Pedometry and 'peer support' in older Chinese adults: a 12-month cluster randomised controlled trial

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KEY MESSAGES

1. Use of pedometers and motivation from friends significantly increased physical activity and fitness levels in older subjects.
2. These interventions significantly improved psychosocial parameters, but had minimal effects on vascular risk factors.
3. Further work is needed to find alternative or additional means to modify the behaviour of approximately 50% of subjects who did not increase their physical activity levels.

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Abstract

There is a need to increase physical activity to attenuate age-related morbidity. This 12-month factorial design cluster trial randomised 399 volunteers from 24 centres to buddy peer support, pedometry, or control group. Data were anayssed using last-observation carried-forward and intention-to-treat methods. Compared to the controls, participants in the pedometry group increased their levels of physical activity energy expenditure significantly, as did those in the buddy group. As recorded by the International Physical Activity Questionnaire [IPAQ], the respective increases amounted to 1820 (95% confidence interval [CI], 1360-2290) and 1260 (95% CI, 780-17 460) metabolic equivalent of task (MET).min.wk^{-1}. The buddy group also had significantly improved aerobic fitness after adjustment for body weight (12%; 95% CI, 4-21%), but this did not attain significance in the pedometry group (7%; 95% CI, -1 to 15%). Our results suggest that recourse to pedometers and the buddy peer support system is simple means of increasing physical activity in older subjects.

Introduction

Population ageing is associated with a high burden of physical and mental problems, which have major social and economic consequences. Epidemiological and clinical intervention studies have shown the benefits of exercise on health.[1-4] However, high levels of inactivity were noted in Hong Kong (over 30-40% in the older population).[3,5-7] In a population-based study in 1995, 25% of elderly (aged 65-74 years) Hong Kong subjects had type-2 diabetes, 53% had hypertension, and 64% had dyslipidaemia.[5,6] Physical activity programmes that improve weight loss and related metabolic parameters have shown benefits in terms of clinically relevant surrogate markers of health.[1,8-11]

Population-based exercise intervention studies should be simple, cheap, and of low maintenance.[1] Formation of small peer support groups and provision of pedometers as motivational tools are two examples. This report provides a summary of a study assessing the usefulness of these interventions in improving physical activity and fitness in an older Chinese population.

Methods

This 12-month cluster randomised controlled study aimed to evaluate the effects of providing a pedometer, and participation in a 'buddy-style' peer support programme on physical fitness and activity and cardiovascular risk factors (anthropometry and blood pressure). The main outcome measures were changes in physical activity measured by the IPAQ[12] and fitness levels. It conformed with the Declaration of Helsinki and was approved by the University of Hong Kong's Ethics Committee. All participants were given opportunities to ask questions regarding the study and gave written informed consent. The study was registered with the University of Hong Kong Clinical Trials Register.

The IPAQ had been validated in the local

population.[12,13] Anthropometric, socioeconomic, lifestyle details, personal and family medical histories were recorded. A submaximal Astrand cycle exercise test was used to assess aerobic fitness in a subgroup of 226 (56.6%) capable subjects. A number of standard tests were performed to assess physical ability. A get-up-and-go test (time taken for the subject to get up from a chair walk 2.5 m, round a marker and return) and a 30-second chair stand test (number of times a person can stand and sit in 30 seconds) were used to measure lower body strength, whereas a 30-second arm curl test (number of arm curls in 30 seconds) was used to measure arm strength.[14] Two maximal effort isometric lower body strength (hip flexion, knee extension) tests were also performed.

There were 412 eligible volunteers identified from 24 community centres for older persons, which provide social and recreational day services for its members. The participants recruited from these centres were: (1) aged ≥60 years, (2) planning to stay in their current residence over the next year, (3) having no recent cardiovascular disease history, and (4) physically capable of participating.

At the baseline visit, all participants in the intervention arms received group-based face-to-face counselling and advice on how to increase energy expenditure via integration of physical activities into their daily routines, and basic strategies for starting (ie start slowly and to work the exercise into the daily routine). They received a contact telephone number for our staff in case they experienced any problems or required additional information regarding the implementation of their intervention. Subjects at those centres randomised to the buddy peer support system were given instructions on how to enlist support and walking partners, such as joining a walking group or with other participants from the same centre. Each participant was asked to reach the daily recommendations from the American College of Sports Medicine/Centers for Disease Control for moderate physical activity; at the start of the study the recommendations were 30 minutes, 3 to 5 times a week with a partner.[1] The participants receiving the pedometers were asked to increase the daily number of steps they took by at least 3500, which has been reported to correlate with the energy expenditure taken during 30 minutes of moderate physical activity.[15]

The subjects in the intervention groups received monthly telephone calls for the first 6 months of the 12-month intervention informing them of the details of the monthly meetings, where feedback from their physical activity diaries was provided and walking goals set for the subsequent month. Motivational meetings were also provided at which staff reinforced the earlier counselling and assisted participants in overcoming hurdles that might have arisen while implementing their targeted activity. The subjects in the control groups received no intervention and were not approached until the completion of the study.

For the main outcome of IPAQ, intraclass correlations (ICC) of between 0.05 and 0.10 were considered, with a median centre size of 17. A study of 400 evaluable participants would have more than 80% power to detect differences with effect sizes of 0.4 (if ICC=0.05) and 0.5 (if ICC=0.1) at the 5% significance level, and takes into account an expected drop out rate of 15%. These effect sizes corresponded to differences in IPAQ scores of 600 and 750 MET.min.wk^{-1} presuming an underlying standard deviation of 1500.

Results

Of the 412 volunteers identified, 399 (96.8%) agreed to participate. The consenting subjects were randomised to the buddy peer support group (12 centres with 10-23 participants per centre, n=193, 65.3% female; 92.2% completed the study) versus the control group (12 centres with 15-18 participants per centre, n=206, 67.0% female; 86.4% completed the study), as well as to the pedometry group (11 centres with 12-19 participants per centre, n=204, 63.2% female; 92.2% completed the study) versus the control group (13 centres with 10-23 participants per centre; n=195, 69.2% female; 86.4% completed the study). There were 43 subjects who did not complete the study owing to injury or sickness, travelling or moving away, loss of contact, or mostly refusal to continue (for no reason).

Data were analysed using the last-observation carried-forward and intention-to-treat methods. Compared to the controls, participants in the pedometry group significantly increased their levels of physical activity energy expenditure (as recorded by the IPAQ) by 1820 (95% CI, 1360-2290) MET.min.wk^{-1} (Table). Despite improvement in activity levels, aerobic fitness (as measured by predicted oxygen uptake) improved by 7% only (95% CI, -1 to 15%), after adjusting for body weight (P=0.10). No other improvements in cardiovascular risk factors or physical function were observed, with only a borderline significant reduction in the number of chair stands (P=0.05).

TABLE. Changes in physical activity (MET.min.wk^{-1}) for the pedometry and buddy interventions relative to controls (both P<0.001)

Intervention	Mean (95% CI) change in physical activity relative to controls (MET.min.wk^{-1})
Pedometry	1820 (1360-2290)
Buddy	1260 (780-17 460)

Compared to the controls, participants in the buddy group significantly increased their levels of physical activity energy expenditure by 1260 (95% CI, 780-17 460) MET.min.wk^{-1} (Table). The improvements in physical activity paralleled with positive changes in aerobic fitness after adjusting for body weight (12%; 95% CI, 4-21%). However, these significant changes only resulted in a small reduction in percentage body fat (-0.6%; 95% CI, -1.1 to -0.0%), with a significant reduction in the duration required to complete the 2.5-m get-up-and-go (-0.3 s; 95% CI, -0.05 to -0.0 s). The combination of motivational tools was no better than the individual interventions.

Discussion

In the older Hong Kong Chinese population, both the pedometry and buddy peer support interventions significantly increased the mean amount of physical activity. The latter intervention also improved aerobic fitness levels. Despite this, there were only limited improvements in the cardiovascular risk factors, with only the buddy group showing reduced body fat and time required to complete the 2.5-m get-up-and-go test. This is likely due to only a small proportion (7-8%) reaching the activity target, with about half showing a positive increase in activity levels. In part this may have been due to relatively high baseline activity levels to start with. Even the low and medium activity groups were achieving a mean of 7405 (95% CI, 6736-8140) steps.d^{-1} and the high activity group a mean of 9806 (95% CI, 8915-10 787) steps.d^{-1}. For persons aged >60 years, these levels of daily step counts appear high by international standards, where 6500 is considered common,[16] with 53% (the low/moderate fit) of our Hong Kong subjects averaging nearly 1000 more than this, and 48% in the high activity group achieving over 3000 more. However, these results were consistent with other studies,[17,18] and was likely due to the 'very high walkability' in the Hong Kong environment.[19]

Few studies have reported the impact of changes in physical activity as measured by the IPAQ on anthropometric measures and related vascular risk factors.[20] Such changes in exercise level measured by other instruments are associated with attenuation of age-related decline in many physical and psychological functions.[2,11,21,22] Meta-analyses evaluating the effects of physical activity or fitness on vascular disease involving 2.5 million person-years of observation have shown a clear inverse dose-response relationship between physical activity or fitness and vascular disease risk; active or fit subjects reduce their vascular disease risk by 30 to 50%, compared to corresponding sedentary or unfit persons.[2,10] This suggests that the increase in physical activity in both our pedometry and buddy groups as well as improved aerobic fitness in the buddy group may have a significant long-term beneficial impact on both all-cause and vascular disease mortality. However, given the lack of a significant improvement in the cardiovascular disease risk factors, larger studies, perhaps with additional risk factors or endpoints are necessary to confirm this assumption.

Recourse to pedometers and the buddy peer support system is a simple means of increasing physical activity in older subjects and targeting obesity and age-related complications. Further research is needed to find alternative or additional means to modify the behaviour of the approximately 50% of the subjects who did not increase their physical activity levels. The reproducibility and long-term maintenance of the improvements in these surrogate risk factors and their subsequent impact on vascular disease morbidity and mortality should also be assessed.

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