THE EFFECTIVENESS OF SUPPORT GROUP AND PEDOMETER IN INCREASING PHYSICAL ACTIVITY IN SEDENTARY ADULTS IN KOTA BHARU KELANTAN

by

DR NUR EMILLIA ABDULLAH

Dissertation Submitted in Partial Fulfillment Of The Requirements For The Degree of Master Of Medicine (Family Medicine)

UNIVERSITI SAINS MALAYSIA

2015

Acknowledgments

The researcher wants to give thanks to the entire people that have become a big part of this study.

First, I would like to thank ***ALLAH s.w.a*** for giving me the strength to finish this study.

I would like to express my sincere gratitude to my advisor ***Prof Azidah Abdul Kadir*** for the continuous support of my research, for her patience, motivation, and immense knowledge. Her guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my Masters in Family Medicine study.

A greater gratitude to ***Dr Lili Husniati Yaacob*** for guiding me through the completion of the thesis writing and my degree. Her patience and abundant care in perfection of the thesis was admirable.

Besides my advisor, I would like to thank the rest of my lecturers: ***Prof Juwita, Dr Norwati Daud and Dr Norsuhaila Idris*** for their insightful comments and encouragement,

My sincere thanks also go to my research assistant, who was very helpful and dedicated.

I thank my fellow classmates for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have.

Last but not the least, I would like to thank my family: my husband, my parents and my children for supporting me spiritually throughout writing this thesis and my life in general.

Table of Contents

List of tables

List of figures

List of Appendices

Abbreviations

WHO	-World Health Organization
NCD	-Non Communicable disease
MET	-Metabolic Equivalent Task
MVPA	-Moderate to Vigorous Physical Activity
TG	-Triglyceride
HDL	-High density lipoprotein
TC	-Total Cholesterol
LDL	-Low Density lipoprotein
FBG	-Fasting Blood Glucose
WC	-Waist Circumference
TDEE	-Total daily energy expenditure
SBP	-Systolic blood pressure
DBP	-Diastolic blood pressure
ANCOVA	-Analysis of Co-Variance
BMI	-Body Mass Index
CAD	-Coronary Artery Disease
7DPAR	-7 Day Physical Activity Recall
PACE	-Patient centered Assessment and Counselling for Exercise

Abstrak

KAJIAN MENGENAI KEBERKESANAN KUMPULAN SOKONGAN DAN PEDOMETER DALAM MENAMBAHKAN AKTIVITI FIZIKAL DI KALANGAN ORANG DEWASA SEDENTARI DI KOTA BHARU, KELANTAN.

Pengenalan: Gaya hidup sedentari adalah satu risiko kepada penyakit diabetis, tekanan darah tinggi, penyakit jantung dan obesiti. Kajian ini mengkaji keberkesanan kumpulan sokongan dan penggunaan pedometer di kalangan orang dewasa sedentari di Kota Bharu, Kelantan.

Objektif: Menentukan keberkesanan kumpulan sokongan dan pedometer di dalam menaikkan aktiviti fizikal orang dewasa yang sedentari. Menentukan keberkesanan intervensi kumpulan sokongan dalam menambahkan kiraan langkah, penggunaan tenaga dan kesan kepada kesihatan kardiovaskular seperti tekanan darah, berat, indeks jisim badan, lilitan pinggang dan ujian darah.

Metodologi: Ini perupakan kajian rawak perbandingan ke atas 80 peserta yang dibahagikan secara rawak kepada kumpulan sokongan dan kumpulan kawalan. Pada permulaan kajian dan selepas tiga bulan intervensi, kiraan langkah, penggunaan tenaga total dan parameter kesihatan kardiovaskular akan diukur.

Keputusan: Kiraan langkah pada bulan kedua dan ketiga kajian didapati bertambah baik dengan signifikan bagi kumpulan sokongan. Parameter seperti berat dan indeks jisim badan menunjukan perubahan signifikan selepas intervensi kumpulan sokongan.

Kesimpulan: Kajian ini menunjukan kesan memberansangkan bagi intervensi kumpulan sokongan dan penggunaan pedometer di kalangan orang dewasa yang sedentari.

Abstract

THE EFFECTIVENESS OF SUPPORT GROUP AND PEDOMETER IN INCREASING PHYSICAL ACTIVITY IN SEDENTARY ADULTS IN KOTA BHARU KELANTAN.

Introduction: Sedentary lifestyle is a risk for diabetes, hypertension, cardiovascular disease and obesity. This trial assessed the effect of support group and pedometer among sedentary adults in Kota Bharu, Kelantan.

Objectives: To determine the effectiveness of support group and pedometer in increasing physical activity of sedentary adults. To determine the effectiveness of support group intervention in increasing step counts, energy expenditure and on cardiovascular health outcome such as blood pressure, weight, body mass index, waist circumference and blood profiles.

Methods: This was a randomized controlled trial of 80 patient randomly allocated to either support group or control group. At baseline and after 3 months after the intervention, steps counts, total daily energy expenditure and cardiovascular health outcome parameters were assessed.

Results: The steps counts at month 2 and month 3 of intervention were significantly improved for support group intervention. The parameter of weight and BMI showed significant changes after 3 months intervention for the support group.

Conclusion: This study showed promising result for support group intervention together with pedometer in increasing physical activity among sedentary adults.

INTRODUCTION

Physical inactivity is the fourth leading risk factor for global mortality and non-communicable disease (1). According to WHO, globally physical inactivity are rising with major implication to general health and for the prevalence of NCDs such as cardiovascular disease, diabetes and cancer and also their risk factors such as raised blood pressure, raised blood sugar and overweight. Increasing physical activity is already known to improve numerous health problems and should be a preventive measure as well as a modifiable risk factor(1). However achieving such a small target of 30 minutes of physical activity per day can be difficult in sedentary urban population.

The definition of sedentary is derived from the latin word, '*sedere*' meaning 'to sit'. The sedentary behaviour involved sitting or reeling resulting in little or no physical activity and minimal energy expenditure. The sedentary behaviour expends only 1-1.5 MET (metabolic equivalent task). This sedentary behaviour occurs frequently throughout the day and across all domains of work, leisure time, domestic and travel. Examples of sedentary activity are television viewing, computer use, driving, reading, socializing, playing electronic games and using public transport (2).

Sedentary rates were high as noted in an urban population of Geneva, Switzerland(3). In this research, M Bernstein has found that 79.5% men and 87.2% women aged 34 to 74 years old live a sedentary lifestyle with the average daily energy expenditures were 2600kcal for men and 2092kcal for women. This energy expenditure rate is reproducible as sedentary definition in research.

The high prevalence of sedentary time and low levels of moderate to vigorous physical activity (MVPA) was also found in population survey done in the United States (4). Here, Schuna et al, establish that adults with self-reported activity of less than 150 minutes/week of MVPA and 'mostly sitting' also accumulated fewest daily steps when monitored. Therefore, the link of sedentary behaviour and low physical activity in urban population does intertwine.

In Malaysia, about 5.5 million of adult age more than 18 years old was not physically active. Urban adults were found to be more inactive (45.6%) compared to rural adults (40.1%). Kelantan has the lowest prevalence in physical inactivity (34.2%) compared to Selangor (52.1%). The prevalence of inactivity among clerical workers is 80.6% and working women is 77.5% (5). As reported in National Health Morbidity Survey 3 (2006), physical inactivity is more prevalent in urban adults (45.6%) compare to rural adults (40.1%).

Walking is a simple, accessible and safe for a sedentary person. It is a moderate type physical activity and ~~the~~ pedometer has become a valid method for assessing walking and perhaps becoming a tool for motivation and promoting adherence to physical activity. Due to limited studies on walking and pedometer, this study aims to assess the effect of support group along with pedometer as a method to increase physical activity in sedentary adult in the Malaysian population.

CHAPTER 1: LITERATURE REVIEW

1.1 Sedentary physiology

Sedentary behaviour has a direct influence on metabolism, bone mineral contents and vascular health (2). The demonstrated effect of sedentary behaviour is metabolic dysfunction by increase in triglyceride (TG) levels, decrease in high density lipoprotein (HDL) cholesterol and decreased insulin sensitivity. In a research by Hamburg et al, physical inactivity was associated with the development of insulin resistance, dyslipidemia, increased blood pressure, and impaired microvascular function in healthy volunteer (6). The sedentary behaviour reduces lipoprotein lipase activity (LPL) thus increasing the level of circulating TG, decreased HDL cholesterol and increasing the risk of cardiovascular disease. In the same way, sedentary behaviour decreases muscle glucose transporter (GLUT) protein content which important in glucose uptake. In numerous studies, it was found that even a minor increase in activity can dramatically increase muscle GLUT thus improve glucose tolerance (6, 7)

Another effect of sedentary behaviour is reduction in bone mineral density (2). It was found that sedentary behaviour leads to rapid increase of bone resorption without simultaneous changes in bone formation thus resulting in reduce bone mineral density and may leads to osteoporosis (8).

1.2 Relationship of sedentary behaviour with major health outcome

There is significant relationship between sedentary behaviour and health outcome including obesity, cardiovascular and metabolic disease, cancer and psychosocial problem(2). In a study by Hu et al, sedentary behaviours especially watching television were associated with significant elevated risk of obesity and type 2 diabetes whereas even light to moderate activity was associated with lower risk(9). Also Healy et al found that high level of sedentary adult time caused increase waist circumference raised triglyceride level and increase fasting blood glucose(10).

There is also frightening association between sedentary behaviour with colorectal cancer and endometrial cancer. In the National Institute of Health-American of Retired Persons Diet and Health Study (NIH-AARP), Gierach et al found that there is increased risk of endometrial cancer with increase sedentary behaviour even more in overweight and obese women(11). Similarly Howard et al has found that sedentary behaviour is positively associated with colon cancer more so in men than women(12).

In children many research showed that early television exposure cause detrimental effect on attention, language and cognitive development(2). Sedentary behaviour especially in increase screen time in children found that there is strong link to obesity, tobacco use and violence. In adults, sedentary behaviour increases the risk of developing a mental disorder (13).

1.3 Physical activity recommendation

Physical activity comprises of several components such as intensity, frequency, duration and type and can be performed in different domains as in occupational, transport or leisure time(5). MET is metabolic equivalents task, commonly used to express the intensity of physical activity. It is as ratio of a person's working metabolic rate relative to resting metabolic rate. So by doing a moderate physical activity, a person expends about 3-6 METs.

World health Organization recommends that inactive people should start with small amount of physical activity and gradually increase the duration, frequency and intensity over time. The recommended level of physical activity is 150 minutes/ week of moderate activity or 30 minutes at least 5 times per week (1). Examples of moderate type activities are brisk walking, dancing, gardening, housework and domestic chores and active involvement in games.

General advice for cardiovascular health in patient with prehypertension as well as hypertensive adult also includes exercise such as brisk walking for 30 to 60 minutes at least 5 times a week(14). Similarly diet and physical activity form an integral part of the management of diabetes(15). Patient is encouraged to practise self-care by increasing

physical activity because it can improve glycaemic control and assist with weight maintenance and reduce the risk of cardiovascular disease. Here, the clinical practise guideline of management of Type 2 Diabetes Mellitus also recommends brisk walking for all (15).

Studies have shown that physical activity has become an important intervention and effective in prevention of cardiovascular disease (16). Here The American Heart Association recommends that women should be advice to accumulate 150 minutes/week of moderate exercise or 75 minute/week of vigorous activity. Brisk walking is recommended as an activity especially in weight reduction and maintenance.

Physical activity is also found to have independent protective effect in preventing stroke(17). The meta-analysis by Reimers et al found that regular exercise can lower the risk of a fatal or non-fatal stroke by about 20% to 30%. Looking at these benefit and recommendation of physical activity, it seems achievable to induce people to change their sedentary time to higher volume of light to moderate intensity physical activity.

1.4 Methods of measuring physical activity

There are many methods to measure physical activity levels but there is no gold standard (18). Welk (2002) wrote about many physical activity intervention and health promotion messages have promoted walking as a healthy form of physical activity. Table 1 below

showed the strength and weaknesses of methods for measuring physical activity in studies(19).

Table 1: Strength and weaknesses of methods for measuring physical activity (Dughill and Stratton, 2007)

Physical activity measure	Instruments	Strength	Limitations
Self-report questionnaire	IPAQ, GPAQ,7DPAR, Active People Survey, PAQ-C/A Log diary	Captures qualitative and quantitative information, inexpensive, low participant burden, possible to estimate energy expenditure	Reliability and validity problems. Misinterpretation, language problems, potential recall bias, problem for use in children less than 10 years old.
Accelerometer	MTI actigraph RT3 triaxial	Objective indicator of body movement (acceleration). Provides a measure of frequency, intensity, duration. Noninvasive. Large storage capacity. Easy data manipulation and analysis.	Expensive. Less useful for detecting upper body movement, incline walking. Problems with placement of monitor during extended monitoring periods.

Table 1: continued			
Heart rate monitoring	Polar team	Indirect physiologic measure of activity. Provides a measure of frequency, intensity and duration. For analyzing exercise class and walking activity.	Expensive. Monitor discomfort. Heart rate affected by arousal, gender, fitness and temperature.
Pedometers	Yamax digiwalker	Inexpensive, non-invasive. Can be administered in large group. Useful in variety of settings, for goal setting and promoting behavior change. Good measure walking type program.	Can be tampered with. Lose accuracy during running or intermittent activity such as exercise class.
Systemic direct observation	SOPLAY SOPARK SOFIT	Can provide qualitative and quantitative information concurrently.	Time to train observers. Time intensive data collection. Observer presence may alter behavior.

1.5 Pedometer

Pedometer is a low cost motion sensor which is typically worn on a belt and waist band and responds to vertical acceleration of the hip during gait cycle(18). It is a valid tracking device for steps counting and has benefit as a feedback tool to the user in research(20). Bravata et al has suggested that the use of the small, relatively inexpensive pedometer is associated with significant increases in physical activity and improvements in health outcomes, at least in the short term (21).

In a research by Tudor-Locke et al, a participant needs to wear the pedometer for at least 3 days for representative data(22). In another study, she found that healthy adult age 20-50 years old are expected to walk 10,000 step/day to be classified as active(23). Here the research used these indices shown in Table 2 below for pedometer determined physical activity level in healthy adults.

Table 2: Pedometer step counts and lifestyle index.

< 5000 steps/day	Sedentary lifestyle index
5000-7499 steps/day	Low active
7500-9999	Somewhat active
>10000 steps/day	Active
>12500 steps/day	Highly active

Subsequently in a meta-analysis by Bohannon, it is estimated that adults actually walk less than the recommended of 10,000 steps per day(24). A study in Japanese adults showed that only 29% of men and 27% of women walked more than 10,000 steps per day(25). Socio-demographic variables associated with steps/ day is different by gender in the Japanese urban population. It is found that high education level was related to lower steps per day, as well as owning motor vehicle. In contrast, Japanese women increase their physical activity by walking their dog.

Looking in Malaysian data, there were 2 published studies on pedometer and walking done in Malaysia. A study done by M. Zaid et al from the National Sport Institute found that about 18% of their staff was considered sedentary and 59% exceeded the cut of point of 7500 steps per day. Here the staffs reported most popular physical activities are jogging, badminton and gym activity. Based on the finding, they supported the use of objective measurement of using pedometer in comparison to self- report in accurately assessing physical activity level in a population (26). Similarly in another study in University Putra Malaysia, pedometer is able to rank the level of activity in their staff (27). Here it was found the average number of steps taken was 7,177 ± 2,518 a day. The major factor responsible for their low level of physical activity was found to be their lack of self-motivation.

1.6 Benefit of walking and pedometer

Pedometer is associated with significant increase in physical activity (21). In the systemic review by Bravata et al, there are 26 studies with 2767 participants including 8 randomized controlled trials showed that pedometer users significantly increase their physical activity. Also , having a step goal of 10,000 steps per day is an important predictor for the increased physical activity. This is also seen in a research by Pal S et al, where low active, overweight women significantly did more physical activity
when they had a daily 10,000 step goal using a pedometer, than when they were asked to achieve 30 minutes of walking per day(28).

Walking program in as low as 3 days per week and within 3 months does show some benefit in improving cardiovascular risk profile (29). Studies also show pedometer usage is associated with decreased in body mass index, blood pressure and reduction of waist circumference. A study done in Australian involving 500 participants in workplace revealed that walking and using the pedometer resulted in improvements in meeting physical activity guidelines, reduction waist circumference, blood pressure as well as sitting time(29). Walking is associated with reduction in the incidence of cardiovascular events in postmenopausal women (34). Even exercising by only walking at a level below that currently recommended in healthy sedentary adult does have some benefit(30).

Walking is a feasible type of exercise to be done even for the most sedentary. Brisk walking is an example of moderate intensity aerobic exercise. There are some medical

conditions postulated to be reduced by regular moderate intensity aerobic physical activity such as coronary heart disease, strokes, overweight, obesity and related metabolic syndrome (31).

People fail to exercise because of misperception that only vigorous and continuous exercise provides health benefits. There is increasing evidence that the health benefits of physical activity are linked to the total amount of energy expended. Thus walking is a moderate activity amounting to 10% of total daily energy expenditure therefore is easy to accommodate in a sedentary adults(32).

1.7 Physical activity promotion and counselling

Primary care practitioner plays a central role in coordinating management of patients and often provides patient education as well as counselling. There are many interventions for promotion of physical activity in primary care has been studied. Counselling patients has been found to be effective in improving physical activity in patients. Using the green prescription program which includes motivational interviewing technique to give advice on physical activity in general practice is effective in increasing participants' physical activity and improving quality of life over 12 months (33).

A review article by Ribeiro et al revealed the tools for primary care doctors and recommends the need to increase the use of physical activity counselling for the general

population, in order to promote better health and a stronger support (34). Marshall et al even demonstrate the efficiency of brief physical activity assessment used by primary care doctors to identify insufficiently active patients who may need physical activity advice (35). It was also found that promotions of physical activity to sedentary adults recruited in primary care significantly increase physical activity levels in 12 months(36). In a meta-analysis, physical activity counselling is part of intervention noted to be effective to increase physical activity among the participants(21).

Health promotions and intervention to change a sedentary person to active person and thus reaping all these benefit is found to be cost effective. In a systemic review by Garett et al, most interventions to increase physical activity were cost-effective (36).

The most commonly used models and theories for interventions aimed at physical activity practice are the social cognitive theory and the transtheoretical (or stages of(37) behavior) model (34).

1.8 Support Group

Support group in exercise gathers people in similar experiences and concerns thus provide emotional help, advice and encouragement to each other. There are many study use support group to encourage physical activity. A systemic review on physical activity interventions in primary care and the community by S.Garrett et al discover that walking, exercise groups

or just brief advice appeared to be more cost effective than supervised gym based exercise(36).

In a meta-analysis by Kassavou et al, nineteen studies showed that intervention to promote walking in groups are efficacious at increasing physical activity (38). Some short duration studies showed lower effect size on outcome compare to studies more than 6 months. The analysis showed that many support group intervention were done in community. In intervention targeting both genders, the effect was more significant than only targeting women subjects. There were groups led by lay people and some groups by professional. However there was no difference in effects size estimates. Assessments were done in most studies via questionnaires, diary and also pedometers. Included in the meta-analysis were the type of support group activity comprises of training sessions, group discussion and added education meetings.

In a study by Wallace, the group level intervention used in the 'Walk the Talk' programme among hypertensive and sedentary African American women was able to significantly reduced blood pressure, reduced weight and increasing walking activity (39). Thus potential become a strategy to promote cardiovascular health in women.

1.9 Justification and rationale

Sedentary lifestyle with limited physical activity leads to general health implication and is a risk to many diseases. From the literature reviews it is justified to change the behaviour of sedentary adult by using pedometer and support group compared to performing office counselling alone.

Furthermore there are a lot of evidences on benefit of pedometer usage in increasing physical activity. However it is found that there is still limited data regarding the use of pedometer plus group support to increase physical activity and improving health outcome in Malaysia and specifically in the east coast of Malaysia.