UNIVERSITI PUTRA MALAYSIA

EFFECTS OF A MULTICOMPONENT EXERCISE TRAINING PROGRAM ON FUNCTIONAL CAPACITY AND QUALITY OF LIFE OF OLDER PERSONS IN RUMAH SERI KENANGAN NEGERI SEMBILAN

MARIA JUSTINE @ STEPHANY
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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

February 2010

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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FEBRUARY 2010

Chair: **Associate Professor Dr. Tengku Aizan Hamid, PhD**

Faculty: **Institute of Gerontology**

The purpose of this study was to measure the effects of a 12-week multicomponent exercise program on functional capacity (physical functioning and psychological functioning) and quality of life of older persons residing in a public funded shelter home in Seremban, Negeri Sembilan. Forty-three subjects with mean age 70.88 ± 7.82 years (exercise = 23, control = 20) participated in this quasi-experimental (pretest-posttest design study). The exercise sessions were carried out group-based three times a week, comprised of aerobic training, strength training, flexibility and balance training. Physical functioning outcome measures were cardiorespiratory endurance (6MWT), right and left armcurl strength (30-sec armcurl), right and left handgrip strength (handgrip dynamometer), lower limb strength (30-sec chairrise), right and left upper limb flexibility (backscratch), right and left lower limb flexibility (chair-sit and reach), balance performance (postural

control(FRT), dynamic mobility and agility (TUG)). Psychological functioning was measured based on level of depression (12-item GDS). Quality of life was measured based on life satisfaction (Cantril's ladder), and physical and mental component summaries of the SF-12 health survey. No significant differences were noted in all variables during the baseline measurements. At the end of the intervention, results for the exercise group revealed significant increases in cardiorespiratory endurance (41.79%), right armcurl strength (25%), left armcurl strength (30.79%), right handgrip strength (13.65%), left handgrip strength (9.93%), lower limb strength (46.19%), postural control (49.58%), dynamic balance and agility (26.37%), and physical health component summary (8.4%) (all, $p < .05$). The exercise group also presented with improvement in flexibility of right lower limb (63.57%), left lower limb (44.17%), right upper limb (36.67%), left upper limb (63.1%), as well as life satisfaction score (10.74%), and mental health component summary (2.95%), but all did not reach significant level ($p > .05$). The control group did not improve significantly in all the measured variables. In terms of psychological functioning, both the exercise and control groups showed increase in depression scores by 1.64% and 17.7% respectively ($p > .05$). This study suggests that multicomponent exercise program may improve physical functioning and quality of life of institutionalized older persons.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KESAN PROGRAM SENAMAN PELBAGAI KOMPONEN TERHADAP KAPASITI KEFUNGSIAN DAN KUALITI HIDUP WARGA TUA DI RUMAH SERI KENANGAN NEGERI SEMBILAN

Oleh

MARIA JUSTINE @ STEPHANY

FEBRUARI 2010

Pengerusi: **Prof Madya Dr. Tengku Aizan Hamid, PhD**

Fakulti: **Institut Gerontologi**

Tujuan kajian ini adalah untuk menilai kesan senaman pelbagai komponen yang dijalankan selama 12 minggu terhadap kapasiti kefungsian (fungsi fizikal dan psikologi) dan kualiti hidup (kepuasan hidup dan kualiti hidup berdasarkan kesihatan) dalam kalangan warga tua yang menetap di institusi kerajaan, di Seremban, Negeri Sembilan. Seramai 43 subjek (senaman = 23, kawalan = 20) dengan purata umur 70.88 ± 7.82 tahun telah menamatkan kajian kuasi-eksperimental (ujian sebelum dan selepas) ini. Senaman ini dijalankan berkumpulan, 3 kali seminggu dan melibatkan kombinasi latihan aerobik, rintangan, kelenturan dan keseimbangan. Penilaian kesan fungsi fizikal melibatkan ujian ketahanan kardiorespiratori (*6MWT*), kekuatan lengan kanan dan kiri (*30-sec armcurl*), kekuatan genggaman tangan kanan dan kiri (*handgrip dynamometer*), kekuatan anggota bawah (*30-sec chairrise*), kelenturan anggota bawah dan atas

(*back scratch, chair-sit and reach*), kawalan postur (*FRT*), serta keseimbangan dinamik dan ketangkasan (*TUG*). Penilaian fungsi psikologi menggunakan skala tahap kemurungan (*12-item GDS*). Penilaian kualiti hidup adalah berdasarkan skala kepuasan hidup (*Cantril's ladder*) dan ringkasan komponen kesihatan fizikal dan mental menggunakan skala *SF-12*. Penilaian awal bagi semua ujian tidak menunjukkan perbezaan yang signifikan bagi kumpulan senaman dan kawalan. Pada akhir intervensi kumpulan senaman menunjukkan peningkatan signifikan pada ketahanan kardiorespiratori (41.79%), kekuatan lengan kanan (25%) dan lengan kiri (30.79%), kekuatan genggaman kanan (13.65%) dan genggaman kiri (9.93%), kekuatan anggota bawah (46.19%), kawalan postur (49.58%), keseimbangan dinamik dan ketangkasan (26.37%), serta ringkasan komponen kesihatan fizikal (8.4%) (semua, $p < .05$). Kumpulan senaman juga menunjukkan peningkatan kelenturan anggota bawah kanan (63.57%) dan kiri (44.17%), anggota atas kanan (36.67%) dan kiri (63.1%), serta skor kepuasan hidup (10.74%) dan ringkasan komponen kesihatan mental (2.95%), tetapi kesemuanya tidak mencapai tahap signifikan ($p > .05$). Kumpulan kawalan tidak menunjukkan perubahan signifikan pada semua variabel yang diuji. Bagi fungsi psikologi, kumpulan senaman dan kawalan menunjukkan peningkatan tahap kemurungan dengan masing-masing 1.64% dan 17.7% ($p > .05$). Hasil kajian ini mencadangkan bahawa senaman pelbagai komponen boleh meningkatkan fungsi fizikal dan kualiti hidup warga tua yang tinggal di institusi.

ACKNOWLEDGEMENTS

I, gratefully acknowledge the contributions of many individuals and groups in the conduct of this study. Without the help of these people, the process of creating, carrying out, and completing this project would not have been possible.

I would first like to thank all the residents of Rumah Seri Kenangan, Seremban, Negeri Sembilan who willingly volunteered to participate in this study. Without their cooperation this project would not have been possible.

Secondly, I express gratitude to my supervisors, Assoc. Prof Dr Tengku Aizan Hamid, Dr Tengku Fadilah Tengku Kamalden, and Dr Zaiton Ahmad who supported me through this long process whether it was assistance in the suitability of the exercise program or feedback on the dissertation.

I am also thankful to my ex-students, especially Che NorHaslindar, Hazila, Asiah, Norashikin, and Sofinah who helped in the implementation of this exercise program. I would also wish to thank Munayati, Saiful Adli, Norazebah, and Salwana who conducted the evaluations. This work could not have been successful without their invaluable help, cooperation and support.

Many thanks are also extended to the support staffs of Rumah Seri Kenangan. They were at all times, helpful and cooperative. Their assistance in the recruitment of study subjects is much appreciated.

My sincere thanks are extended to the Dean of the Faculty of Health Sciences, Unviersiti Teknologi MARA, Prof Dr Abdul Rahim, Head of Physiotherapy program, Puan Kamaria Kamaruddin, other colleagues, Aslinda, Dr Rozana, and Madam Thum Hoe Hoe for their understanding and confidence in my abilities to complete this research.

Finally, not forgetting my dear family, Haslanoor and Muhd Adlan, and close friends, for their love, understanding and support that kept me going during my studies. Thank you for being there for me, I know I owe my time with you all.

APPROVAL

I certify that a Thesis Examination Committee has met on 25 February, 2010 to conduct the final examination of **Maria Justine @ Stephany** on her thesis entitled **"Effects of a Multicomponent Exercise Training Program on Functional Capacity and Quality of Life of Older Persons in Rumah Seri Kenangan Negeri Sembilan** in accordance with Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Degree of Doctor of Philosophy.

Members of the Thesis Examination Committee were as follows:

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DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.

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MARIA JUSTINE @ STEPHANY

Date:

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LIST OF ABBREVIATIONS

ACSM	American College of Sports Medicine
BRMS	Bech-Rafaelsen Melancholy Scale
BS	Back scratch test
CES-D	Center for Epidemiologic Studies Depression Scale
CR	30-sec chairrise
CSAS	Cantril's self-anchored scale
CSR	Chair Sit-and-reach test
FRT	Functional reach test
GDS	Geriatric Depression Scale
HRE	Hydraulic-resistance exercise
HRSD	Hamilton Rating Scale for Depression
ICF	International Classification of Functioning, Disability and Health
MCS	Mental health component summary
PACE	Program circuit exercise
PCS	Physical health component summary
QOL	Quality of life
RCT	Randomized controlled trial
SDM	Statistics Department of Malaysia
TUG	Time up and go test
USDHHS	US Department of Health and Human Services
WHO	World Health Organization
6MWT	Six-minute walk test

CHAPTER I

INTRODUCTION

1.1 Introduction

The older population in Malaysia is growing rapidly. In 2007, they were 1,195,480 people aged 65 years and above which represented 4.41% of the total population (Statistics Department of Malaysia [SDM], 2008). It was projected that by the year 2019, older persons population aged 65 and above would reach 7% and would double to 14% in 2043 (Tengku Aizan, Zaiton, Shariffah Norazizan, & Mohmad, 2006). In 2006, the life expectancy at birth for female and male were 76.4 years and 71.9 years respectively (SDM, 2008), and this could further increase in the years to come due to improvement in the health care system.

The rapid changes in the number of aged population posed a serious implication as extended years of life often involved increased incidence of chronic diseases and development of functional limitations (Nakasato & Carnes, 2006; Seguin & Nelson, 2003; Singh, Chin, Bosscher, & Mechelen, 2006). In America it was estimated that 80 to 85% of people over age 65 have at least one chronic illness and nearly half of the older people reported that chronic illness limited their activity to some degree (Jamshidi, Oppenheimer, Lee, Lepar, & Espenshade, 1992), while in Malaysia, in the year 2002, chronic diseases were cited as the major causes of death and

disability, accounting for 71% of all deaths and 69% of the total burden of disease (as cited in Ramli & Taher, 2008). However, the gradual physiological aging process would still affect all the major organ systems even if the older person was not suffering from any diseases (Brennan, 2002).

In addition, the recent changes in the social systems such as migration, urbanization, increased participation of females in the labour force and changes in the family structure had heightened the need for institutionalization for some older persons (Arokiasamy, 1997). Institutionalized older persons presented with declining quality of life over time due to deterioration of the physical and psychological functioning (Degenholtz, Rhee, & Rosen, 2004). As such one major issue that challenges the public health policy is in terms of health care provision for the institutionalized older persons due to their dependency on government subsidy. Dependency with reduce quality of life was considered as a concern of older adults and a burden on the funding of health care (Noro & Aro, 2004; Paterson, Govindasamy, Vidmar, Cunningham, & Koval, 2004). Aljunid (1997) had highlighted this issue and suggested that the health care system needed improvement to ensure comprehensive and integrated health services were provided to address the physical, social and mental health of the older persons.

Recently, there was an increasing interest among researchers in implementing exercise programs as one of the health care strategies to improve and maintain the functional capacity of older people (Guralnik, Ferrucci, Simonsick, Salive, & Wallace, 1995; Ritchie, Trost, Brown, & Armit, 2005). According to the American College of Sports Medicine ([ACSM], 1998a), the goals of an exercise program for frail older individuals included maintenance of functional capacity for independent living, reduction in the risk of cardiovascular disease, retardation of the progression of chronic diseases, promotion of psychological well-being, and provision of opportunities for social interaction. However, to date, research on the effects of exercise intervention have tended to focus on the community older persons rather than the institutionalized older persons. As such, the aim of this study was to evaluate the effects of an exercise intervention on the functional capacity (physical functioning and psychological functioning) and health-related quality of life of institutionalized older persons.

1.2 Problem Statement

Institutionalized older persons were found to be high-risk people not only due to the aging process, but partly due to the sedentary lifestyle (Au-Yeung et al., 2002; Bastone & Filho, 2004; Evans, 1999). Aging led to a decline in physical and psychological functioning (Kawamoto, Yoshida, & Oka, 2004) that caused high level of dependency (Chin, van Poppel, Twisk, & van Mechelen, 2006a; Noro & Aro, 1996; Singh et al., 2006).

In Malaysia, it was reported that 27.2% of the older persons aged 60 and above living in the government shelter homes (Rumah Seri Kenangan) were dependent in at least one activity of daily living (ADL) (Zaiton, Nor Afiah, & Latiffah, 2006). In terms of psychological well-being among older persons in Malaysia, the prevalence of depression was reported to be at 22.2% for institutionalized older persons (Mohd Aznan & Samsul, 2007), and 7.6% for community living older persons (Sherina, Rampal, & Mustaqim, 2004). Therefore, it is particularly important that the institutionalized older persons are introduced to exercise intervention in view of their high prevalence of functional decline.

Health care professionals need to promote exercise intervention that can benefit the overall functional capacity and enhancement of quality of life of institutionalized older persons (Csapo, Gormasz, & Baron, 2009; Deschamps et al. 2010; Deschamps, Onifade, Decamps & Bourdel-Marchasson, 2009; Evans, 1995). Burbank, Reibe, Padula, and Nigg (2002) argued that even in advanced old age, one could improve strength, decrease the risk of falls, improve cardiorespiratory fitness and improve ability to live independently. As such a comprehensive exercise intervention should be able to address the physical and psychological well-being of institutionalized older persons.

It had been widely recommended that an exercise intervention for the older persons should consist of aerobic activities, strength training, balance and flexibility (ACSM, 1998a; Bird, Smith, & James 1998; Heath & Stuart, 2002; Mazzeo & Tanaka 2001; McDermott & Mernitz, 2006; Nelson et al., 2007; Newman, 1995; Nied & Franklin, 2002; Nitz & Hourigan, 2004; Skinner, 1993). Exercise recommendations should also be incorporated with regular motivation as well as education on the benefits and barriers of exercise (Hughes, Prohaska, Rimmer, & Heller, 2005; McDermott & Mernitz, 2006). However, there is lack of evidence on the effectiveness of such a comprehensive program or the so-called multicomponent exercise program in improving the functional capacity and quality of life among institutionalized older persons.

Previous studies on exercise interventions for institutionalized older persons were mainly emphasizing on one or two fitness components such as strength alone or combination of strength and aerobic training. Aerobic and strength training had been shown to operate through different mechanisms in promoting health in the older persons (Madden, Blumenthal, Allen, & Emery, 1989). Strength training improved muscle mass, muscle strength and muscle quality (Cassilhas et al., 2007; Seguin & Nelson, 2003) while aerobic training mainly affected cardiovascular fitness, blood pressure and plasma lipoprotein profiles (Rydwik, Frandin, & Akner, 2004). Takeshima et al. (2007) had shown that improvement in cardiorespiratory fitness was limited to aerobic

training, whereas improvement in upper and lower body strength were outcomes of resistance and balance training, and that there was no improvement in flexibility from cardiorespiratory, resistance, and balance exercises. The evidence for balance training or flexibility training alone on the improvement of functional capacity of older persons was also inconclusive (Nied & Franklin, 2002). Previous studies had shown that strength training improved balance in older persons (Barret & Smerdely, 2002; Nelson et al., 1994). More recently, it has been identified that balance component is a key element in exercise programs aiming to reduce risk of falls among older persons (Sherrington, Whitney, Lord, Herbert, Cumming, & Close, 2008). However, it should be noted that the majority of the information available on benefits of exercise for older persons across the strength, balance, cardiovascular fitness and flexibility domains has been derived from community living.

Therefore, based on international exercise recommendations, and the differing physical benefits associated with different exercise types, an exercise intervention or recommendation for older persons must be multicomponent that includes aerobic, strength, balance and flexibility training, to maximize potential functional outcomes. In addition, an exercise program for older persons must be functionally-oriented that emphasizes coordination and postural control to gain overall effects on functional capacity. Bastone and Filho (2004) argued that it would be more beneficial to

train using movements that closely mirror daily activities rather than to train to increase strength and the power of individual muscle group per se. Similarly, group-based activity could also boost the older person's adherence to regular exercise and be beneficial to mental health (Helbostad, Sletvold, & Moe-Nilssen, 2004). Mauk (2005) have highlighted that group exercise and health educations have the added benefit of increasing opportunities to socialize. Research on group-based multicomponent exercise training that is functionally oriented as well as emphasizing education on the benefits of exercise program are still lacking, and especially in Malaysia insufficient study is available.

Therefore, this study introduced a multicomponent and well-structured exercise intervention for older persons living in institutions with the purpose of maintaining their overall functioning and quality of life. The exercise program incorporated all the components of fitness required by older persons, which included strength, aerobic, flexibility, and balance training, and based on low frequency, low- to moderate-intensity, and using very few and inexpensive equipment. Each activity or movement was implemented to mimic functional tasks in order to train functions required in a real-life situation that is directed towards actual daily activities, for example strengthening the knee extensors while getting up and progressing to holding an object from sitting to standing.

1.3 Research Objectives

The primary objectives of this study were to measure the effects of participation in a 12-week multicomponent exercise program on:

i. Physical functioning (cardiorespiratory endurance, muscle strength, flexibility, & balance performance).

ii. Psychological functioning (level of depression).

The secondary objectives of this study were to measure whether the intervention influences well-being directly or through changes in disability status (Ferrucci et al., 2004), i.e., whether the intervention has an effect on:

i. Life satisfaction.

ii. Health-related quality of life (physical and mental health)

1.4 Research Hypotheses

Based upon the prior research and the research objectives, the following alternative hypotheses were tested at the 0.05 level of significance:

i. There will be a significant effect of participation in a 12-week multicomponent exercise program on physical functioning (cardiorespiratory endurance, muscle strength, flexibility, and balance performance).