' physical activity, this study has several limitations. The sample size was relatively small, particularly the number of participants as couples (n = 44). Results revealed a trend but they cannot be generalized, therefore future studies can focus on clarifying this issue. Additionally, the outcome measure was the self-reported number of steps per day that were registered by participants in a logbook. More user-friendly and sophisticated technology that records and registers daily steps in a database and do not require effort would probably be more useful and may help decrease drop-out rates (Morais et al., 2017). The importance of behavioural-cognitive theoretical based interventions to improve older adults' physical activity has been emphasized in recent research. The 24-week physical activity program presented in this study, carried out in the Primary Health Care context, and based on the recent developments of behavioural-cognitive framework, has proven useful increasing older adults daily walking behaviour. Future research can highlight which cognitive strategies can improve older adults' couples' physical activity behaviour.

Funding

The Foundation for Science and Technology (Fundação para a Ciência e Tecnologia – FCT project ref #PTDC/SAU-SAP/110799/2009) funded the research project. All authors were team members of the funded project.

Competing Interests

The authors have declared that no competing interests exist.

Acknowledgments

The Ethics Committee of the Portuguese Health Department (*Administração Regional da Saúde de Lisboa e Vale do Tejo* (ARSLVT) approved this study. The ACES-Oeiras (Agrupamento de Centros de Saúde da Região de Oeiras, Portugal) agreed the project to be carried out on its Health Care Centre's network.

References

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84*, 888-918. doi:10.1037/0033-2909.84.5.888

Atreja, A., Bellam, N., & Levy, S. R. (2005). Strategies to enhance patient adherence: Making it simple. *Medscape General Medicine, 7*, 4.

Blair, S. N. (2009). Physical inactivity: The biggest public health problem of the 21st century. *British Journal of Sports Medicine, 43*, 1-2. doi:10.1016/s1440-2440(07)70066-x

Booth, M. L., Owen, N., Bauman, A., Clavisi, O., & Leslie, E. (2000). Social-cognitive and perceived environment influences associated with physical activity in older Australians. *Preventive Medicine, 31*, 15-22. doi:10.1006/pmed.2000.0661

Bravata, D. M., Smith-Spangler, C., Sundaram, V., Gienger, A. L., Lin, N., Lewis, R., . . . Sirard, J. R. (2007). Using pedometers to increase physical activity and improve health: A systematic review. *Journal of the American Medical Association, 298*, 2296-2304. doi:10.1001/jama.298.19.2296

Burke, L. E., & Dunbar-Jacob, J. (1995). Adherence to medication, diet, and activity recommendations: From assessment to maintenance. *The Journal of Cardiovascular Nursing, 9*(2), 62-79. doi:10.1097/00005082-199501000-00007

Chase, J. A. D. (2013). Physical activity interventions among older adults: A literature review. *Research and Theory for Nursing Practice, 27*, 53-80. doi:10.1891/1541-6577.27.1.53

French, D. P., Olander, E. K., Chisholm, A., & Mc Sharry, J. (2014). Which behaviour change techniques are most effective at increasing older adults' self-efficacy and physical activity behaviour? A systematic review. *Annals of Behavioral Medicine, 48*, 225-234. doi:10.1007/s12160-014-9593-z

Garcia, A. W., & King, A. C. (1991). Predicting long-term adherence to aerobic exercise: A comparison of two models. *Journal of Sport & Exercise Psychology, 13*, 394-410. doi:10.1123/jsep.13.4.394

Garrett, S., Elley, C. R., Rose, S. B., O'Dea, D., Lawton, B., & Dowell, A. C. (2011). Are physical activity interventions in primary care and the community cost-effective? A systematic review of the evidence. *The British Journal of General Practice, 61*, e125-e133. doi:10.3399/bjgp11X561249

Gellert, P., Ziegelmann, J. P., Warner, L. M., & Schwarzer, R. (2011). Physical activity intervention in older adults: Does a participating partner make a difference? *European Journal of Ageing, 8*, 211-219. doi:10.1007/s10433-011-0193-5

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*, 69-119. doi:10.1016/S0065-2601(06)38002-1

Guallar-Castillón, P., Santa-Olalla Peralta, P., Ramón Banegas, J., López, E., & Rodríguez-Artalejo, F. (2004). Actividad física y calidad de vida de la población adulta mayor en España. *Medicina Clínica, 123*(16), 606-610. doi:10.1016/s0025-7753(04)74616-3

Guerreiro, M., Silva, A. P., Botelho, M., Robusto-Leitão, O., Castro-Caldas, A., & Garcia, C. (1994). Adaptação à população portuguesa da tradução do "Mini Mental State Examination" (MMSE). *Revista Portuguesa de Neurologia, 1*, 9-10.

Gusi, N., Reyes, M. C., Gonzalez-Guerrero, J. L., Herrera, E., & Garcia, J. M. (2008). Cost-utility of a walking programme for moderately depressed, obese, or overweight elderly women in primary care: A randomised controlled trial. *BMC Public Health, 8*, Article 231. doi:10.1186/1471-2458-8-231

Hagger, M. S., & Luszczynska, A. (2014). Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way forward. *Applied Psychology: Health and Well-Being, 6*(1), 1-47. doi:10.1111/aphw.12017

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L. (2002). Application of the Theory of Planned Behaviour in behaviour change interventions: A systematic review. *Psychology & Health, 17*, 123-158. doi:10.1080/08870440290013644a

Hilgenkamp, T., Van Wijck, R., & Evenhuis, H. (2012). Measuring physical activity with pedometers in older adults with intellectual disability: Reactivity and number of days. *Intellectual & Developmental Disabilities, 50*, 343-351. doi:10.1352/1934-9556-50.4.343

Hong, T. B., Franks, M. M., Gonzalez, R., Keteyian, S. J., Franklin, B. A., & Artinian, N. T. (2005). A dyadic investigation of exercise support between cardiac patients and their spouses. *Health Psychology, 24*, 430-434. doi:10.1037/0278-6133.24.4.430

Irwin, M. L., Tworoger, S. S., Yasui, Y., Rajan, B., McVarish, L., LaCroix, K., . . . McTiernan, A. (2004). Influence of demographic, physiologic, and psychosocial variables on adherence to a yearlong moderate-intensity exercise trial in postmenopausal women. *Preventive Medicine, 39*, 1080-1086. doi:10.1016/j.ypmed.2004.04.017

Kassavou, A., Turner, A., & French, D. P. (2013). Do interventions to promote walking in groups increase physical activity? A meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 10*, Article 18. doi:10.1186/1479-5868-10-18

King, A. C. (2001). Interventions to promote physical activity by older adults. *Journal of Gerontology: Series A, 56A*, 36-46. doi:10.1093/gerona/56.suppl_2.36

King, A. C., Rejeski, W. J., & Buchner, D. M. (1998). Physical activity interventions targeting older adultsa: A critical review and recommendations. *American Journal of Preventive Medicine, 15*, 316-333. doi:10.1016/S0749-3797(98)00085-3

Koring, M., Richert, J., Parschau, L., Ernsting, A., Lippke, S., & Schwarzer, R. (2012). A combined planning and self-efficacy intervention to promote physical activity: A multiple mediation analysis. *Psychology Health and Medicine, 17*, 488-498. doi:10.1080/13548506.2011.608809

Lamb, S. E., Bartlett, H. P., Ashley, A., & Bird, W. (2002). Can lay-led walking programmes increase physical activity in middle aged adults? A randomised controlled trial. *Journal of Epidemiology and Community Health, 56*, 246-252. doi:10.1136/jech.56.4.246

McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: A meta-analysis. *Health Psychology Review, 5*(2), 97-144. https://doi.org/10.1080/17437199.2010.521684doi:10.1080/17437199.2010.521684

McMurdo, M. E., Sugden, J., Argo, I., Boyle, P., Johnston, D. W., Sniehotta, F. F., & Donnan, P. T. (2010). Do pedometers increase physical activity in sedentary older women? A randomized controlled trial. *Journal of the American Geriatrics Society, 58*, 2099-2106. doi:10.1111/j.1532-5415.2010.03127.x

Morais V. P., Carvalho, C., Encantado, J., Santos, I., Almeida, P., & Leal, I. (2017). *Longitudinal research and intervention with older adults in Portuguese health primary care setting: Issues and strategies.* Manuscript submitted for publication.

Newsom, J. T., Kaplan, M. S., Huguet, N., & McFarland, B. H. (2004). Health behaviors in a representative sample of older Canadians: Prevalences, reported change, motivation to change, and perceived barriers. *The Gerontologist, 44*, 193-205. doi:10.1093/geront/44.2.193

Norman, P., & Conner, M. (2005). The theory of planned behavior and exercise: Evidence for the mediating and moderating roles of planning on intention-behavior relationships. *Journal of Sport and Exercise Psychology, 27*, 488-504. doi:10.1123/jsep.27.4.488

Oldridge, N. B. (2008). Economic burden of physical inactivity: Healthcare costs associated with cardiovascular disease. *European Journal of Preventive Cardiology, 15*, 130-139. doi:10.1097/HJR.0b013e3282f19d42

Orrow, G., Kinmonth, A. L., Sanderson, S., & Sutton, S. (2012). Effectiveness of physical activity promotion based in primary care: Systematic review and meta-analysis of randomised controlled trials. *British Medical Journal, 344*(March 26), Article e1389. doi:10.1136/bmj.e1389

Pettee, K. K., Brach, J. S., Kriska, A. M., Boudreau, R., Richardson, C. R., Colbert, L. H., & Newman, A. B. (2006). Influence of marital status on physical activity levels among older adults. *Medicine and Science in Sports and Exercise, 38*, 541-546. doi:10.1249/01.mss.0000191346.95244.f7

Scholz, U., Schüz, B., Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2008). Beyond behavioural intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology, 13*, 479-494. doi:10.1348/135910707X216062

Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology, 57*, 1-29. doi:10.1111/j.1464-0597.2007.00325.x

Sheeran, P., & Webb, T. L. (2016). The intention-behavior gap. *Social and Personality Psychology Compass, 10*(9), 503-518. doi:10.1111/spc3.12265

Sniehotta, F. F. (2009). Towards a theory of intentional behaviour change: Plans, planning, and self-regulation. *British Journal of Health Psychology, 14*, 261-273. doi:10.1348/135910708X389042

Sniehotta, F. F., Schwarzer, R., Scholz, U., & Schüz, B. (2005). Action planning and coping planning for long-term lifestyle change: Theory and assessment. *European Journal of Social Psychology, 35*, 565-576. doi:10.1002/ejsp.258

Stimpson, J. P., Masel, M. C., Rudkin, L., & Peek, M. K. (2006). Shared health behaviors among older Mexican American spouses. *American Journal of Health Behavior, 30*(5), 495-502. doi:10.5993/AJHB.30.5.6

Tudor-Locke, C., Williams, J., Reis, J., & Pluto, D. (2002). Utility of pedometers for assessing physical activity: Convergent validity. *Sports Medicine, 32*, 795-808. doi:10.2165/00007256-200232120-00004

Umberson, D. (1987). Family status and health behaviors: Social control as a dimension of social integration. *Journal of Health and Social Behavior, 28*, 306-319. doi:10.2307/2136848

van Doorslaer, E., Masseria, C., Koolman, X., & OECD Health Equity Research Group. (2006). Inequalities in access to medical care by income in developed countries. *CMAJ: Canadian Medical Association Journal, 174*(2), 177-183. doi:10.1503/cmaj.050584

van Gool, C. H., Penninx, B. W. J. H., Kempen, G. I. J. M., Miller, G. D., van Eijk, J. T. M., Pahor, M., & Messier, S. P. (2006). Determinants of high and low attendance to diet and exercise interventions among overweight and obese older adults: results from the arthritis, diet, and activity promotion trial. *Contemporary Clinical Trials, 27*(3), 227-237. doi:10.1016/j.cct.2005.11.002

van Solinge, H., & Henkens, K. (2005). Couples' adjustment to retirement: A multi-actor panel study. *The Journals of Gerontology: Psichological Sciences and Social Sciences, 60B*(1), 11-20. doi:10.1093/geronb/60.1.S11

van Stralen, M. M., De Vries, H., Mudde, A. N., Bolman, C., & Lechner, L. (2009). Determinants of initiation and maintenance of physical activity among older adults: A literature review. *Health Psychology Review, 3*(2), 147-207. doi:10.1080/17437190903229462

Wallace, J. P., Raglin, J. S., & Jastremski, C. A. (1995). Twelve month adherence of adults who joined a fitness program with a spouse vs without a spouse. *The Journal of Sports Medicine and Physical Fitness, 35*(3), 206-213.

Wiedemann, A. U., Lippke, S., Reuter, T., Ziegelmann, J. P., & Schüz, B. (2011). The more the better? The number of plans predicts health behavior change. *Applied Psychology: Health and Well-Being, 3*, 87-106. doi:10.1111/j.1758-0854.2010.01042.x

World Health Organization (WHO). (2011). *Global Recommendations on physical activity for health: 65 years and above.* Retrieved from http://www.who.int/dietphysicalactivity/physical-activity-recommendations-65years.pdf