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PhD THESIS

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PROMOTING THE WELL-BEING OF ELDERLY WOMEN THROUGH EXERCISE

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ABSTRACT.

By the next decade, 5.1 percent of the British population will be over the age of eighty years. Women will make up over half of this figure. Finding ways of helping elderly women to maintain good health and therefore well-being, will become even more critical. Exercise is increasingly being recognised as a possible way of promoting health for elderly women, as evidence is emerging of the physical and psychological benefits that accrue from exercise. However, the empirical research evidence on exercise has derived mainly from young and middle-aged males, which means little is known about the specific benefits of exercise for the elderly and there are few tools to measure accurately exercise behaviour in this population. In the few exercise studies which have been conducted with the elderly, methodological flaws have often left the results unclear. Exercise up-take and adherence amongst elderly women is also low and psychological models have so far failed to adequately explain the reasons for this.

To achieve the aim of this thesis to contribute to knowledge on the relationship between physical activity and well-being in elderly women, three studies are conducted. In study one, a postal questionnaire for measuring exercise behaviour, beliefs and attitudes in this population was first developed, (the London Health and Fitness Questionnaire; LHFQ), with 248 elderly women. Second in study two, a randomised controlled trial of 100 post-menopausal women assigned to either a six month brisk walking programme or homeopathic dose of exercise was conducted. Baseline and six month measures of stamina, leg strength, exercise attitudes (using the LHFQ) and subjective health status (using the Nottingham Health Profile; NHP) were taken. Finally, study three is exploratory, and examines the influences on elderly women's participation in domestic and sporting physical activity, in a sample of 820 retirees from a major national retail company. The LHFQ and the NHP were used to obtain data.

In study one, the reliability and validity of the LHFQ proved acceptable. Re-test reliability was best for number of hours spent on carrying out errands and recreational exercise, but lowest for reports on past exercise experience and identifying barriers to exercise. The LHFQ appears to have satisfactory face, content and construct validity.

In study two, repeated measures ANOVAs were used to detect any changes between and within the brisk walking and placebo exercise groups over the six month period. Mean scores on the NHP indicated that the brisk walking programme had a more beneficial impact on health status, with significant improvement in perceived physical mobility. Significant positive changes were also noted for brisk walkers on two exercise attitude statements. Stamina and leg strength significantly improved for both groups over time. A number of threats to the internal validity of the study findings emerged and these are discussed at length.

In study three, multiple regression analyses indicated that although different factors influence domestic and sporting activity, good health status and age (being younger) are core variables influencing both these activities. In addition, positive exercise beliefs and attitudes, and past exercise experience were shown to influence exercise behaviour.

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Dr Rachel Asch, Professor Shah Ebrahim, Dr Andrew Guppy, Dr Ben Lowden and Dr Peter Salmon.

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CHAPTER ONE

INTRODUCTION

INTRODUCTION.

The overall aim of this thesis is to contribute to the knowledge base of what is known about exercise activity, well-being and elderly women. More specifically, this thesis endeavours to contribute towards developing: a questionnaire methodology for assessing the exercise behaviour, beliefs and attitudes of the elderly, in a valid and reliable way (study one); a better understanding of, the relationship between low intensity exercise and well-being in the elderly (study two) and the factors which may influence domestic and sporting activity patterns amongst elderly women (study three).

1.1 DEFINING TERMS: EXERCISE, WELL-BEING AND THE ELDERLY

1.1.1 Exercise.

The generic term 'exercise' includes descriptions of physical activities which vary in terms of intensity, frequency, endurance and expected physiological effects. In addition, physical activities can be solitary or socially interactive and/or taught by an instructor; they may be aggressive competitive pursuits or gentle and relaxing; activities may be utilitarian such as walking to the shops or hanging washing on the line.

Exercise has typically been classified into three main types: cardio-respiratory or aerobic endurance, muscular strength or anaerobic endurance, and flexibility/co-ordination/ relaxation exercise [1]. Some physical activities may incorporate all three types of exercise. The definition of exercise has recently been extended to include customary or domestic activities such as washing-up, shopping and gardening [2].

Aerobic exercise

Aerobic exercise is any physical activity that stimulates the heart, lungs and vascular systems to take up and deliver oxygen to the tissues and cells of the body [3]. The most popular aerobic exercises are those which use large muscle groups and allow continuous and rhythmic activity to be maintained. Running, swimming and walking are examples of this type of exercise.

Intensity, duration and frequency of the physical activity are three key components which determine whether cardiovascular-respiratory training effects will be produced [4]. Intensity refers to how hard the person works when exercising. To achieve aerobic fitness it is estimated that a person needs to increase their heart rate to sixty percent of their maximum heart rate, which is approximately equivalent to fifty percent of their maximum oxygen uptake. Once this level of intensity has been achieved, sustaining the activity then becomes important. Twenty to thirty minutes is recommended as the optimum duration. In terms of frequency, it is recommended that aerobic exercise is performed for three non-consecutive days per week [4]. An activity of lower intensity

performed over a longer period of time, can produce the same aerobic conditioning as a bout of more intense exercise, performed for a shorter period of time [5].

Anaerobic exercise.

Anaerobic exercise involves high intensity work sustained for short periods. It refers specifically to the work level which can be sustained for a period of time without exceeding the cardiovascular system's ability to meet an increased demand for oxygen[3]. Weight lifting or sprint running are typical examples of exercises which are anaerobic.

Anaerobic capacity is reported as being easier to measure in older people than aerobic capacity, because testing involves elderly people demonstrating short bursts of energy rather than completing long endurance tests [6].

Flexibility, relaxation, co-ordination exercise.

Yoga is a type of exercise which improves flexibility, relaxation and co-ordination. Flexibility has been defined as the functional capacity of the joints to move through a full range of movements [3]. It is thought that much of the back pain and discomfort experienced by sedentary adults is caused by weakness or stiffness of posture muscles and tension. Exercise programmes for the elderly which increase muscular strength and flexibility are therefore important. Among the significant short-term benefits for the older person is the potential to gain same-day improvement in joint mobility. Mobilising and lubricating major joints of the body through a variety of stretching and relaxation exercises has been shown to contribute to better motor control and dynamic balance [7].

Customary/domestic physical exercise.

The work of Dallosso and associates [2] has been primarily responsible for extending the definition of exercise to include customary or domestic physical activity. They have defined customary/domestic physical exercise as those activities which are carried out for a minimum of three minutes, at least weekly. Activities include outdoor productive activities such as gardening, house and car maintenance; indoor productive activities such as housework, decorating and indoor maintenance; purposeful walking such as walking to the shop and leisure activities such as cycling, swimming, and recreational walking. Non-continuous activities likely to contribute to muscle strength such as climbing stairs, dragging heavy loads, and joint flexibility activities such as reaching and bending are also included in their definition.

In this thesis the terms exercise and physical activity will be used interchangeably. On occasions, aerobic and anaerobic exercise such as walking, cycling, swimming and bowls will be referred to as sporting activity.

1.1.2 Well-being.

Among all the elements of an elderly person's life situation, health is most strongly related to subjective well-being [8-11]. People who are sick or physically disabled are much less likely to express contentment about their lives [8 12-14]. The term well-being is therefore defined in this thesis as good mental and physical health. This definition of well-being is supported by the World Health Organisation who define health as 'the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' [15]. It is acknowledged that health is not an absolute concept, but something which can fluctuate and is open to change. In this thesis well-being is sometimes specified as physical or psychological well-being, depending on the focus of the research being reviewed. Although this demarcation is considered to be largely arbitrary, since it is argued that poor physical is likely to be associated with poor psychological or mental health, and therefore overall well-being.

It was difficult to choose a research instrument which would capture both the physical and psychological elements of well-being, in a valid and reliable way in elderly samples. After deliberation the Nottingham Health Profile (NHP) [16] was chosen. The NHP is in two parts and measures subjective health status. Part 1 focuses on six areas of well-being: physical mobility, pain, energy, sleep, emotional reactions and social isolation. Part 11 asks questions about the impact of health on performing daily activities such as house-work, interests and hobbies. Reliability and validity of the NHP have proved satisfactory when used in postal and interview surveys of UK samples of elderly and chronically ill people.

1.1.3 The elderly

A satisfactory definition of 'the elderly' is difficult to find, since older people are heterogeneous in physical ability. Functional classification rather than calendar age are thought by some, to be a more appropriate way of classifying the elderly [17]. The ages of women referred to in studies described in this thesis range from fifty-five to ninety-three years. So, for the purposes of this thesis, the elderly are defined as those people aged fifty-five years or over. At times the term 'older women' may be interchanged with the word elderly. Whilst the thesis concentrates mainly on reviewing studies which have focused on elderly women, the relative paucity of exercise studies in this arena, means that at times, studies which have used elderly men and younger samples are sometimes included, for reference.

1.2 WHY FOCUS ON EXERCISE, WELL-BEING AND ELDERLY WOMEN?

There are three very good reasons why elderly women are the special focus and why examining the relationship between exercise and well-being amongst elderly women is currently an important area of research. These reasons are outlined below.

Firstly, there are demographic reasons. The number of elderly people in society is increasing rapidly. Women tend to outlive men by several years and therefore make

up the largest proportion of the aged population. In 1990, thirteen percent of men and eighteen percent of women in Britain were aged sixty-five years and over [18]. The number is set to increase for this age group and for those aged eighty plus (sometimes referred to as fourth agers). By the next decade 3.1 million people, or 5.1 percent of the British population, will be over the age of eighty. This compares with 3.7 percent in 1980 [19]. By the year 2000, it is estimated that there will be eighty-six men for every one hundred women aged over seventy years in the world [20].

Mortality figures in England and Wales for 1988 indicated that for each major cause of death, the rate for those over sixty-five years exceeded the cumulative total for all other age groups [21]. However, patterns of illness, disease and death vary between men and women. Women tend to have more acute and chronic conditions and hence often greater functional limitations than men. For example, women have more days of bed rest, restricted activity and longer stays in hospital. Men on the other hand have more life-threatening illnesses [21]. As the number of years that people live becomes extended, it is important to ensure that during these years, people enjoy a good quality of life by maintaining good health, fitness and independence for as long as possible. Since women are unique in the nature of their illnesses and the number of years lived, they are the special focus of this thesis.

In terms of health interventions, exercise is consistently identified as one of the most popular and significant components of any health promotion programme. By increasing levels of physical activity (and therefore levels of fitness) health interventions aim broadly to increase well-being. This is because exercise is thought to provide a needed stimulus for the maintenance of structural and functional integrity of the cardio-respiratory system [22-23], the locomotor system [24-27] and may be a protective factor in heart disease [28-31]. More recently, attention has been drawn to the psychological benefits that emerge during and after exercise participation. Reduction in depression [33-35], anxiety [36] [37] and improvements in mood [39] and memory [40-42] are some of the documented benefits. Potential mechanisms mediating improvements in well-being are thought to involve enhanced feelings of mastery and self-efficacy [43-46] and physiological changes from elevations in brain and plasma opioid levels [47] [48].

However, the majority of work examining the relationship between exercise and well-being has been performed with younger, often male cohorts; there have been relatively few studies carried out specifically with elderly women. Therefore the empirical and theoretical basis for knowledge on activity and well-being generalised from these samples to the elderly, is largely invalid. For example, it is commonly accepted that in order to achieve physiological benefits from exercise, exercise must be performed vigorously for twenty minutes, at least three times per week. With the advent of research with specific elderly populations, a more modest intensity and frequency of exercise has been found to beneficial. Customary activities such as regular brisk walking are thought to be of use in the prevention of stroke [50], osteoporosis [51] [52] and are closely correlated with non-specific symptoms [53]. Questionnaires which have tested satisfactorily for reliability and validity with younger cohorts, have not transferred well to the elderly. It is now thought that

estimates of physical activity amongst the elderly using age-neutral questionnaires have underestimated the amount of time spent on physical activities by approximately two hours and twenty minutes per day [49].

1.3 THE DEVELOPMENT OF THE LONDON HEALTH AND FITNESS POSTAL QUESTIONNAIRE.

In preparation for examining the relationship between physical activity and well-being amongst the elderly, it was therefore necessary to develop a questionnaire which would measure exercise behaviour in a valid and reliable way. The first empirical study in this thesis, outlines the development of this questionnaire, which becomes known as the London Health and Fitness Questionnaire (LHFQ). Rather than start from scratch with designing a new questionnaire, it was decided to adapt the existing interview schedules used in the UK National Fitness Survey [54]. Questions were used from the following sections of the interview schedules: past and current exercise behaviour, personal beliefs, attitudes and perceived barriers towards exercise, health-related behaviour, health status and socio-demographic details. Physical activity was grouped into three basic categories: home activities (for example, house-work and gardening); habitual activity (for example, walking for errands and climbing stairs); and sports/recreational activities (for example, swimming, cycling and bowls). Information on activity type, frequency, duration and intensity were collected so that individuals could later be categorised into activity groups rather than make an estimate of their total energy expenditure.

The reliability and validity of the LHFQ were tested on two samples of elderly women: a sample of 130 women drawn at random from the age/sex registers of GPs in Wapping, East London and a sample of 118 women drawn at random from lists supplied by the retirement service association of a major national retail company in Norwich, Norfolk. Test re-test reliability was assessed using repeat questionnaires and interviews. Construct validity was assessed by looking at the correspondence between exercise behaviour, personal health beliefs and attitudes among women who went out daily and those who did not; those less than and older than the average age of the sample, and those who said they did and did not take a daily brisk walk. Criterion validity was assessed by looking at the correspondence between exercise activity diaries and completed questionnaires. Face validity was ascertained primarily by comments made by respondents during interviews and by response rates to the postal surveys.

1.4 THE IMPACT OF BRISK WALKING ON THE WELL-BEING OF ELDERLY WOMEN.

In the few studies which have focused specifically on the impact of exercise on the elderly, the research evidence is promising. For example there are indications that, the risks of developing chronic illness and disability in old age may be prevented by adopting a more physically active lifestyle [55-57] . Physical capacity [58], physical self-efficacy [59], body image [60 61], morale [62] and health status [63] may also improve as a result of participation in exercise. However, there are a number of methodological flaws

with existing exercise studies, including the use of volunteer samples, non-random allocation to treatment groups, lack of clear specifications of different exercise treatments, inadequate monitoring of compliance and possible confounding of the social effects of exercise on well-being.

Study two therefore aims to improve on the research designs of previous exercise studies. It sets out to investigate the effects of a low intensity aerobic exercise programme and its contribution to the well-being of elderly women. More specifically, the study aims to determine whether a six month brisk walking programme:

1. produces physical benefits in terms of increasing stamina (cardiovascular fitness) and strength (leg strength).

2. produces psychological benefits in terms of increasing physical, social and emotional subjective health status.

3. changes attitudes towards exercise and increases perceived physical self-efficacy.

100 women (with a mean age of sixty-six years) were recruited from the fracture clinic of a large teaching hospital in East London. The women were randomly assigned to either group 1 (n=35), the brisk walking group, or group 2 (n=41) who received a homeopathic dose of exercise. Group 1 were requested to walk at a pace they considered to be brisk for at least twenty minutes, three times per week. Guidance was given on drawing up an exercise plan. Group 2 were instructed in an exercise plan which comprised sedentary, non-weight bearing exercises such as wrist and ankle flexibility movement. Both groups were given diaries so that they could log the intensity and frequency of the exercises they did, and compliance could be monitored.

Measures were taken at the start and end of the six month period. Stamina and strength were measured using a step test exercise and leg extension rig, respectively. Well-being was measured using the NHP and attitudes towards exercise, using the LHFQ.

1.5 THE INFLUENCES ON THE DOMESTIC AND SPORTING PHYSICAL ACTIVITY PATTERNS OF ELDERLY WOMEN.

The elderly are increasingly being seen as appropriate candidates for health promotion initiatives. This approach represents a new move by the government and health education authorities to acknowledge that the promotion of health in the elderly is as valid as traditional health care approaches which have concentrated on reducing the incidence and/or severity of chronic illness. Historically, health promotion initiatives have been slow to emerge for the elderly, possibly because several popular but misguided beliefs have been held by health professionals and the elderly themselves. Namely, that the elderly are unable or unwilling to modify long-established un-

healthful lifestyles; the damage to health caused by a lifetime of engaging in poor health practices is irreversible; that the elderly cannot tolerate health promotion interventions which include an exercise component; that any changes brought about by health promotion interventions would be insignificant and therefore not be cost effective; and finally, that the elderly are difficult to recruit into programmes and harder to evaluate than young and middle-aged groups [64 65] .

It is perhaps not surprising therefore that exercise remains a minority pursuit for the elderly in general and elderly women in particular [66 67]. Mechanisms mediating lower levels of physical activity in elderly women have received little attention. Psychological models such as the Theory of Planned behaviour [68], Health Belief Model [69] and the Psychological Model for Physical Activity Participation [70], have so far been relatively unsuccessful at explaining these phenomena. Research into theories of exercise adherence has concentrated on the age group sixteen to sixty-four years [71] and is derived mainly from North America. Where previous research examining the determinants of physical activity amongst the elderly has occurred, it is now thought to be limited because age-neutral questionnaires were used [72] . If the elderly are to be recruited for health promotion programmes and physical activity targets outlined in the Health of the Nation [73] are to be met, one of the first steps will be to study the determinants of physical activity for elderly women.

Study three looks at the levels of domestic and sporting activity amongst elderly women and the influences on their participation in that activity. A large sample of elderly women, (n=820) were randomly drawn from lists of members of the retirement service associations of a national retail company. Data was collected using the LHFQ (a questionnaire tested for reliability and validity for an elderly population). In addition, the women were asked to make self-reports of well-being using the NHP. Women were divided into tertiles of low, moderate and high domestic and sporting physical activity and the associations between these variables and others such as health-status, exercise attitudes and socio-economic status were examined.

1.6 Outline of the chapters in this thesis.

Chapter two examines the relationship between health, fitness and well-being in the elderly in detail. It also examines the status of the research evidence to date with regards the effects of exercise activity on the physical and psychological well-being of the elderly. The shortcomings of existing exercise studies are explored and a case for improving future exercise studies is made. A section in chapter two is also dedicated to justifying the choice of the NHP as the main method of measuring well-being in this thesis.

Chapter three starts with outlining findings which suggest that physical activity patterns in the elderly are generally low and that exercise behaviour may be difficult to self-regulate. A critical review of the contribution of psychological models and a medley of other research, which has attempted to explain exercise behaviour in the elderly is given. These approaches are found to be largely unsuccessful at

satisfactorily explaining why exercise uptake in the elderly is low, and a case for more exploratory research, is made.

Chapter four represents the first empirical piece of research in the thesis, study one. It describes the development of the London Health and Fitness Questionnaire (LHFQ). Study two, an evaluation of the impact of a six month brisk walking programme on the well-being of a group of post menopausal women, is presented in chapter five. In chapter six, study three is presented. It is an exploratory piece of research, examining the influences on the participation of elderly women in domestic and sporting activity. Chapter seven comprises the final chapter, where the findings of all three studies are drawn together and some conclusions are drawn with regards to this thesis in achieving its overall aim of contributing to the knowledge base on exercise activity, well-being and elderly women. Some recommendations are made for future research.

1.7 REFERENCES.

1. de Coverley Veale. Exercise and mental health. *Acta Psychiatrica Scandinavia*, 1987; **76**:113-120.

2. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H., and Arie, T. Levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

3. Lamb, K.L., Brodie, D.A. and Roberts, K. Physical fitness and health-related fitness indicators of a positive health state. *Health Promotion*, 1988; **3**(2): 171-181.

4. Sidney, K.H. and Shephard, R.J. Activity patterns of elderly men and women. *Journal of Gerontology*, 1977; **32**: 25-32.

5. Shephard, R.J. The scientific basis of exercise prescribing for the very old. *Journal of the American Geriatric Society*, 1990; **38** (1): 62-70.

6. Posner, J.D., Gorman, K.M., Klein, H.S. and Woldow, A. Exercise capacity in the elderly. *American Journal of Cardiology*, 1986; **57**: 52-88.

7. O'Brien, S.J. and Vertinsky, P.A. Unfit survivors: exercise as a resource for aging women. *The Gerontologist*, 1991; **31**(3): 347-357.

8. Larson, R. Thirty years of research on the subjective well-being of older Americans. *Journal of Gerontology*, 1978; **1**: 109-125.

9. Loomis, R.A. and Thomas, C.D. Elderly women in nursing homes and independent residence: health, body, attitudes, self-esteem and life satisfaction. *Canadian Journal of Aging*, 1991; **10** (3): 224-231.

10. Grau, L. Mental health and older women. *Women and Health*, 1988; **14**: 75-91.

11. Maddox, G.L. (Ed.) *The encyclopedia of aging*. New York: Springer, 1987.

12. Edwards, J. and Klemmack, D. Correlates of life-satisfaction: a reexamination. *Journal of Gerontology*, 1973; **28**: 497-502.

13. Palmore, E. and Luikart, C. Health and social factors related to life satisfaction. *Journal of Health and Social Behaviour*, 1972; **13**: 68-80.

14. Spreitzer, E. and Schneider, E. Correlates of life-satisfaction among the aged. *Journal of Gerontology*, 1974; **29**: 454-458.

15. World Health Organisation (WHO). *Constitution*. New York: WHO, 1946.

16. Hunt, S.M., McEwen, J. and McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

17. Van Sasse, J.L.C.M., Noteboom, W.M.P. and Vandenbroucke, J.P. Longevity of men capable of prolonged physical exercise: a 32 year follow up of 2259 participants in the Dutch eleven cities ice skating tour. *British Medical Journal*, 1990; **301**: 22-29.

18. Secretary of State for Health. *The health of the nation: a strategy for health in England.* London: HMSO, 1991.

19. Fielding, H. Real Life. One hundred and something. *The Independent on Sunday*, 12th February, 1995, p. 25.

20. United Nations Department of International Economic and Social Affairs. *World survey on the role of women in development. report of the commission on the status of women.* New York: United Nations, 1986.

21. Verbrugge, L. A health profile of older women with comparisons to older men. *Research on Ageing,* 1984; **6** (3): 291-322.

22. Sidney, K.H., and Shepherd, R.J.Frequency and intensity of exercise training for elderly subjects. *Medicine Science and Sports,* 1978;**10**:125-131.

23. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in Nursing and Health,* 1990; **13:** 209-218.

24. Grimby, G. Physical activity and muscle training in the elderly. *Acta Medicine Scandanivica*, Supplement, 1986; **711**: 233-7.

25. Hardman, A.E. Benefits of low intensity exercise in women. *Sports Medicine and Soft Tissue Trauma* 1991; **3(1)**: 14-15.

26. Simpson, W.M. Exercise: prescriptions for the elderly. *Geriatrics* 1986; **41**(1): 95-100.

27. Holloszy, J.O. Exercise, health, and aging: a need for more information. *Medicine and Science in Sports and Exercise* 1983; **15**(1): 1-5.

28. Morris, J.N., Everitt, M.G., Pollard, R., Chave, S.P.W. and Semmence, A.M. Vigorous exercise in leisure-time: protection against coronary heart disease. *Lancet*, 1980; **II**: 1207-1210.

29. Paffenbarger, R.S., Hyde, R.T., Wing, A.L. and Hsieh, C.C. Physical activity, all-cause mortality and longevity of college alumni. *New England Journal of Medicine*, 1986; **314**: 605-613.

30. Donahue, R.P., Abbott, R.D., Reed, D.M. and Yano, K. Physical activity and coronorary heart disease in middle-aged and elderly men. The Honolulu Heart Programme. *American Journal of Public Health*, 1988; **78** :307-312.

31. Shaper, A.G. Pocock, S.J., Walker, M., Cohen, N.M., Wale, C.J. and Thompson, A.J. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *British Medical Journal*, 1981; **283**: 179-86.

33. Larson, R. Thirty years of research on the subjective well-being of older Americans. *Journal of Gerontology*, 1978;**1**: 109-125.

34. Edwards, J. and Klemmack, D. Correlates of life-satisfaction: a re-examination. *Journal of Gerontology*, 1973; **28**: 497-502.

35. Palmore, E. and Luikart, C. Health and social factors related to life satisfaction. *Journal of Health and Social Behaviour*, 1972;**13**: 68-80.

36. Spreitzer, E. and Schneider, E. Correlates of life-satisfaction among the aged. *Journal of Gerontology*, 1974;**29**: 454-458.

37. Blazer, D.G. and Houpt, J. Perception of poor health in the healthy older adult. *Journal of American Geriatric Society*, 1979; **27**: 332-334.

39. Pearlman, R.A. and Uhlmann, R.F. Quality of life in elderly, chronically ill outpatients. *Journal of Gerontology*, 1991; **46**: 31-38.

40. Ivancevich, J.M. and Matteson, M.T. Promoting the individual's health and well-being. In Cooper, C.L. and Payne, R. (Eds.). *Causes, coping and consequences of stress at work*. London: John Wiley and Sons Ltd., 1988 pp.267-299.

41. Watson, D. and Pennebaker, J.W. Health complaints, stress and distress: exploring the central role of negative affectivity. Psychological Review, 1989; **96**: 234-254.

42. Burvill, P.W. and Hall, W.D. Predictors of increased mortality in elderly depressed patients. *International Journal of Geriatric Psychiatry*, 1994; **9**: 219-227.

43. Perkins, J. and Dick, T.B.S. Smoking and myorcardinal infarcation:secondary prevention. *Postgraduate Medical Journal*, 1985; **61**: 295-300.

44. Fentem, P.H., Bassey, E.J. and Turnbull, W.B. *The new case for exercise*. London: Health Education Authority, 1988.

45. Leventhal, E.A. and Prohaska, T.R. Age, symptom, interpretation and health behaviour. *Journal of the American Geriatrics Society*, 1986; **34**: 185-191.

46. Prohaska, T.R., Leventhal, H. and Keller, M.L. Health practices and illness cognition in young, middle aged, and elderly adults. *Journal of Gerontology*, 1985; **40**: 569-578.

47. Hart, S. Psychology and the health of elderly people. In Bennett, P., Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood Press, 1991. pp 246-275.

48. European working party on high blood pressure in the elderly. Mortality and morbidity results from the European working party on high blood pressure in the elderly trial. *Lancet*, 1985; **i**: 1349-1354.

49. Washburn, R.A., Jette, A.M. and Janney, C.A. Using age-neutral physical activity questionnaires in research with the elderly. *Journal of Aging and Health*, 1990; **2** (3):341-356.

50. Wannamethee, G., Shaper, A.G., Physical activity and stroke in British middle aged men. *British Medical Journal,* 1992; **304**: 597-601.

51. Krolner, B. Physical exercise as a prophylaxis against involutional vertebrae bone loss : A controlled trial. *Clinical Science,* 1983; **64**: 641-46.

52. Prince, R.L., Smith, M., Dick, I., Price, R.I., Webb, P., Henderson, N.K., et al. Prevention of Post-menopausal Osteoporosis: a comparative study of exercise, calcium supplementation, and hormone replacement therapy. *New England Journal of Medicine,* 1991; **325(17)**: 1189-1195.

53. Ebrahim, S., Dallosso, H.M., Morgan, K., Fentem, P.H. and Arie, T. The causes of handicap among a random sample of old and very old people : possibilities for prevention. *Journal of the Royal College of Physicians,* 1988; **22**: 105-7.

54. Sports Council and Health Education Authority. *Activity and Health Research in the Allied Dunbar National Fitness Survey: a report on activity patterns and fitness levels: main findings* . London: Ancient House Press, 1992.

55. Gloag D. Exercise, fitness and health. *British Medical Journal,* 1992; **305:** 377-388.

56. Fentem P.H, Bassey E.J, Turnbull N.B. *The new case for exercise.* London: Health Education Authority, 1988.

57. Ebrahim, S., Dallosso, H.M., Morgan, K., Fentem, P.H. and Arie, T. The causes of handicap among a random sample of old and very old people : possibilities for prevention. *Journal of the Royal College of Physicians,* 1988; **22**: 105-7.

58. Posner, J.D., Gorman, B.S., Howard, S.K., and Woldow, A. Exercise capacity in the elderly. *American Journal of Cardiology* 1986; **57**: 52-58.

59. Hogan, P.I. and Santomier, J.P. Effect of mastering swimming skills on older adults'self-efficacy. *Research Quarterly for Exercise and Sport*,1984; **55**: 294-296.

60. Olson, M.I. *The effects of physical activity on the body image of nursing home residents*. Unpublished master's thesis. U.S.:Springfield College,1975.

61. Sidney, K.H. and Shephard, R.J. Attitudes toward health and physical activity in the elderly: effects of a physical training programme. *Medicine and Science in Sport*, 1976; **8**: 246-252.

62. Perri, S. and Templer, D.I. The effects of an aerobic exercise programme on psychological variables in older adults. *International Journal of Aging and Human Development*, 1985; **20**: 167-172.

63. Morgan, K., Dallosso, H.M., Arie, T., Byrne, E.J. and Waite, J. Mental health and psychological well-being among the old and very old living at home. *British Journal of Psychiatry*, 1987; **150**: 801-807.

64. Ory, M.G. Considerations in the development of age sensitive indicators for assessing health promotion. *Health Promotion*, 1988; **3** (2): 139-149.

65. Hart, S. Psychology and the health of elderly people. In Bennett, P. and Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood press, 1991. pp 246-275.

66. Activity and Health Research. *Allied Dunbar national fitness survey: a report on activity patterns and fitness levels. Main findings.* London: Sports Council and Health Education Authority, 1992.

67. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H. and Arie, T. H.D. Levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

68. Ajzen, I. (1985) From intentions to actions: a theory of planned behaviour. In J. Kuhl and J. Beckman (eds.). *Action-control: from cognition to behaviour.* Heidelberg, Germany: Springer, pp 12-39.

69. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508.

70. Sonstroem, R.J. Physical estimation and attraction scales: rational and research. *Medicine and Science in Sports*, 1978; **10**: 97-192.

71. Dishman, R.K., Sallis, J.F. and Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**: 158-171.

72. LaPorte, R.E., Black-Sandler, R. , Cauley, J.A., Link, M., Bayles, C. et al. The assessment of physical activity in older women: analysis of inter-relationships and reliability of activity monitoring, activity surveys and caloric intake. *Journal of Gerontology*, 1983; **38**: 394-397.

73. Secretary of State for Health. *The health of the nation. A strategy for health in England.* London: HMSO, 1991.

CHAPTER TWO

PROMOTING THE WELL-BEING OF ELDERLY WOMEN: IS THERE A CASE FOR EXERCISE?

2.1 THE RELATIONSHIP BETWEEN HEALTH, FITNESS AND WELL-BEING IN THE ELDERLY

Women make up a higher proportion of the aged population since they tend to outlive men by several years; a trend which is set to continue [1]. Mortality figures in England and Wales indicate that for each major cause of death, the rate for those over sixty-five years exceeded the cumulative total for all other age groups [2]. Historically, the effort of professionals working in the field of health education was directed at reducing the incidence and/or severity of chronic illness in later life, rather than promoting good health. The following misguided beliefs have informed policy decisions: health prevention and promotion are suitable only for the young and middle-aged groups since elderly people are unable or unwilling to modify long-established un-healthful lifestyles; older people cannot tolerate health promotion intervention such as exercise regimens; the damage to health caused by a lifetime of engaging in poor health practices is irreversible; any changes brought about by health promotion interventions would be insignificant and therefore not cost effective; and older people are more difficult to recruit into studies and harder to evaluate [3 4]. More recently, attitudes have started to change. In 1992, the Government put forward a strategy of health for the nation [5] . This white paper emphasises the need to *add years to life* and *add life to years* by increasing life expectancy and the number of years lived free from ill health and by reducing premature death. It is a strategy based on ideas instigated by the World Health Organisation in the Ottawa Charter. The Ottawa charter for health promotion encourages governments to work at a local level in assisting individuals to increase control over and improve health. It advocates an ideal of achieving 'Health for All by the Year 2000' [6].

The World Health Organisation defines health as 'the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity' [7]. This definition has broadened the concept of health to acknowledge that health includes positive qualities such as mental and social well-being, and that physical aspects of health, whilst important, form just part of the health picture. However, the emphasis on 'complete' well-being has been criticised. This is because the definition excludes roughly ten per cent of people world-wide, who have a permanent disability [8] and an even higher proportion of elderly people who have chronic physical illnesses [9]. In addition, health is not an absolute concept, it is not always stable, it may fluctuate between good and poor. The concept of functional fitness has been suggested as being more relevant when thinking about the health of the elderly [10]. Functional fitness relates to the physical capacity of an individual to meet ordinary and unexpected demands of daily life safely and effectively [8]. Included in this definition is the ability to perform necessary personal and domestic tasks such as dressing, climbing stairs, shopping and cooking. Some researchers have gone as far as suggesting that functional classification rather than calendar age may be a more useful basis for categorising health status, since older people are heterogeneous in physical ability [12]. Physical illness may affect an individual's capacity for independent living, resulting in altered social relationships, lowered self-esteem and vulnerability to depression [13].

There is evidence to suggest that when individuals are asked to globally assess their own health, they include, emotional and physical health in their ratings; physician ratings

appear to be narrower, primarily reflecting physical rather than psycho-social well-being [14]. While some studies have indicated elderly people tend to overestimate their level of health [15] and fitness [16], others have found they rate their health in negative terms [17]. A number of explanations for the different self-rating patterns of health and fitness have emerged. Older adults may arrive at a positive appraisal of their health and fitness because they spontaneously compare themselves with peers of their own age [18]. Since, societal expectations of physical ability diminish with age, it is possible that the baseline for comparison is particularly low [16]. They may be able to sustain positive appraisals of their own health simply because health aspirations decline with increasing age [20]. People who are unfit may take longer to perform a physical task and find the task tiring. They may convince themselves that on the basis of their exertion and fatigue, they are working hard [21]. Respondents of all ages have expressed the belief that ageing is associated with increased susceptibility to diseases [22]. Thus, it is possible that if people expect illness with ageing, they may redefine health.

Individuals in their older years typically may experience a variety of major life changes. As well as a loss of work role and death of partners and friends, they will experience a change in physical health [23] . Men and women differ in the nature and extent of their illnesses. Women tend to have more acute and chronic conditions and hence often greater functional limitations than men. While men have more life-threatening illnesses, women have more days of bed rest, restricted activity as well as longer stays in hospital [2]. However, among all the elements of an older person's life situation, health is the most strongly related to subjective well-being. People who are sick or physically disabled are much less likely to express contentment about their lives [25-30]. It is perhaps not surprising that the term well-being is often used synonymously with the more familiar terms health and excellent health [31]. Recent evidence indicates that subjective perception of physical symptoms [32] is an important component of well-being. That is, those people who report fewer physical symptoms have higher well-being scores. Impaired mobility has been found to be the best physical indicator of subsequent mortality in depressed older adults [33].

There is evidence to suggest that elderly people engage in a wide variety of behaviours in order to protect and promote their health [34 35] and that they may do so more frequently than younger contemporaries [36 37]. A growing sense of vulnerability to disease and disability may be a contributing factor towards an age-related trend towards self-care [38].

There is also evidence to suggest that behavioural change in later life can combat some risk factors in certain conditions. For example, active treatment of hypertension has been shown to be beneficial [39]; stopping smoking after a myocardial infarction has been as successful in the elderly as younger age groups in preventing secondary incidents and minimising morbidity [40]; adopting a more physically active lifestyle may alleviate or prevent chronic illness or disability [41].

It is the role of exercise in maintaining good physical and psychological well-being amongst elderly women which is the focus of this thesis. It is the research evidence which examines the case for exercise to which we now turn.

2.2 THE EFFECTS OF EXERCISE ON THE PHYSICAL WELL-BEING OF THE ELDERLY.

Ageing is marked by a decline in exercise capacity, however, decline in physical capacity appears to occur with, rather than because of ageing [47]. Two factors appear to modulate the physiologic response to exercise: ***inactivity*** and ***disease.***

The effects of inactivity were observed in a study which involved young volunteers undergoing twenty days of total bed rest. Exercise testing before and at the end of the rest period revealed a twenty-seven percent decline in cardio-respiratory fitness, a twenty-nine percent reduction in cardiac output and stroke volume, plus a reduction in lean body mass. These changes are thought to be similar in kind and degree to those seen in people after thirty years of sedentary living [49].

Physical activity is causally associated with physical work capacity (PWC). PWC, is commonly determined by measuring the maximum amount of oxygen a person is able to consume per minute (VO_2 max). The minimum level of VO_2 max required by older adults to maintain independent functioning in the community is estimated at being between fifteen to seventeen ml/kg/min [50]. This threshold is often approached at age seventy-four years, but it can be delayed until age eighty-eight years plus, if adults maintain high VO_2 max through regular exercise [47 50]. Maintenance of PWC in the later years is important because it counteracts the demise of functional fitness and relative disability. Aerobic capacities of older adults (with a mean age of fifty-nine years), who exercised regularly, were sixty percent higher than those of sedentary middle-aged men, and only fifteen percent lower than those of athletes in their twenties [51]. A ten year longitudinal study demonstrated that maintenance of vigorous physical activity completely forestalled the age-associated decline in aerobic capacity [52].

So, PWC defines or limits a person's lifestyle. People with high PWC will have more energy to spend on their routine daily activities and will tire less quickly. If fitness declines too much, it is no longer possible to maintain independent living status, and institutionalisation or home care becomes necessary. Whilst limitations on daily energy expenditure do not impose problems for young and middle-aged people, low fitness can be a problem for the elderly. Ordinary daily activities such as climbing stairs, rising up from a chair without arm support and using public transport, often requires above or close to the maximal performance of elderly people around the age of eighty years [49]. Most individuals over eighty years of age need assistance with climbing stairs or walking [53]. Other studies have shown that even non-institutionalised young elderly people between the ages of sixty-five and seventy-four years, may find that dressing represents fifty percent of their maximal capacity [54]. Some of this relative disability is due to chronic disease such as coronary heart disease. However, a substantial portion is due to disuse [54]. Attempts to improve PWC therefore become critical.

The theoretical relation between inactivity and functional deterioration has been highlighted in other studies [59-61]. Without intervention, it appears that sedentary elderly women continue to decline in functional fitness. Furthermore, a study by Morey and colleagues [63] provides an indication that an elderly population with

chronic illnesses can benefit from aerobic, anaerobic and relaxation forms of exercise. They examined the impact of exercise on cardiovascular fitness, flexibility and strength using a prospective longitudinal design. The exercise intervention consisted of ninety minutes of exercise, three days per week, at seventy percent of each person's maximal capacity for four months. Significant improvements in cardiovascular fitness were found at four months, along with significant improvements in abdominal strength and hip flexibility. No major complications resulted from the exercise. A follow-up study is necessary to determine if the improvements in cardiovascular fitness, strength and flexibility result in these individuals avoiding or postponing the need for long-term care.

Although a large number of studies including longitudinal ones, show that exercise training in the elderly produces a significant increase in work capacity. Controversy exists surrounding the exact nature of the intensity, frequency and duration of exercise needed to produce beneficial effects. Results from some studies suggest that small changes in lifestyle such as walking to the shops instead of taking the bus, or climbing steps instead of taking the lift, may be enough to prevent the decline in physical ability [54]. In cases of very sedentary persons, for example, those who seldom leave the house, a small increment in physical activity produces a relatively great benefit [55 56]. In contrast, others have found that low intensity, low frequency exercise over a fifty-two week period is insufficient to bring about any significant changes in physiological response [57]. In this study, the largest gain was made by those elderly members belonging to the high frequency, high intensity group, followed by low frequency, high intensity group members. Yet, significant improvements in the cardiovascular functioning of the elderly have been found after participation in a five month programme of low intensity exercise [62]. Moreover, a twelve week low impact aerobic exercise performed for fifty minutes three times a week, was sufficient to produce significant cardio-respiratory benefits in a group of elderly volunteers [58]. Thus some confusion remains over the exercise prescription which might be of benefit to elderly women.

2.3 THE EFFECTS OF EXERCISE ON DISEASE PROCESSES IN THE ELDERLY.

In this section, the role of exercise as a protector in two diseases: coronary heart disease (CHD) and osteoporosis will be examined. CHD is chosen because numerous studies over the past three decades have examined the relationship between physical activity and CHD. Osteoporosis has been chosen because it is more common in women; the most common aetiology of this disease is post-menopausal oestrogen deficiency.

2.3.1 Coronary Heart Disease.

Whilst a vast amount of time and money has been spent researching the relationship between CHD and exercise, research has focused exclusively on male samples, although CHD is by no means exclusive to men [5]. Typically studies incorporate longitudinal designs involving large numbers of men, for example, up to 17, 000 men in anyone study [64 65]. Elderly men have been included in some studies,[65 66] whilst others concentrate on middle-aged men only [64 67]. All these studies follow a

similar format: baseline data is gathered using a physical activity diary, whereby intensity, frequency and duration of normal work and leisure exercise activities are recorded. Men are typed accordingly into low, moderate or high activity groups. At the same time, physiological measures of cardiovascular fitness and blood pressure are taken plus a record is made of other health behaviours such as alcohol consumption and smoking. In addition a note is made of personal and family history of CHD. Samples are followed up over a number of time periods expanding several years and any changes in lifestyle or the development of CHD is carefully monitored.

The results from four major studies all confirm that for middle-aged and elderly men, the risk of heart disease decreases significantly with increasing physical activity [64-67]. That is, exercise is a protective factor against developing CHD. For example, in the Honolulu Heart Programme, [66] in those active elderly men aged sixty-five to sixty-nine years, the rate of definite CHD was less than half the rate experienced by those who led more sedentary lifestyles. The importance of an active lifestyle held true when other cardiovascular risk factors such as smoking, alcohol and blood pressure were controlled for. The Harvard Alumni longitudinal study [65] found that men expending 2,000 calories a week or more on activities such as walking, stair climbing and sports had a thirty-nine percent lower risk of developing CHD than less active classmates. The most active men in the two oldest age groups sixty to sixty-nine years and seventy to eighty-four years, were found to have a fifty percent less chance of dying prematurely compared to the least active men.

However, once again, a discrepancy exists over the level of intensity of exercise needed to confer beneficial effects. For example, In Britain, Morris and associates [64] revealed that the men who recorded participating in vigorous sports in their physical activity diaries, had forty percent less chance of having a fatal heart attack than their colleagues reporting no vigorous exercise. For non-fatal episodes of CHD the risk was as low as fifty percent. The benefits of vigorous exercise were shown across all age groups, but appeared to offer more protection in older men than younger men. The authors conclude from the results that *vigorous exercise* provides a natural defence for the body, producing a protective effect on the ageing heart. In contrast, the authors of the British Regional Heart Study [67] found that men who took part in *moderate* or moderately vigorous activity had lower rates of heart attacks than those men who participated in vigorous exercise. They conclude from their analysis that, whilst overall level of physical activity is an important independent protective factor in heart disease, moderate exercise is sufficient to obtain such a positive effect.

2.3.2 Osteoporosis.

The research evidence suggests that a major non-dietary factor pre-disposing high bone mass is exercise, although much of it is only correlational [53-55]. It has been suggested that physical fitness is a major determinant of bone density in the spine and femoral neck [72]. There is encouraging evidence to suggest that post-menopausal women can build bone through weight bearing [73] or muscle tension stress forms of

exercise,[74] and that popular aerobic activities such as dancing [77] and walking [78] are sufficient to increase indices of bone density and condition.

Bone mass is greater in some skeletal sites in highly trained athletes than in sedentary controls, although female athletes who exercise both intensely and vigorously have been shown to have decreased bone density [75].

Prince and colleagues [79] conducted a comparative study into the effects of hormone replacement therapy, calcium and exercise on the prevention of post-menopausal osteoporosis. 120 post-menopausal women (mean age fifty-six years) were randomised into four independent groups : an exercise group, an exercise group plus calcium supplementation, an exercise plus oestrogen group, and a placebo control group. The study continued for two years, in which time, periodic measurements were taken of the women's bone density at three places in their forearms. The study showed that increase in bone density was greatest in the exercise-oestrogen group. 52% of the women in this group, compared to 11% and 12.5 % in the exercise and exercise-calcium groups respectively, experienced an increase in bone density following treatment. The results suggest that in post-menopausal women with low bone density, exercise can play a role in increasing bone mass, especially if combined with oestrogen or calcium.

2.4 THE EFFECTS OF EXERCISE ON THE PSYCHOLOGICAL WELL-BEING OF THE ELDERLY.

One of the best studies designed to examine the relationship between customary/domestic exercise and measures of psychological well-being has been carried out by Morgan and associates [81]. Their sample consisted of a representative number of 1042 elderly women and men aged sixty-five years and over living at home. Each person was interviewed using a structured questionnaire which covered aspects of health and lifestyle. Special attention was given to recording the type, frequency and intensity of customary activity, and activities were divided into five mutually exclusive categories: indoor and outdoor productive activities; walking; shopping and leisure activities. Well-being was defined as including aspects of morale, life satisfaction, social engagement, health and functional capabilities.

The authors found that physical health status, social engagement and age emerged as dominant predictors of well-being, which is similar to earlier research findings [47]. However, the correlation between activity scores and psychological well-being show a marked and persistent sex difference. For women, once health, social engagement and chronological age were taken into account, customary physical activity was neither a significant predictor of morale or mental health status. For men, however, significant relationships between morale, mental health and customary physical activity emerged. For example, the activity 'home maintenance' explained a significant proportion of the variance in life satisfaction, and was a discriminating variable in classifying emotional disturbance in men. Results from this study support the proposition that customary physical activity for men, may be an effective vehicle for successful ageing. Whilst the activities contribute to the

reserve of functional capacity for women, they don't appear to improve explicitly, psychological well-being.

However, not all studies have found that low intensity exercise contributes to psychological well-being, irrespective of sex. In a study examining the effect of low and moderate exercise over a nine month period, in seventy-two elderly volunteers, no significant changes in life satisfaction or quality of sleep occurred. Although, health perception scores improved for both groups on the sub-scale dimensions perception of health worry and rejection of the sick role at the four and a half month stage [66] .

The effects of higher intensity exercise on psychological well-being are also mixed. Some studies suggest that twelve [82] or fourteen weeks [80] of aerobic exercise is sufficient to bring about significant increases in psychological well-being, whilst others have found that an aerobics programme must be at least eight months in duration to be effective [82a].

There is evidence, especially with young/middle-aged samples, that exercise may reinforce a sense of self-mastery [85-88], feeling successful [90] and an increased internal locus of control [90 91]. Further support for this relationship has come more recently from researchers investigating the change from negative to positive feelings which accompanies participation in exercise programmes. In a six week field study of high and low intensity exercise classes [92] participants completed questionnaires before and after each weekly class. Of the subjects who reported increased tension/anxiety and fatigue as a result of the classes, some dropped out, whilst a proportion continued, despite negative moods. These subjects subsequently reported that they 'felt better for doing so'. The authors conclude that individuals who exercise may sometimes be motivated by negative moods because persevering with a difficult task provides a feeling of mastery over something unpleasant.

Most people wish to feel competent and be in control of their immediate environment. Self-efficacy for older people may mean that the perspective of control translates itself to sustaining independence in living. For example, it may mean a search for a sufficient reserve of aerobic power to complete daily tasks without fatigue, or having sufficient muscular strength to rise from a chair unaided. The relationship between a five week swimming programme and self-efficacy in adults aged sixty years plus was investigated in one study [93] . Participants in the swimming programme (n=32) reported significantly larger changes in swimming self-efficacy than a non-swimming control group (n=33). In addition seventy-eight percent of the swimmers reported that the feelings of self-efficacy and competence derived from their swimming experience, transferred to other areas of life.

It has been well documented amongst the young, that body image, or one's attitudes toward the aesthetic and functional abilities of one's body, is a very important component of the overall self-concept [94]. There is evidence available which suggests that mood state is influenced by the extent of any gap between the perceived and the desired body image [95]. Physically strong individuals have been found to be more satisfied with their bodies, less anxious and emotionally labile, and more confident

than others [96]. Over the length of an eighteen month conditioning programme, clients developed a more positive self-image, with associated increases in stamina and energy [97]. Likewise, positive changes in self-image were found in post-coronary patients who were undertaking a twenty-four week conditioning programme [98]. Although much seems to depend on a person's initial perception of body image, and their cognitive perception or interpretation of their physical condition. Since, no changes in perceived or ideal body image were found in elderly volunteers who took part in endurance training over a three month period. However, those people who failed to participate regularly in the exercise programme, experienced a widening of the gap between actual and desired image [100].

Research generally confirms the hypothesis that fitness training improves the self-concept. For example, positive changes have been found for adult male rehabilitation clients [101] and obese teenage males [102]. However, it is possible that changes in self-concept are associated with the perception of improved fitness rather than actual changes in physical fitness [99].

In one of few studies investigating the relationship between body image and exercise in an older population, nursing home residents participated in rhythmic breathing, slow stretching, and special upright exercises twice a week for eight weeks [103]. Participants' body image scores improved significantly. Sidney and Shephard [104] also found that increases in body image scores for healthy elderly volunteers occurred, following an endurance programme.

Loomis [105] conducted a study examining the health problems, body attitudes, self-esteem and life satisfaction of elderly women comprising nursing home residents (n= 25) with a mean age of eighty years, and women living in their own homes (n= 28) with a mean age of sixty-nine years. Nursing home residents were found to be significantly more dissatisfied with their physical agility, strength and co-ordination, than their community counterparts. This finding held true even after correcting for age and health problems. Moving to a nursing home is likely to result in a decrease of physical activity such as shopping and house-keeping. The findings of this study highlight the need for elderly women in nursing homes to have access to light regular daily exercise alongside the provision of good medical/physical care.

The above review highlights the fact that overall, there have been few studies designed to examine the relationship between exercise and psychological well-being amongst elderly women. In the few studies that do exist, sex differences appear to be in operation, with one study demonstrating that it is men, rather than women who confer benefits from customary/domestic exercise. There also appears to be some controversy once again, over the frequency, intensity and duration necessary in exercise programmes to bring about beneficial results. In addition, some of the elderly samples used are quite specific, for example, groups of elderly nursing home residents [103 105], which means the generalisability of the results from these studies are quite limited to other groups of elderly women living in the community.

2.5 CONTRAINDICATIONS TO TAKING EXERCISE FOR THE ELDERLY.

The appearance of abnormalities in heart rhythm, a peak heart rate that is low for age, a failure of rise in blood pressure during exercise, the onset of chest pain and a low maximal oxygen intake, are indications of a personal adverse reaction to exercise [106]. Occasional deaths during running events and other sporting activities illustrate the point that intense exercise can be dangerous, especially in those with unsuspected underlying heart disease. Unaccustomed vigorous exercise increases the immediate risk of sudden death by a factor of five to ten [114]. Vigorous exercise under hot conditions can result in death from heart failure or stroke for an elderly person. In very cold weather, cutaneous vasoconstriction, a rise of blood pressure and reflex coronary vasoconstriction can provoke myocardial ischemia. A poor peripheral circulation increases the risk of chilblains and frostbite [114]. The very old (seventy-five years plus) are particularly vulnerable since they have difficulty in adapting to extreme environments.

Special precautions are needed for those elderly people who take medication such as prescription drugs. Cardiovascular drugs such as beta blockers and diuretics affect exercise tolerance. Hypotension and hypoglycaemia may develop if attention is not given to the timing of drug intake before and after an exercise period [115].

However, the risk of injury seems roughly proportional to the amount of exercise that is undertaken per session and per week. It is perhaps not surprising to find that both traumatic and overuse injuries occur less frequently in the elderly, because the elderly are less ambitious exercisers. The exception may be for osteoporotic elderly women who have brittle bones. These women are at increased risk from exercise-related injuries.

2.6 SUMMING UP: IS THERE A CASE FOR EXERCISE?

In general, the above studies appear to give broad support to the premise that participating in exercise can increase well-being amongst the elderly. Low intensity, low frequency exercise seems to improve cardiovascular functioning in the elderly, even in those people enduring chronic illnesses. A lifestyle of moderate exercise has been shown to be a protective factor in the development of coronary heart disease, for men [67] and sufficient evidence exists to recommend increases in weight bearing exercise for most middle-aged and elderly women, to protect against osteoporosis[73] [74 77 78].

Customary/domestic exercise appears to confer psychological benefits for men, [81] but perhaps the best support for a positive relationship between exercise and psychological well-being comes from studies examining the effects of exercise on self-efficacy/mastery and self-concept [85-104].

The findings that low intensity, low frequency exercise may be beneficial for the elderly is particularly exciting. If these findings are replicated, the implications may be enormous, since low intensity exercise is safer for a wide range of elderly people. It is also associated with a higher rate of adherence amongst the elderly [106]

[107]. However, more work is needed to investigate this relationship. Since, in studies examining the relationship between exercise and physical and psychological well-being a discrepancy exists over the exact intensity, frequency and duration an exercise prescription should take to produce beneficial effects. Exercise encompasses a diversity of types of physical activities, and there is therefore a need to specify clearly the exact nature of the exercise treatment being performed. In this way, subjects know exactly what is required and treatment results can be interpreted and compared across studies. Whilst some researchers were careful at differentiating between the different intensities of exercise in each treatment group [57] [63]; others were not [58] [62]. It is possible in one study that the moderate intensity exercise protocol was too mild to maximise the differences between the groups [62]. Thus, a failure to differentiate distinctly between different intensities of exercise meant that the differences between treatment groups became blurred. Exercise treatment manuals may help to ensure that treatment procedures are practised in a standardised manner, allowing replication.

In one of the CHD studies, [64] no attempt was made to grade duration or frequency of vigorous exercise once it had been coded as exceeding five and thirty minutes, for sport and heavy work respectively. In practise this meant that for those men who did carry out vigorous exercise, duration and frequency were underestimated. This imprecision may partly explain why other studies have found that moderate exercise is sufficient to protect against CHD [67].

The difference in results found in studies examining exercise intensity and psychological well-being may be determined in part by how the concept psychological well-being is defined. The term has been defined in a myriad of ways including social engagement, self-concept, anxiety, depression, perceived health and locus of control and measured using a wide range of instruments.

Another reason for the difference in results between investigators may be due to differences in monitoring compliance with the exercise prescription. Monitoring compliance becomes especially difficult, but all the more critical if an exercise intervention is continued for more than a few weeks. In the studies reviewed, some exercise treatments lasted up to twelve months. The difference in results found may be due to the apparent lack of attention given to monitoring compliance in some treatments [58] [62].

Other methodological problems with the majority of studies reviewed include the use of volunteer samples, small sample sizes, non-random treatment assignment and lack of appropriate control groups. Most exercise studies rely on the use of volunteers. This calls for caution when thinking about the external validity or generalisability of the research findings. People who choose not to volunteer for an exercise programme may be qualitatively different from those who choose to participate. For example, non-participants may have a lower level of initial fitness or be less self-motivated to take part in or adhere to a programme [107]. In terms of sample size many studies included less than thirty subjects in each group. In exercise studies, large numbers are needed to maximise any between group differences and erase any idiosyncrasies in results within and between groups.

With exercise studies, it is not possible to carry out a double-blind type of experimentation because subjects are aware of whether they are receiving an exercise prescription. However, special attention has to be given to the use of control groups. A group which receives no treatment may provide an inadequate comparison. This is because this group is likely to become demoralised over time as they remain neglected (untreated), whilst the experimental subjects have regular contact and develop positive expectations about the treatment [116].

Similarly, a clear distinction needs to be drawn between activity as exercise and activity as social engagement. The use of social activity as a form of control group in some exercise studies [82] may mean the demarcations between the groups become less distinct and that physical and social benefits may become confounded. Since it has been shown for example, that a programme of recreational exercise can contribute to mental health by providing new opportunities for group participation, social contacts and group acceptance [83 84].

Recommended treatment options for a comparison group include a homeopathic dose of exercise [108], guided meditation [109], psychotherapy [110] and music appreciation [111]. A taxonomy of various outcome indices including magnitude, universality, generality, acceptability, safety, stability [112] and prevention [113] have been suggested. The concepts of acceptability (the likelihood that a given treatment will be accepted and/or completed by the patient) safety (the freedom from undue complication) and prevention (the power of the treatment to decrease the risk development of a disorder in a vulnerable population) are perhaps most relevant in exercise studies. For example, there is little point in having a treatment which produces a change in symptoms (magnitude) in a large proportion of the target population (universality), which carries a high rate of injury (safety) and leads to a poor adherence rate (acceptability) and doesn't have the power to decrease further risk (prevention).

More research is needed to examine the relationship between exercise and well-being, especially the effects of low intensity exercise on well-being. Future research should aim to recruit large numbers of neutral elderly people who do not explicitly volunteer to participate in an exercise study. Studies should also aim to randomise individuals into different treatment groups, thereby avoiding the differential selection of subjects to groups. Suitable control group conditions using for example, a homeopathic dose of exercise, which is not social in nature should be selected. In addition tight descriptions of the intensity, frequency and duration of an exercise prescription and careful physiological and psychological measurements should be made. Standardised scales, tested for reliability and validity on representative samples of elderly people should be used. In total, this should contribute towards providing a less ambiguous evaluation and explanation of the effects of any future exercise programmes.

Table 2.1 **The benefits that exercise may confer on the well-being of the elderly.**

FACTORS	INCREASE	DECREASE
Functional fitness [54-56]	O	
Anaerobic endurance [63 105]	O	
Aerobic endurance [47 50-52 62 63 80-82]	O	
Mobility/agility/flexibility [63 105]	O	
Coronary heart disease [64-67]		O
Bone density [53-55 77-79]	O	
Health status [81]	O	
Body image [96-99 103]	O	
Self-concept [101 102]	O	
Morale [80 81]	O	
Life satisfaction [80 81 105]	O	
Self-efficacy [85-90 92 93]	O	
Internal locus of control [90 91]	O	

2.7 CHOICE OF A SCALE FOR MEASURING WELL-BEING IN THIS THESIS.

A variety of approaches have been taken in attempting to define and measure 'well-being'. For example, well-being has been connected with people's feelings about their everyday-life activities: [117 118]

> ''Such feelings may range from negative mental states (dissatisfaction, unhappiness, worry etc.) through to a more positive outlook (which extends beyond the mere absence of illness) into a state which has sometimes been identified as positive mental health....'' [119].

However, the definition of positive mental health is difficult, since it is a malleable concept which is both multi-dimensional and value-laden. Early research in the area began with attempts to assess people's adjustment within specified domains of their life, such as work, health and religion [120 121]. These approaches were criticised for having a bias toward people with a specialised and idealised, external life situations[122]. Subsequent attempts to measure well-being, as will be seen, have defined it as an internal construct, independent of the exterior conditions of a person's life.

In coming to a decision about how to define and measure well-being, the following advice was taken:

> ''A person's ill health is indicated by feelings of pains and discomfort or perceptions of change in usual functioning and feeling. Measures of health status need to take both concepts into account. A person can feel ill without medical science being able to detect disease. What matters in the 20th century is how

> the patient feels....Symptom response or survival rates are no longer enough .....the therapy has to be evaluated in terms of whether it is more or less likely to lead to an outcome of a life worth living in social and psychological, as well as physical, terms''. [123]

In this thesis well-being is defined broadly, using the Nottingham Health Profile (NHP) [124]. Part 1 of the instrument measures perceived or subjective health status by asking for yes/no responses to 38 simple statements covering six dimensions: mobility, pain, energy, sleep, emotional reactions and social isolation. Part 11 asks about the effects of health on seven areas of daily life including looking after the home, social life and interests and hobbies. Therefore according to the NHP, a person would be defined as being in good health or in a state of well-being if they considered themselves to be free, or have minimal problems on all dimensions and areas in Part 1 and 11 respectively.

It was difficult to decide on an outcome measure of well-being. The NHP was chosen after careful consideration of the benefits and disadvantages of a number of other instruments including: the Sickness Impact Profile (SIP) [125], the General Health Questionnaire (GHQ) [126], the Affect-Balance Scale (ABS) [117] and the Philadelphia Geriatric Center Morale Scale (PGMS) [127]. All these scales, apart from the GHQ were developed in the USA and because of cultural differences, had the disadvantage of having to be adapted before use in the UK. Although the SIP has been adapted already for use in the UK (the modified version is called the Functional Limitations Profile [128]), its length (136 items) and the fact that it can be used only with people who are regarded or regard themselves as ill, made it unsuitable. The more concise NHP has been selected in preference to the SIP, by others [129 130].

The ABS and the PGMS are both short and have been used widely in population surveys, including elderly people living in the community; reliability and validity are satisfactory. However, both instruments are general measures of well-being and as such are quite vague when it comes to measuring the effects of well-being following an exercise intervention, as proposed in study two. For example the PGMS asks subjects to respond to statements such as 'I am as happy now as when I was younger' and 'I see enough of my friends and relatives'. The ABS asks whether in the last week a person has become 'upset because someone criticised you' or 'on top of the world because someone complimented you'. Thus in terms of face validity as an outcome measure, it is not clear how the scales may correspond to hypothesised increases in well-being following participation in an exercise programme. Additionally, the ABS is confounded by items referring to activation ('excited or interested in something') and accomplishments ('pleased about having accomplished something').

The GHQ was developed in London during the 1970s for use as a screening questionnaire to help General Practitioners to detect psychiatric illnesses, and as such it is based on health professionals' conceptualisations of health, rather than those of lay people. It has the advantage of being self-administered and comes in a variety of sizes (12, 28, 30 and 60). It has been used widely in surveys, including health surveys of the elderly. The GHQ-30 seems to be the most widely validated and generally all

aspects of validity are satisfactory [131 132]. However, reliability poses some problems. Test re-test reliability appears to be higher with clinically defined groups with a high prevalence of disorder [132]. There is also a problem of distinguishing between true change and unreliability, since the scale asks subjects to rate their present health in relation to their usual health. In addition, when applied to the elderly, false positive scores are likely. Since items such as 'been having restless, disturbed nights?' and 'been losing confidence in yourself?' may be expected as part of the normal ageing process as one experiences decline in physical abilities such as bladder control and eyesight. Other problems in administration have been found which may affect reliability with the elderly. Elderly people with failing eyesight and arthritic fingers may have difficulty completing the GHQ independently and will require varying degrees of assistance from an interviewer [133].

In contrast, the NHP has been successfully used in a number of postal surveys with elderly and chronically ill people. It is short, simple and self-administered (and therefore inexpensive). Population norms exist for the instrument, as do scores on individual patient groups [134]. It has the dual advantage of having been developed in the U.K. and formed by gathering statements about the impact of ill health, not from professionals but from lay people in the community. Lay people have also given the health statements weights according to how severe they perceive a particular health problem. It is easily understood and requires a low reading age (a minimum age of ten years). It has face validity if used in exercise intervention studies since it asks people directly about changes in energy, mobility and sleep. These are all variables likely to vary with increased exercise. Although, like the GHQ, it is possible that false positive scores could occur on the dimension sleep since statements such as 'I'm waking up in the early hours of the morning' may be more to do with the need to use the toilet, than a disturbance in well-being. There has also been some criticism that the six dimensions are not mutually exclusive. For example, one study found that the dimensions pain and physical mobility were highly correlated [135].

The NHP has been found to be a satisfactory measure of subjective health status in physical, social and emotional spheres when tested for reliability and validity on different population groups both in the community and on specific patient groups, including extensive work with the elderly [124 130 136 137].

Although the NHP is suitable for people who are not necessarily ill or unhealthy, like many other measures, it uses negative rather than positive health statements. This was planned by the developers of the scale, to avoid including health problems which would be affirmed by a large proportion of the population [124]. This leaves the scale with a tendency to be more responsive to severe rather than moderate health problems and produce low or zero value scores, which cannot be compared over time. On balance, although the NHP is far from perfect, it was considered to be the most acceptable for the nature of two studies proposed in this thesis, study two and three. A copy of the NHP can be seen in appendix A.

2.8 REFERENCES

1. United Nations Department of International Economic and Social Affairs. *World survey on the role of women in development: Report of the Commission on the status of women*. New York: United Nations, 1986.

2. Verbrugge, L. A health profile of older women with comparisons to older men. *Research on Ageing*, 1984; **6(3)**: 291-322.

3. Ory, M.G. Considerations in the development of age sensitive indicators for assessing health promotion. *Health Promotion*, 1988;**3 (2)**: 139-149.

4. Hart, S. Psychology and the health of elderly people. In Bennett, P., Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood Press, 1991. pp 246-275.

5. Secretary of State for Health. *The health of the nation. A strategy for health in England.* London: HMSO, 1991.

6. World Health Organisation (WHO). *Ottawa charter for health promotion.* NewYork: WHO, 1986.

7. World Health Organisation (WHO). *Constitution*. New York: WHO, 1946.

8. Minkler, M. and Checkoway, B. Ten principles for geriatric health promotion. *Health Promotion*, 1988; **3 (3)**: 277-285.

9. Office of Population Censuses and Surveys. *General Household Survey*. London: HMSO, 1987.

11. Osness, W. *Goals, plans, and work of the ARAPCS fitness task force*. Las Vegas: AAHPERD national convention, 1987.

12. Van Sasse, J.L.C.M., Noteboom, W.M.P. and Vandenbroucke, J.P. Longevity of men capable of prolonged physical exercise: a 32 year follow up of 2259 participants in the Dutch eleven cities ice skating tour. *British Medical Journal*, 1990; **301**: 22-29.

13. Murphy, E. Social origins of depression in old age. *British Journal of Psychology*, 1982; **141**: 135-142. 1982.

14. Hall, J.A., Epstein, A.M. and McNeil, B.J. Multidimensionality of health status in an elderly population. *Medical Care*, 1989; **27**: 5168-5177.

15. La Rue, A., Bank, L. Jarvik, L. and Hetland, M. Health in old age: how do physicians ratings and self-ratings compare? *Journal of Gerontology*, 1979, **34**: 687-691.

16. Sports Council and Health Education Authority. *Activity and Health Research in the Allied Dunbar National Fitness Survey: a report on activity patterns and fitness levels: main findings* . London: Ancient House Press, 1992.

17. Levkoff, S.E., Cleary, P.D. and Wetle, T. Differences in the appraisal of health between aged and middle-aged adults. *Journal of Gerontology*, 1987; **42**: 114-120.

18. Stoller, E. Self-assessments in the elderly: the impact of informal assistance. *Journal of Health and Social Behaviour*, 1984; **25**: 260-270.

20. Tornstam, L. Health and self-perception: a systems theoretical approach. *Gerontologist*, 1975; **27**: 264-270.

21. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10(2)**: 125-131.

22. Keller, M.L., leventhal, H., Prosaska, T.R. and Leventhal, E.A. beliefs about ageing and illness in a community sample. *Research in Nursing and Health*, 1989; **12**: 247-255.

23. Danish, S.J., Sniper, M.A. and Nowack, C.A. Developmental intervention: enhancing life-event processes. In P.B. Baltes and O.G. Brim (eds.) *Life span, development and ageing*. New York: Academic Press, 1980, pp. 340-366.

25. Larson, R. Thirty years of research on the subjective well-being of older Americans. *Journal of Gerontology*, 1978;**1**: 109-125.

26. Edwards, J. and Klemmack, D. Correlates of life-satisfaction:a reexamination. *Journal of Gerontology*, 1973; **28**: 497-502.

27. Palmore, E. and Luikart, C. Health and social factors related to life satisfaction. *Journal of Health and Social Behaviour*, 1972;**13**: 68-80.

28. Spreitzer, E. and Schneider, E. Correlates of life-satisfaction among the aged. *Journal of Gerontology*, 1974; **29**: 454-458.

29. Blazer, D.G. and Houpt, J. Perception of poor health in the healthy older adult. *Journal of American Geriatric Society*, 1979; **27**: 332-334.

30. Pearlman, R.A. and Uhlmann, R.F. Quality of life in elderly, chronically ill outpatients. *Journal of Gerontology*, 1991; **46**: 31-38.

31. Ivancevich, J.M. and Matteson, M.T. Promoting the individual's health and well-being. In Cooper, C.L. and Payne, R. (Eds.). *Causes, coping and consequences of stress at work.* London: John Wiley and Sons Ltd., 1988 pp.267-299.

32. Watson, D. and Pennebaker, J.W. Health complaints, stress and distress: exploring the central role of negative affectivity. *Psychological Review*, 1989; **96**: 234-254.

33. Burvill, P.W. and Hall, W.D. Predictors of increased mortality in elderly depressed patients. *International Journal of Geriatric Psychiatry*, 1994; **9**: 219-227.

34. Perkins, J. and Dick, T.B.S. Smoking and myorcardinal infarction: secondary prevention. *Postgraduate Medical Journal*, 1985; **61**: 295-300.

35. Fentem, P.H., Bassey, E.J. and Turnbull, W.B. *The new case for exercise*. London: Health Education Authority, 1988

36. Leventhal, E.A. and Prohaska, T.R. Age, symptom, interpretation and health behaviour. *Journal of the American Geriatrics Society*, 1986; **34**: 185-191.

37. Prohaska, T.R., Leventhal, H. and Keller, M.L. Health practices and illness cognition in young, middle aged, and elderly adults. *Journal of Gerontology*, 1985;**40**: 569-578.

38. Hart, S. Psychology and the health of elderly people. In Bennett, P., Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood Press, 1991. pp 246-275.

39. European working party on high blood pressure in the elderly. Mortality and morbidity results from the European working party on high blood pressure in the elderly trial. *Lancet*, 1985; **i**: 1349-1354.

40. Perkins, J. and Dick, T.B.S. Smoking and myorcardinal infarcation:secondary prevention. *Postgraduate Medical Journal*, 1985; **61**: 295-300.

41. Fentem, P.H., Bassey, E.J. and Turnbull, W.B. *The new case for exercise*. London: Health Education Authority, 1988.

42. de Coverley Veale. Exercise and mental health. *Acta Psychiatrica Scandinavia*, 1987; **76**:113-120.

43. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H., and Arie, T. Levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

44. Lamb, K.L., Brodie, D.A. and Roberts, K. Physical fitness and health-related fitness indicators of a positive health state. *Health Promotion*, 1988**; 3(2)**: 171-181.

45. Sidney, K.H. and Shephard, R.J. Activity patterns of elderly men and women. *Journal of Gerontology*, 1977; **32**: 25-32.

46. Shephard, R.J. The scientific basis of exercise prescribing for the very old. *Journal of the American Geriatric Society*, 1990; **38** (1): 62-70.

47. Posner, J.D., Gorman, K.M., Klein, H.S. and Woldow, A. Exercise capacity in the elderly. *American Journal of Cardiology*, 1986; **57**:52-88.

48. O'Brien, S.J. and Vertinsky, P.A. Unfit survivors: exercise as a resource for aging women. *The Gerontologist*, 1991; **31**(3): 347-357.

49. Saltin, B., Blomqvist, G. and Mitchelle, J.H. Response to exercise after bedrest and after training. *Circulation*, 1968; **7(1)**: 37-8.

50. Blair, S.N., Lavey, R.S., Goodyear, N., Gibbons, L.W. and Cooper, K.H. Physiologic responses to maximal graded exercise testing in apparently healthy white women aged 18 to 75 years. *Journal of Cardiac Rehabilitation*, 1984; 4: 459-468.

51. Van Sasse, J.L.C.M., Noteboom, W.M.P. and Vandenbroucke, J.P. Longevity of men capable of prolonged physical exercise: a 32 year follow up of 2259 participants in the Dutch eleven cities ice skating tour. *British Medical Journal*, 1990; **301**: 22-29.

52. Palmore, E.B., Nowlin, J.B. and Wang, H.S. Predictors of function among the old-old: a ten year follow-up. *Journal of Gerontology*, 1985; **40**: 244-250.

53. Blair, S.N., Haskell, W.L., Ho, P., Paffenbarger, R.S., Vranizan, K.M., Farquhar, J.W. and Wood, P.D. Assessment of habitual physical activity by a seven day recall in a community survey and controlled experiments. *American Journal of Epidemiology*, 1985; **122**: 794-804.

54. Wheat, M.E. Exercise in the elderly. *Western Journal of Medicine*, 1987; **147**: 477-480.

55. Price, J.H. and Luther, S.L. Physical fitness: its role in health for the elderly. *Journal of Gerontological Nursing*, 1980; **6(9)**: 517-523.

56. Markides, K.S. and Lee, D.J. Predictors of well-being and functioning in older Mexican Americans and Anglos: an eight year follow-up. *Journal of Gerontology*, 1990; **45 (1)**: 69-73.

57. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10(2)**: 125-131.

58. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

59. Bassey, E.J., Fentem, P.H., MacDonald, J.C. and Scriven, P.M. Self-paced walking as a method for exercise testing in elderly and young men. *Clinical Science Medicine*, 1976; **51**: 496-502.

60. Plowman, S.A., Drinkwater, B.L. and Horvath, S.M. Age and aerobic power in women: a longitudinal study. *Journal of Gerontology*, 1979; **34**: 512-520.

61. Serfass, R.C. Physical exercise and the elderly. In Studd, G.A. (Ed.), *Encyclopedia of physical education, fitness and sports: training, environment, nutrition and fitness*. Salt Lake City: Brighton, 1980.

62. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218.

63. Morey, M.C., Cowper, P.A., Feussner, J.R., DiPasquale, R.C. and Crowley, G.M. Evaluation of a supervised exercise programme in a geriatric population. *Journal of the American Geriatric Society*, 1989; **37**: 348-354.

64. Morris, J.N., Everitt, M.G., Pollard, R., Chave, S.P.W. and Semmence, A.M. Vigorous exercise in leisure-time: protection against coronary heart disease. *Lancet*, 1980; **II**: 1207-1210.

65. Paffenbarger, R.S., Hyde, R.T., Wing, A.L. and Hsieh, C.C. Physical activity, all-cause mortality and longevity of college alumni. *New England Journal of Medicine*, 1986; **314**: 605-613.

66. Donahue, R.P., Abbott, R.D., Reed, D.M. and Yano, K. Physical activity and coronorary heart disease in middle-aged and elderly men. The Honolulu Heart Programme. *American Journal of Public Health*, 1988; **78** :307-312.

67. Shaper, A.G. Pocock, S.J., Walker, M., Cohen, N.M., Wale, C.J. and Thompson, A.J. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *British Medical Journal*, 1981; **283**: 179-86.

72. Pocock, N.A., Eisman, J.A., Yeates, M.G., Sambrook, P.N. and Eberl S. Physical fitness is a major determinant of femoral neck and lumbar spine bone mineral density. *Journal of Clinical Investment*, 1986; **78**: 618-21.

73. Simkin, A., Ayalon, J., Leichter, I. Increased trabecula bone density due to bone-loading exercises in postmenopausal osteoporotic women. *Calcification Tissue International*, 1987; **40**: 59-63.

74. Beverly, M.C., Rider, T.A., Evans, M.J., Smith, R. Local bone mineral response to brief exercise that stresses the skeleton. *British Medical Journal*, 1989; **229**: 233-35.

75. Cann, C.E., Martin, M.C., Genant, H.K. and Jaffe, R.B. Decreased spinal mineral content in amenorrhoeic women. *Journal American Medical Association*, 1984; **251**: 626-9.

77. Chow, R.K., Harrison, J.E., Brown, C.F. and Hajek, V. Physical fitness effect on bone mass in postmenopausal women. *Archives of Physical Medical Rehabilitation*,1986; **67** : 231-34.

78. Hardman, A.E., Hudson, A. Walking for health: a closer look at exercise. *Health Trends*, 1989; **21**: 91-2.

79. Prince, R.L., Smith, M., Dick, I., Price, R.I., Webb, P.G., Henderson, N., Harris, M.M. Prevention of postmenopausal osteoporosis : A comparative study of exercise, calcium supplementation and hormone replacement therapy. *New England Journal of Medicine*, 1991; **325** (17): 1189-1195.

80. Perri, S. and Templer, D.I. The effects of an aerobic exercise programme on psychological variables in older adults. *International Journal of Aging and Human Development*, 1985; **20**: 167-172.

81. Morgan, K., Dallosso, H.M., Arie, T., Byrne, E.J. and Waite, J. Mental health and psychological well-being among the old and very old living at home. *British Journal of Psychiatry*, 1987; **150**: 801-807.

82. Emery, C.F. and Gatz, M. Psychological and cognitive effects of an exercise programme for community-residing older adults. *The Gerontologist*, 1990; **30(2)**: 184-188.

82a. Emery, C.F. and Blumenthal, J.A. Perceived change among older participants in an exercise programme for older adults. *The Gerontologist*, 1990; **30** (4):516-521.

83. Ransford, C.P. A role for amines in the antidepressant effect of of exercise: a review. *Medicine Science and Sports Exercise*, 1982;**14**: 1-10.

84. Jasnoski, M.L., Holmes, D.S., Solomon, S. and Aguiar, C. Exercise changes in aerobic capacity, and changes in self-perception: an experimental investigation. *Journal of Research in Personality*, 1981; **15**: 460-466.

85. Greist, J.H., Klein, M.H., Eischens, R.R., Faris, J., Gurman, A.S. and Morgan, W.P. Running through your mind. In Sachs, M.H. and Sachs, M.L.(Eds.). *Psychology of running*. Champaign, Illinois: Human Kinetics Publishers, 1981.

86. Hughes, J.R. Psychological effects of habitual aerobic exercise: a critical review. *Preventive Medicine*,1984;**13**: 66-84.

87. Weinstein, W.S. and Meyers, A.W. Running as a treatment for depression: is it worth it ? *Journal of Sports Psychology*, 1983; **5**: 228-301.

88. Greist, J.H., Klein, M.H., Eischens, R.R., Faris, J.W. and Gurman, A.S. Running through your mind. *Journal of Psychosomatic Research*,1978; **22**: 259-294.

90. Seligman, M.E.P. Learned helplessness. *Annals Review Medicine*,1972; **23**: 407-412.

91. Doyne, E.J., Chambless, D.L. and Beutler, L.E. Aerobic exercise as a treatment for depression in women. *Behaviour Therapy*,1983; **14**: 434-440.

92. Salmon, P., Steinberg, H., Morris, M and Sykes, E.A. *Physical exercise as a form of psychological stress*. Proceedings of the Sport, Health, Psychology and Exercise Symposium, London: Sports Council, 1988 pp. 153-160.

93. Hogan, P.I. and Santomier, J.P. Effect of mastering swimming skills on older adults'self-efficacy. *Research Quarterly for Exercise and Sport*,1984; **55**: 294-296.

94. Harris, D.V. Involvement in sports: a somato-psychic rationale for physical activity. Philadelphia: Lea and Febiger, 1973.

95. Kirkaldy, B.D. and Shephard, R.J. Therapeutic implications of exercise. *International Journal of Sports Psychology*, 1990; **21**: 165-184.

96. Tucker, L.A. Muscular strength and mental health. *Journal of Personality and Social Psychology*, 1983a; **45**: 1355-1360.

97. Heinzelmann, F. and Baggley, R. Response to physical activity programmes and their effects on health behaviour. *Public Health Reports*, 1970; **85**: 905-911.

98. McPherson, B.D., Paivio, A.,Yohasz, M.S., Rechnitzer, P.A. and Pickard, H.A. Psychological effects of an exercise programme for post infarct and normal adult men. *Journal of Sports Medicine*,1967; **7**: 95-102.

99. Heaps, R.A. Relating physical and psychological fitness: a psychological view point. *Journal of Sports Medicine and Physical Fitness*, 1978; **18**: 399-408.

100. Sidney, K.H. and Shephard, R.J. Attitudes towards health and physical activity in the elderly. Effects of a physical training programme. *Medicine and Science in Sports*, 1977; **8**: 246-252.

101. Collingwood, T.R. The effects of physical training upon behaviour and self attitudes. *Journal of Clinical Psychology*,1972; **28**: 583-585.

102. Collingwood, T.R. and Willett, L. The effects of physical training upon self-concept and body attitudes. *Journal of Clinical Psychology*, 1971; **27**: 411-412.

103. Olson, M.I. The effects of physical activity on the body image of nursing home residents. Unpublished master's thesis. U.S.:Springfield College,1975.

104. Sidney, K.H. and Shephard, R.J. Attitudes toward health and physical *activity in the elderly: effects of a physical training programme. Medicine and Science in Sport*, 1976; **8**: 246-252.

105. Loomis, R.A. and Thomas, C.D. Elderly women in nursing home and independent residence: health, body, attitudes, self-esteem and life satisfaction. *Canadian Journal of Aging*, 1991; **10 (3)**: 224-231.

106. Royal College of Physicians. Medical aspects of exercise: benefits and risks. *Journal of the Royal College of Physicians of London*, 1991; **25 (3)**: 193-196.

107. Dishman, R.K., Sallis, J.F. and Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**:158-171.

108. Rechnitzer, P.A., Sangal, S., Cunningham, D., Andrew, G. and Buck, C. A controlled prospective study of the effect of endurance training on the recurrence rate of myocardial infarction. *American Journal of Epidemiology*, 1975; **102**: 358-365.

109. Bahrke, M.S. and Morgan,W.P. Anxiety reduction following exercise and meditation. In Sachs, M.H. and Sachs, M.L. (Eds.) *Psychology of running*. Champaign, Illinois: Human Kinetics Publishers, 1981

110. Greist, J.H., Klein, M.H., Eischens, R.R., Faris, J., Gurman, A.S. and Morgan, W.P. Running through your mind. In Sachs, M.H. and Sachs, M.L.(Eds.). *Psychology of running*. Champaign, Illinois: Human Kinetics Publishers, 1981.

111. Keller, S. and Seraganian, P. Physical fitness level and autonomic reactivity to psychosocial stress. *Journal of Psychosomatic Research*, 1984; **28**: 279-287.

112. De Rubeis, R.J. and Hollon, S.D. Behavioral treatment of the affective disorder. In Michelson, L., Hersen, M. and Turner, S.M. (Eds.) *Future perspectives in behaviour therapy.* New York: Plenum, 1981.

113. Simons, A.D., Epstein, L.H., McGowan, C.R. and Kupfer, D.J. Exercise as a treatment for depression: an update. *Clinical Psychology Review*, 1985; **5**: 553-568.

114. Kavanagh, T. and Shephard, R.J. Can regular sports participation slow the aging process: data on master athletes. *The Physician and Sports Medicine*, 1990; **18**: 97-102.

115. Lampman, R. Evaluating and prescribing exercise for elderly patients. *Geriatrics*, 1987; **8(42)**: 63-65.

116. Garfield, S.L. Critical issues in the effectiveness of psychotherapy. In Walker, C.E. (Ed.). *Clinical practice of psychology.* Oxford: Pergamon Press, 1981.

117. Bradburn, N.M. *The structure of psychological well-being.* Chicago: Aldine, 1969.

118. Warr, P. and Wall, T. *Work and well-being*. Harmondsworth: Penquin, 1975.

119. Warr, P. A study of psychological well-being. *British Journal of Psychology*, 1978; **69**: p. 111.

120. Cavan, R., Burgess, E., Havighurst, R. and Goldhamer, H. *Personal adjustment in old age*. Chicago: Science Research Associates,1949.

121. Havighurst, R. The social competence of middle aged people. *Genetic Psychology Monographs*, 1957; **56**: 297-375.

122. Neugarten, B., Havighurst, R. and Tobin, S. The measurement of life satisfaction. *Journal of Gerontology*, 1961; **16**: 134-143.

123. Bowling, A. *Measuring Health: a review of quality of life measurement scales*. Milton Keynes: Open University Press, 1991, p. 1.

124. Hunt, S.M., McEwen, J. and McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

125. Deyo, R.A., Inui, T.S., Leininger, J.D. et al. Physical and psychological functions in rhematoid arthritis: clinical use of a self-administered instrument. *Archives of International Medicine*, 1982; **142**: 879-82.

126. Goldberg, D.P. *Manual of the General Health Questionnaire*. Windsor: NFER-Nelson, 1978.

127. Lawton, M. The Philadelphia Geriatric Centre Morale Scale: a revision. *Journal of Gerontology*, 1975; **30**: 85-89.

128. Patrick, D.L. (ed.) *Health and care of the physically disabled in Lambeth. Report of Phase II of the Longitudinal Disability Interview Survey*. London: St Thomas's Hospital Medical School, Department of Community Medicine.

129. Buxton, M. The economics of heart transplant programmes: measuring the benefits. In Teeling Smith, G. (ed.) *Measuring the social benefits of medicine*. London: Office of Health Economics, 1983.

130. O'Brien, B.J. Assessment of treatment in heart disease. In Teeling Smith, G. (ed.) *Measuring the social benefits of medicine*. London: Office of Health Economics, 1983.

131. Williams, P. Depressive thinking in general practice patients . In Freeling, P., Downey, L.J. and Malkin, J.C. (eds.) The presentation of depression: current approaches. *Royal College of General Practitioners*, Occasional Paper, 1987; 36: 17-20.

132. Goldberg, D.P. and Williams, P. *A user's guide to the General Health Questionnaire*. Windsor: NFER-Nelson, 1988.

133. Bowling, A. The prevalence of psychiatric morbidity among people aged 85 and over living at home. *Social Psychiatry and Psychiatric Epidemiology*, 1990; **25**: 132-140.

134. Hunt, S.M., McEwan, J. and McKenna, S.P. Perceived health: age and sex comparisons in a community. *Journal of Epidemiology and Community Health*, 1984; **34**: 281-286.

135. Kind, P and Carr-Hill, R. The Nottingham Health Profile: a useful tool for epidemiologists? *Social Science and Medicine*, 1987; **25**: 905-910.

136. Jenkinson, C., Fitzpatrick, R. and Argyle, M. The Nottingham Health Profile: an analysis of its sensitivity in differentiating illness groups. *Social Science and Medicine*, 1988; **27**: 1411-14.

137. Hunt, S.M., McKenna, S.P. and Williams, J. Reliability of a population survey tool for measuring perceived health problems: a study of patients with osteo-arthritis. *Journal of Epidemiology and Community Health*, 1981; **35**: 297-300.

CHAPTER THREE

THEORETICAL APPROACHES TO UNDERSTANDING EXERCISE BEHAVIOUR IN THE ELDERLY.

3.1 EXERCISE PARTICIPATION RATES AMONGST THE ELDERLY.

Whilst it is acknowledged, that existing exercise studies have contained a number of methodological flaws, there is sufficient evidence to suggest that taking exercise might be an important, and perhaps essential behaviour for effective functioning in daily life. The potential physical and psychological rewards of exercise seemingly outweigh any associated costs for the elderly. However, physical activity levels are low amongst adults, particularly older women. Older women are highlighted as the group who encounter more barriers to taking up and maintaining exercise due to health problems, social norms that have not encouraged exercise participation and poor exercise habits learned in adolescence [7].

A major national fitness survey conducted in England: the National Fitness Survey (NFS) [1] showed that whilst the majority of people express a strong belief in the value of exercise in maintaining and increasing health and fitness, only a minority engage regularly in physical activity of a moderate or vigorous intensity. This highlights a consistent finding in the exercise adherence literature, that one's attitude towards exercise does not appear to predict participation or adherence to an exercise programme [2].

In the NFS men and women of all ages believed themselves to be fit, although physiological and self-report measurements indicated that this belief was incorrect. 61% of men and 69% of women in activity level zero believed themselves to be very or fairly fit, whilst 47% of men and 57% of women in this category believed themselves to be very or fairly active.

The results of the study revealed that older women were especially unfit. 50% of women over fifty-five years did not have sufficient arm strength to lift half their body weight, or the leg strength to climb stairs without assistance. Only 26% of women in the age group fifty-five to sixty-four years and 16% of women aged sixty-five to seventy-four years, did exercise with sufficient intensity and duration to achieve age-appropriate aerobic health targets. Domestic activities made a significant contribution to moderate activity levels and virtually all vigorous activities were achieved through sport and recreation. Walking, swimming, cycling and bowls are reported as being the most popular participation sports for women aged over fifty-four years in the UK [3]. These statistics show that there are regional variations in participation, with southern regions exhibiting higher participation rates.

Based on a study of 1042 elderly men and women aged sixty-five to seventy-five years plus, living in the Nottingham community, Dallosso and associates [3a] found that engagement in customary physical activity such as goal-directed maintenance and management of the house-hold was low, especially for those people aged seventy-five years and over. Participation in indoor activities was reported by the largest percentage of the sample, followed by outdoor activities. The indoor and outdoor activities were made up almost exclusively of light or moderate intensity exercise. Sex differences were found in the structure of customary physical activities. The day

to day activities of women were linked to traditional gender roles, with home-management tasks, principally housework and shopping, providing women with most of their daily exercise. Shopping and house-work activities were marginalised by men. For men, outdoor productive, strength and flexibility activities were carried out most frequently. In terms of overall structure, the results showed that women tend to be more uniformly active than men. Men were more active however in participating in leisure activities such as cycling, swimming and walking.

There is also evidence to suggest that whilst people may start off with good intentions to take exercise, this behaviour is difficult to sustain. Exercise adherence has been loosely defined in the literature as exercise behaviour within a structured programme and as exercise maintenance outside of a formal programme[4]. Both types of exercise have yielded consistently poor adherence rates. Nearly 50% of subjects drop out within six months of initiating an exercise routine and this figure is even less for longer term adherence to exercise, especially outside of a formal exercise programme[5]. It seems that people who make an uninterrupted transition from supervised to self-directed exercise are more likely to maintain exercise over a long term [6].

Many theoretical approaches assume that behavioural choices are formed from a rational decision making process for example, [8 9]. These theories hold a broad assumption that people are capable of self-regulating goal-directed behaviour through cognitive activity. That is, if people believe strongly enough in something (for example the benefits of exercise) they will be capable of working towards obtaining it. It seems, however, that exercise behaviour may be difficult to self-regulate.

The task of increasing the proportion of the population that engage in exercise, leisure or domestic physical activity sufficient to promote health benefits and improve physical capacity is a central interest for health promoters and policy makers [10 11 12]. A search for those factors and processes that cause some individuals to exercise whilst others remain sedentary is a major challenge. In other words it seems important to try and understand the *what*, *why* and *how* underlying people's exercise behaviour. Health promotion programmes developed without this preparatory work have been widely adopted in the UK [13 14], although their efficacy is now thought to be limited. If increased physical activity targets outlined in the government's white paper, Health of the Nation [15] are to be met, the first step will be to examine whether psychological theories and empirical studies have anything useful to say about the conditions which will encourage exercise uptake in relevant target populations, such as older women. This seems a necessary task before designing specific health promotion interventions.

3.2 Psychological Models of Exercise Behaviour.

The purpose of this chapter is to critically examine the contribution of the main health behaviour psychological models to our understanding of what causes some people to exercise, whilst others do not. These models are the Theory of Reasoned Action[16] ,the

Theory of Planned Behaviour[17] ,the Health Belief Model [18], the theory of Self-Efficacy[19], and the Psychological Model for Physical Activity Participation [20].

3.2.1 A critique of the Theory of Reasoned Action.

Fishbein and Ajzen's Theory of Reasoned Action (TRA) [16] predicts behaviour from a person's *intentions* to actually perform the specific behaviour in question. Behavioural intention is believed to be influenced by the person's *attitude towards* performing the behaviour and by the *subjective norm*. Attitude is a personal factor that refers to an individual's positive or negative evaluation of the behaviour. Subjective norm is defined as the perception of what generalised important others believe about the individual performing the behaviour [21]. In the case of exercise, the model predicts that exercise behaviour will occur if the following things are present: a person intends to exercise, they have a positive attitude towards exercise and if significant others such as family members or peers, support them in their quest to exercise.

The TRA model, whilst not originally developed for predicting exercise behaviour has some merit when applied to this domain. For example, the authors of the model advocate the use of narrow, situation-specific attitude and intention measures. This enables attitudes to be reduced to a collection of beliefs and subjective norm to comprise a list of significant others, including a measure of motivation to comply with their wishes. The model also emphasises the importance of the interaction between personal variables such as attitudes and situational factors such as social support. There is some evidence from the research literature to suggest that social support emanating from specific (as opposed to generalised) others, such as spouse, family, health professionals and peers, is one of the situational predictors of exercise behaviour[22 23].

The specificity of the TRA model is worthy of merit; by its reliance on specific attitude and belief statements congruent to specific behaviours, the model has overcome criticisms of attitude theory brought about by previously low attitude-behaviour relationships. However, the model's specificity may also act as a limitation when applied to predicting exercise behaviour. This is because it's use is confined to predictions of immediate or subsequent short-term exercise. Various researchers have noted the instability of intention to exercise over an extended time frame [24]; lack of correspondence of intention with respect to time [25 26], action [27] and generality [28]. No direct examination of longer term activity adherence has been made to date.

Moreover, empirical support for the model when applied to exercise behaviour, is poor. The strength of the relationships between intention and exercise behaviour is weak with correlations recorded as low as .22 [24] but most typically in the .30 and .40 range.[27 28] Although attitude toward participation in exercise has been a stronger influence on intention than subjective norm [27 30 31] , the strength of this relationship has been weak [24] or nonsignificant [32]. Thus, it seems, intentions are largely necessary but *not* sufficient to predict exercise behaviour.

Explanations for the relatively poor relationship between intention and exercise behaviour have focused on researchers not applying the model in its entirety [31 33 34 35]. Other problems may be connected to the fact that previous experience may impact on attitude strength and subsequent behaviour [22 36] . Theoretical shortcomings of the TRA model have been addressed by Ajzen. In the process, he has proposed the Theory of Planned Behaviour (TPB) [17].

3.2.2 A critique of the Theory of Planned Behaviour.

Ajzen, in the Theory of Planned Behaviour (TPB) builds on the TRA model by adding a third dimension to form the TPB [17]. In addition to intention to exercise, attitude towards exercise and subjective norm or social pressure, perceived *behavioural control* is deemed important. He defines perceived behavioural control as the person's belief as to how easy or difficult the performance of the behaviour is likely to be. Internal factors such as skills, abilities and self-motivation, and external factors such as time and opportunity, influence behavioural control and ultimately exercise participation. Ajzen suggests that this part of the model takes account of non-volitional behaviours and hypothesises that this will add to its predictive strength. Attention to the volitional nature of physical activity and the possibility of moderating variables such as health barriers have been suggested by others [27 37 38] .

Just like the TRA model, the TPB was not developed with exercise behaviour in mind. Rather, it was developed in non-health environments and does not cater for emotional fear or arousal elements of human behaviour. This has led some to argue that the TPB model is limited to the rational part of any health decision [39]. In addition, the model has received little empirical testing in exercise studies. In those studies of exercise behaviour where the model has been used, there is some limited support for it. For example a study looking at the ability of a range of social cognitive models to predict exercise participation in undergraduates in the USA, found that whilst perceived control increased the TRA model's prediction of intention to exercise amongst students, it did not predict *actual* exercise participation [27]. Similar results have been found by others[40].

Some researchers believe that one of the reasons for a poor relationship between intention and actual exercise behaviour is that the definition of intention is not tight enough [29 41 42]. At the heart of the debate is the lack of distinction between intention and expectation and the manner in which the two constructs have been defined and used in studies. Courneya and McAuley [29] believe that a number of studies have confounded intention with expectation [25 26 31 43]. Warshaw and Davis [42] define behavioural intention as being 'the degree to which a person has formulated *conscious* plans to perform or not perform some specified future behaviour'. They define behavioural expectation as 'the individual's estimation of the *likelihood* that he or she will actually perform some future specified behaviour'. Using this approach, Warshaw and Davis found that exercise behaviour (taking a walk) was predicted significantly better by expectation (r=.58) than intention (r-.38). Further support for a slightly stronger relationship in favour of expectation and behaviour (r= .57) rather

than intention and behaviour (r=.49) has been found[41]. When only non-volitional behaviours were considered, the discrepancy between the two relationships became more pronounced, with correlations reported as .51 and .38 for expectation/behaviour and intention/behaviour respectively. However, more research in the exercise behaviour domain is needed to compare directly the predictive power of intention versus expectation, since to date the number of studies are small and the results are inconclusive.

3.2.3 A critique of the Health Belief Model.

The Health Belief Model (HBM) was developed in the 1970s [18] . The HBM proposes that an individual's decision about whether to take exercise is determined by four psychological variables: perceived susceptibility, perceived severity, perceived benefits and perceived barriers. The emphasis is therefore on the *perceptions* of the individual in question.

Susceptibility and severity combine to give a measure of threat. The greater the perceived susceptibility and severity, the greater the likelihood of taking action. Specific action taken will depend on the perceived benefits such as efficacy of the action, and barriers such as the costs involved. The model hypothesises that actions with many benefits and few costs are most likely to be chosen. Modifying factors such as demographic (for example age) and socio-psychological variables (for example, social class) are thought to influence these variables.

The presence of cues preceding action are an essential part of the HBM. Cues can be internal, for example an individual may recognise that they are becoming unfit and then take exercise, or external, for example a relative may remark on them becoming overweight and this may prompt a person to take exercise. It is also thought that there is a pre-disposition to respond to cues, with certain individuals more likely to respond then others [18]. More recently, two other variables have been added to the model. These are the value the individual places on health [44] and the individual's beliefs concerning their health locus of control [45]. Health locus of control refers to whether individuals consider that their health is under their own internal control or whether external powerful others/factors govern health. The health locus of control was developed from earlier work by Rotter [46]. In terms of exercise, the following factors are thought to maximise the chance of predicting a person's participation: if they value their health, believe that they have control over their health, perceive themselves to be potentially at risk from an illness (which exercise could prevent/mediate) and can see the benefits of taking part in exercise.

Support for the HBM seems to have derived largely from retrospective studies measuring belief and behaviour concurrently [47]. This may be one reason why the HBM, although not used widely to understand exercise behaviour, when applied in prospective studies has lacked predictive efficiency [33 48 49]. Part of the problem could be that in these studies all HBM components were not included, nor were standardised measures specific to exercise employed. Another answer may lie with the fact that the model was originally developed

to predict a single instance of one specific behaviour. In contrast, exercise comprises a variety of behaviours carried on repeatedly over time, rather than a one off behaviour. Similarly, the HBM model presents a motivational orientation of illness avoidance, whereby perceived severity and susceptibility have to be present before an individual decides to act. Exercise behaviour could be seen in this light. For example patients who have had a heart attack may be involved in a rehabilitation exercise programme. More often however, the reasons for exercising are not as severe and the motivation to exercise may be varied. For example, people may wish to exercise to lose weight, for social reasons, for enjoyment and to feel good. In fact, perceived ill health may be a cue to rest rather than a cue to participate in behaviour involving exertion.

Measurement difficulties have been cited as a particular problem with the HBM, and it has been described by some as more a collection of variables than a formal theory or model [39]. The part of the model which seems to be most useful in understanding exercise adherence or lack of it, are perceived barriers [22]. Other researchers have taken the perceived susceptibility and severity component of the HBM and tried to increase the predictability of the model by attempting to make more explicit the processes involved in making health behaviour decisions. In a rare paper examining late life health behaviour, Rakowski and Hickey [50] add a temporal perspective to the HBM. They suggest that a person's age may be a strong mediating factor determining whether a person engages in a particular health behaviour. They suggest that the interaction between perceived severity of a target condition and actual or perceived time pressure to seek treatment, may have a significant impact on the complexity and scope of one's decision processes when older. However, this addition to the model remains to be tested.

Weinstein [51] suggests that susceptibility can be broken down into five stages in what he calls a precaution adoption process. At stage one, a person has heard about a health hazard (for example that lack of exercise can cause heart disease); at stage two, the person believes that the health problem is important for other people; by stage three personal susceptibility to the health hazard is admitted; at stage four preventive action is started; and stage five is where the person actually maintains the preventive action, or takes precaution.

This model asserts that believing that something is risky for others is an earlier stage than when a person believes they are personally susceptible. So depending on the stage in the process, different factors will be effective in moving the person along. It is anticipated that in the early stages, information about personal risk will be more important than information about how to change behaviour. There is limited evidence to support this approach [52]. However, Weinstein like others, has found that none of the social cognitive variables were effective in predicting behaviour in those who had decided to act, once the behavioural intention had been reached. No other predictor was consistently predictive in prospective studies [2].

3.2.4 A critique of the theory of Self-Efficacy.

The theory of Self-Efficacy (SE) was first proposed by Bandura [19] . The theory states that behavioural change is not solely dependent on a personal belief that a certain behaviour will result in a desirable effect, but also on a belief that one is capable of carrying out that behaviour (SE). The theory places an emphasis on an individual's judgement of their personal capabilities and expectations of succeeding in a particular area. Perceived skill is thought to determine an individual's choice of activity, how much effort they expend and how long they persist in the face of aversive stimuli. SE is thought to be influenced by the perceived presence of relevant skills in the activity area, by past experience/accomplishments, by observing the experiences of others (vicarious learning) and by social persuasion. Increased physiological arousal can be interpreted as an inability to carry out a course of action successfully and can lead to a decrease in personal efficacy or self doubt [54].

Bandura's social cognitive theory is more well known in the field of clinical psychology; like the other theories outlined earlier, it was not specifically developed to understand exercise behaviour. However, it is possible to see how the theory may apply to exercise behaviour. Following the rationale of the model, exercise behaviour is more likely to occur if a person believes they have the skills to take part, if, they previously have taken part and achieved some success, they can observe others' gaining enjoyment and success and they receive support for taking part and finally, if their emotional concern about exhibiting the behaviour is not too high.

There is some limited empirical support for the theory of SE in predicting exercise behaviour [24 55 56]. SE beliefs have been found to distinguish those patients who do not attain their exercise intensity prescription from those who exceed it [57]. SE beliefs are better predictors of exercise compliance than health control beliefs for chronic obstructive lung patients [58] and relate to adoption of vigorous activity in men and adoption/maintenance of moderate activity for middle-aged men and women in unsupervised settings [59]. In one study, correlational analyses revealed a modest but significant difference between SE and regularity of exercise (r=.28) and duration of activity (r=.32) [60]. SE and outcome expectations have significantly discriminated those who adhered to an exercise programme [61]. The predictive power of outcome expectations alone is less clear; one study has shown that only efficacy expectations contributed towards exercise participation in college students [24]. Thus this finding is in disagreement with Bandura's claim, that expectation of future satisfaction influences motivation [62 63], at least in the area of exercise behaviour.

In a comparison between Bandura's theory of SE and the TRA and TPB, the theory of SE was better able to predict exercise participation; SE and self-evaluation of the behaviour significantly contributed to the prediction. The study found that the higher a person's confidence in participating in physical activity and the higher their satisfaction with present activity, the more exercise performed [24]. This finding has been replicated [27].

Conversely, dropouts and compliers have been equally likely to perceive the major benefit of exercise as increased ability for safe exertion [64] and low SE has been related to intention to begin a corporate exercise programme [65]. One of the drawbacks to the theory of SE is the lack of standardised scales applicable to elderly populations. The scales available, and indeed the research carried out have all been developed with either children, college students or middle aged adults.

3.2.5 A critique of the Psychological Model for Physical Activity Participation.

The Psychological Model for Physical Activity Participation was proposed by Sonstroem [20]. It is the first model developed specifically for the prediction of exercise behaviour and contains an integral component which links exercise and consequent physical fitness to self-esteem. In predicting exercise behaviour the model posits that self-perceptions of physical ability (**Estimation** of physical ability) influences an individual's interest in physical activity, (**Attraction** towards exercise participation), and that attraction provides the greater influence on exercise participation. The Estimation scale contains thirty-three items assessing self-perceptions of physical abilities (conceived as a component of global self-esteem), whilst the Attraction scale consists of fifty-four items designed to measure interest in vigorous physical activity.

The model was originally constructed for adolescent boys and appears to have been successful in producing correlational evidence associating physical activity and psychological health with this group. For example, Estimation has been related to physical fitness scores [66-68]. These positive results have not been replicated with adults [69]. Overall the model has been less effective in predicting exercise behaviour than in demonstrating positive correlates of exercise [71].

In general, the model does not appear to have been tested widely. Critics of the model believe that part of the model's failure may lie in the fact that the Estimation and Attraction scales, originally developed for adolescent males, do not generalise well to adults [71]. Although the model has a certain amount of face validity in that estimation of physical ability and attraction towards exercise participation seem necessary components for uptake, these components seem inadequate on their own in explaining an individual's long term attitude toward actually performing exercise.

3.2.6 A critique of the Psychological Theories/Models of Exercise Behaviour.

How far do psychological models of exercise help us understand why some people choose to exercise, whilst others refrain?

All five models attempt to assess the *likelihood* or *expectancy* of someone taking exercise, but do so in different ways; each approach has had differing amounts of success. The TRA and TPB try to predict exercise behaviour via behavioural intention and propose that the multiplicative combination of outcome evaluation, belief strength, normative beliefs and motivation to comply with perceived social pressure will predict exercise behaviour. Whilst the TRA benefited from the

addition of perceived behavioural control (to form the TPB), this addition only served to improve the predictive strength of the model to explain intention to exercise. The TPB is still unable to predict *actual* exercise behaviour in any significant way. One of the most useful parts of the model seems to be the concept of subjective norm or social pressure to perform exercise [22].

The HBM attempts to predict actual exercise behaviour, rather than intention to exercise. It states that if a person is responsive to bodily or social/environmental cues and becomes aware of a threat to their health (perceived susceptibility and severity to ill health) they may choose to exercise if the perceived benefits outweigh the costs. However, the HBM whilst reasonably able to predict health behaviour in other domains [47] does not appear to have transferred well to the area of exercise behaviour. The model contains a certain paradox in that it proposes that a person may choose to increase their physical exertion and take exercise, at a time when their health is not at its best. Exercise behaviour is obviously more complex than this; people may choose to exercise to prevent ill health but there are many other reasons for taking exercise as well. One of the most useful concepts from the model is the importance of perceived barriers to taking exercise [22].

The application of the Precaution Adoption Process model [51] to the HBM goes some way to delineating *how* change occurs, by emphasising personal vulnerability or receptivity factors. However, it fails to take into account the relationship between background, personal and situational variables and still only appears to be able to increase the prediction of intention to exercise as opposed to predicting actual exercise behaviour. This model, like the TRA, TPB and HBM, is still concerned with being predictive and believes exercise behaviour follows a linear design. There is some evidence available which suggests that exercise behaviour may be best represented as a cyclical rather than a linear sequence. That is, many individuals are unable to effect lasting changes or make a firm commitment to exercise/health behaviours with the first attempt, so they may make repeated efforts over time [72-74].

The Psychological Model for Physical Activity Participation is the only model to date which has been developed specifically to predict exercise behaviour. Ironically, it is the most disappointing model out of all the ones described here. It is adventurous in that it tries to incorporate self-esteem (a possible by-product of taking exercise) into the framework. However, part of its downfall is its reliance on large questionnaires measuring Estimation of skills and Attraction to physical activity and its specificity to adolescents.

The most promising psychological model for explaining *why* people take exercise is Bandura's theory of SE. The theory shares a number of similarities with some of the other models outlined here. For example, the theory of SE believes, as does the TPB, that internal factors such as a person's perceived ability to perform a specific exercise is important in determining actual exercise behaviour. The TPB and theory of SE also attribute importance to the role of social persuasion. In common with the HBM, a person must believe that participating in exercise will have a beneficial

outcome, before taking part. Two distinguishing parts of SE theory are the emphases it places on past experiences/accomplishments and on the emotion involved in the behaviour, namely physiological arousal. In studies where SE theory and the TPB have been compared, SE seems better able to predict what conditions need to prevail for exercise behaviour to occur. In addition, physical SE scales can be used in a wide variety of situations requiring physical skills [75]. However, it remains the case, that SE is more able to explain *why* people are exercising when they are already engaged in it rather than predict the conditions prospectively. Since, the theory stresses that a person's sense of mastery is acquired as a result of the cumulative effects of one's efforts, it seems necessary for the theory to try to account in some way for *how* people may get started in the first place. That is, explain how people may encounter and cope with exercise for the first time.

The weakness of the models may be explained in part by the fact that, with the exception of the Psychological Model for Physical Activity, none of the theories were originally developed with the health behaviour, exercise, in mind. As indicated in the introduction, exercise behaviour contains a whole host of behaviours within the generic term. It may be partly the case that non-specific health behaviour models have been applied without regard for this important distinction or, for how this might confound or limit the predictive utility of generalised models.

Exercise behaviour is a unique form of health behaviour; notably biological aspects and the role of physical exertion single it out from other health behaviours. Certainly researchers have drawn attention to the fact that exertion barriers may play a role in discouraging people from taking exercise. For example, there is quite substantial evidence available which suggests that moderate exercise in the form of brisk walking, is more likely to be maintained than more vigorous types of exercise[22 59]. Alternatively, the key to exercise behaviour may lie in concrete feelings of exertional vigour, well-being or intrinsic enjoyment rather than abstract fears about poor health or promises of longevity. If this were the case it may help to explain why the theory of SE is better able to explain exercise behaviour *after* people are engaged in physical activity.

The inadequacy of psychological models to account for exercise behaviour may partly rest at source with the developers of the models. Whereas general agreement exists amongst professionals such as psychologists and epidemiologists concerning who and what behaviour renders a person 'at risk', lay conceptions do not necessarily match these [76]. For example, the whole notion of perceived susceptibility or vulnerability (as outlined in the HBM) is extremely subjective This is a criticism which can be levelled at all social cognitive models of health/exercise behaviour. There may be a mismatch between lay and professional people in terms of their conceptualisations or representations of illness threats. Calls have been made for attention to focus on understanding individual's own implicit models of illness[78], rather than being largely dependent on professional's own

conceptualisations. Recent attempts to do so in the field of HIV research have led to good effect [79].

The fact that the social cognitive models are not placed in a wider context, and as a result do not consider broader social, economic and environmental influences, such as socio-economic status, educational level and age have been cited as other possible reasons for the models to fail to be predictive of health behaviour [80]. Cognition is considered in the models to be the primary determinants of behaviour. Clearly cognition is important, but a person's attitudes, beliefs and thoughts are not the whole story.

3.3 Stepping outside the Psychological Models of Health/Exercise Behaviour: Research examining the Determinants of Exercise Behaviour.

One of the main strengths of researchers examining the determinants of exercise behaviour is the fact that they have not been driven by a specific psychological model and therefore have had the scope to attend to the wider social influences affecting exercise behaviour. Unfortunately, with the exception of the findings from the UK National Fitness Survey [1] (NFS), most of the research has been carried out in North America with the age group eighteen to sixty-four years, using age-neutral questionnaires. This limits the validity and generalisability of the findings. However, the literature may offer some insight (alongside psychological theories and models) into why some people exercise and others do not. In addition, compared to research using psychological models, some attention has been given to elderly samples. A review of these studies may serve to highlight other factors which may be helpful in explaining exercise behaviour.

In the NFS problems with health were mentioned as a frequent barrier to taking more exercise; the less active people reported chronic disease or injury including angina, breathlessness, and heart disease. Physical inability, health risks or injury have been mentioned in other studies[81 82].

The NFS also showed that people who exercise regularly in their youth are more likely to continue or resume exercise in later years and that activity declines with age: 40% of sixty-five to seventy-four year olds were in activity level zero compared to less than 10% of sixteen to twenty-four year olds. There is also a gradual decline in frequency and intensity from fifty-four years onwards with the age group thirty-five to fifty-four years being the most active for women. Although it is worth noting that the average aerobic capacity of the most fit 10% of women aged sixty-four to seventy-five years was higher than the least fit 10% of men aged twenty-five to thirty-four years.

One of the most consistently reported attitudinal barriers to exercise participation is people not regarding themselves as being the 'sporty' type. The NFS found that 24% and 38% of men and women respectively mentioned this. Shyness, feeling

overweight, lack of time and energy are other reasons mentioned for not taking up exercise [81-83].

Improving or maintaining health and fitness, to feel in good shape physically, the opportunity to get outdoors and meet friends, to relax, have fun and enjoyment and to feel a sense of achievement, are all factors reported in the literature as being among the most important motivating reasons for engaging in exercise [81 85 86]. Sex differences have been found. There is a tendency for women to rate looking good, controlling and losing body weight as the most important motivators whereas men rate having fun and relaxing as the most important [81].

Social/environmental factors such as support from friends/ relatives, access to facilities and exercise programme factors such as the range of activities on offer, have also been found to predict exercise participation and adherence [81].

3.3.1 Determinants of Exercise Behaviour Amongst the Elderly.

Whilst it is acknowledged that the age group eighteen to sixty-four years covers a wide age span, it is anticipated that the determinants of exercise for older people outside this group may be different. At present there is insufficient research evidence to confirm this. It is possible that personal attributes including age and health status, knowledge about physical activity and exercise outcomes, and other perceived barriers to taking exercise such as social norms, support and programme access, may be more important factors influencing exercise adherence in an older age group. Studying determinants of physical activity should help in developing programmes of health promotion for older people.

In existing studies which have looked at retirees' perceived incentives and barriers to participation in health promotion activities, interested respondents have been younger, more highly educated and are more likely to have rated their health status as excellent. The perception that one's health was too poor is a frequently mentioned barrier to participation [87 88]. Those retirees who expressed less interest in participating were also found to be less confident of their physical abilities, were unhappy exercising in front of others because of how they perceived their body image and were more worried about potential injuries [87 88].

Safety concerns are amongst the most frequently mentioned barriers to exercise for elderly women. The three barriers most quoted are: concerns about the likelihood of serious injury, the threat of sudden death caused by physical exertion and fears of wearing out the body [88a]. Many elderly women regard exercise as more of a health risk than a health precaution [88b]. In addition, there is evidence that the elderly believe their need for exercise diminishes with age and underrate their own capabilities and abilities [88c]. Some of their worries are well-founded. For example, problems with joints are reported as one of the most common clinical complaints of the elderly with 57% of people over fifty-five years reporting some form of problem with their joints. 24% of these people go on to experience moderate or severe limitation of daily

activities. The most severe cases may be diagnosed as osteoarthritis or degenerative joint disease. A reduction in vision and hearing are also common [88d]. Both of which are needed for effective balance, and to minimise falls. However, most of the elderly's beliefs are contrary to research evidence which suggests that injury from moderate levels of exercise participation is rare [88e]. The risk of injury seems roughly proportional to the amount of exercise that is undertaken per session and per week. It is perhaps not surprising to find that both traumatic and overuse injuries occur less frequently in the elderly, because the elderly are less ambitious exercisers. The exception may be for osteoporotic elderly women who have brittle bones. These women are at increased risk from exercise-related injuries.

Studies on Canadian men and women who are sixty-five years or older show that personal factors such as smoking is related to leisure time inactivity and high drop out of exercise programmes [89]. This negative relationship is enhanced in supervised programmes where high intensity and frequency of activity is expected [90] . It has been shown that elderly men and women who expect little health and fitness value from physical activity will choose to exercise at low frequency and intensity in a supervised programme[91]. Those people who perceive their health as poor are unlikely to join an exercise programme [92]. Perceived gains in both fitness and health have been associated with length of supervised exercise participation among men and women aged sixty-three years. Dropping out was due to a lack of enjoyment [93]. Exercise programme characteristics such as no cost, run close to home and in the day-time have been shown to be vital for success[87].

Supervised attendance, compliance with an exercise intensity prescription and maintenance of a home-based cycling programme have been predicted by low anxiety levels[94]. The elderly perceive facilities to be an important influence on activity participation and home based exercise can facilitate participation [92]. Americans and Canadians aged sixty-five years or older participate at a higher rate in leisure time physical activity than persons aged fifty to sixty-four years. One theory put forward for this is that the older age group have more time available because they have retired from work[95].

Moderate physical activity, compared to sporting fitness activities is associated with a higher rate of adoption and maintenance of physical activity patterns and this is particularly true for women[96]. In supervised exercise programmes in which the intensity of activity is individualised according to fitness levels, adherence is related to activity intensity or duration if injury is not present [97]. Choice of activity has increased exercise participation amongst young adults [98] and it is thought that diversity of types and amounts for people aged sixty-five years and over may also be important predictors of participation for this age group [99].

A consistent predictor of behavioural health change and short term adherence is self-motivation, conceptualised as a behavioral tendency to persevere independent of situational reinforcements [100]. Self-motivation appears to be strengthened when behaviours and social commitments are experienced as originating internally, as

opposed to when they are external such as being dependent on the reinforcement of other people [101].

3.4 Integrating the Research Literature on Determinants of Exercise Behaviour with Psychological Models: increasing an Understanding of Exercise Behaviour .

Compared to the theoretical psychological models of exercise/health behaviour, the research examining the determinants of exercise behaviour could be described as an attempt to provide practical answers aimed at recruiting and keeping participants involved in regular exercise. Certainly, the research strategy seems less coherent at first glance. But what are the consistent themes coming out of the research evidence and how do these compare with the theoretical models outlined earlier?

One of the themes is perceived poor health. It seems that contrary to the prediction made by the HBM, those people who are more at risk of ill health are *more* likely to perceive barriers to exercise and *less* likely to begin taking exercise. This seems to hold true for all age groups. Furthermore, smoking behaviour may serve to further confound perceptions of ill health (for example, breathlessness).

The second theme surrounds the role of past experience of exercise behaviour Those people who took part in exercise during their youth are more likely to resume or continue exercise during all stages of life, although some tailing off of in terms of frequency and intensity of exercise behaviour is noted as people get older, irrespective of past experience. This finding supports part of the theory of SE.

The importance of internal factors such as having confidence in physical abilities (physical SE) and related attributes such as physical energy, shyness and being overweight, research suggests may act as barriers to exercise behaviour. External factors such as access to exercise facilities, social support, choice of exercise including low/moderate intensity activities plus the option of exercising at home seem to be important. Again, similarities between the theory of SE and TPB (in terms of outcome expectancy) can be seen. Further support for the theory of SE can be seen with the finding that feelings of mastery and well-being are cited as reasons why people continue to exercise, once started.

On balance, there seems to be a certain amount of overlap in content between the research generated both inside and outside a theoretical framework. Research suggests that the most promising explanations for exercise behaviour are connected to variables such as health status, past experience and perceived barriers (internal and external) to exercise. If these variables could be measured using a methodology which has been developed specifically for an elderly population, it is possible that a clearer understanding of exercise behaviour could be established.

Thus the following chapter, outlines the development of a methodology for measuring exercise and health-related behaviour in the elderly, in a valid and reliable way: the development of the London Health and Fitness Questionnaire (LHFQ). This questionnaire

was primarily developed in preparation for study three in this thesis (presented in chapter six), which attempts to:

1. increase a knowledge base of the factors that lead some elderly women to exercise and others not, in a large UK sample;

2. examine whether the determinants for exercise behaviour vary according to exercise type. That is, whether different factors such as barriers to exercise, past experience, a person's age, socio-economic and health status may influence participation in domestic and sporting physical activity levels.

3.5 REFERENCES.

1. Sports Council and Health Education Authority. *The Allied Dunbar National Fitness Survey*. London: Ancient House Press 1992.

2. Johnston, M. Current trends in health psychology. *The Psychologist*, 1994; **7** (3):114-118.

3. Office of Population Census and Surveys. *General House-hold Survey*. London: HMSO, 1992.

3a. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H. and Arie, T. levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

4. Martin, J.E. and Dubbert, P.M. Exercise applications and promotion in behavioural medicine: current status and future directions. *Journal of Consulting and Clinical Psychology, 1982;* **50** (6): 1004-1017.

5. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1:** 237-267.

6. Minor, M.A. and Brown, J.D. Exercise maintenance of persons with arthritis after participation in a class experience. *Health Education Quarterly*, 1993; **20**(1):83-95.

7. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., and Pambianco, G. A Randomised exercise trial in older women: increased activity over two years and factors associated with compliance. *Medicine and Science in Sports and Exercise*, **1986; 7:** 557-562.

8. Ajzen, I. From intentions to actions: a theory of planned behaviour. In J. Kuhl and J. Beckman (eds.). *Action-control: from cognition to behaviour.* Heidelberg, Germany: Springer, 1985. pp 12-39.

9. Bandura, A. *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice Hall, 1986.

10. Bauman, A., Owen, N. and Rushworth, R.L. Recent trends and socio-demographic determinants of exercise participation in Australia. *Community Health Studies*, 1990; **14**:19-26.

11. Marti, B. Salonen, J.T., Tuomilehto, J. and Puska, P. 10 year trends in physical activity in the eastern Finnish adult population: Relationship to socio-economic and lifestyle characteristics. *Acta Medica Scandinavica*, 1988**; 224** :195-203.

12. Uitenbroek, D.G. Relationships between changes in health and fitness and the perception of exercise. *Research Quarterly for Exercise and Sport*, 1993; **64 (3)**: 343-347.

13. Family Heart Study Group. Randomised controlled trial evaluating cardiovascular screening and intervention in general practice:principal results of British family heart study. *British Medical Journal*, 1994; **308**: 313-20.

14. Imperial Cancer Research Fund OXCHECK Study Group. Effectiveness of health checks conducted by nurses in primary care: results of the OXCHECK study after one year. *British Medical Journal*, 1994; **308**: 308-12.

15. Secretary of State for Health. *The health of the nation. A strategy for health in England.* London: HMSO, 1991.

16. Fishbein, M. and Ajzen, I. *Belief, attitude, intention and behaviour: an introduction to theory and research.* Reading, MA: Addison-Wesley, 1975.

17. Ajzen, I. (1985) From intentions to actions: a theory of planned behaviour. In J. Kuhl and J. Beckman (eds.). *Action-control: from cognition to behaviour.* Heidelberg, Germany: Springer, pp 12-39.

18. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508

19. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. *Psychological Review*, 1977; **84**: 192-215

20. Sonstroem, R.J. Physical estimation and attraction scales: rational and research. *Medicine and Science in Sports*, 1978; **10**: 97-192.

21. Ajzen, I. and Fishbein, M. *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, New Jersey: Prentice Hall, 1980.

22. Dishman, R.K. Sallis, J.F., Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**: 158-171.

23. Heinzelmann, F. and Bagley, R.W. Response to physical activity programmes and their effects on health behaviour. *Public Health Reports*, 1970; **85**: 905-911.

24. Dzewaltowski, D.A. Toward a model of exercise motivation. *Journal of Sport and Exercise Psychology*, 1989; **11**: 251-269.

25. Godin, G., Valois, P., Shephard, R.J. and Desharnais, R.J. Prediction of leisure-time exercise behaviour: a path analysis (LISREL V) model. *Journal of Behavioural Medicine*, 1987; **10**: 145-158.

26. Mullen, P.D., Hersey, J.C. and Iverson, D.C. Health behaviour models compared. Social *Science and Medicine*, 1987; **24**: 973-981.

27. Dzewaltowski, D.A., Nobel, J.M. and Shaw, J.M. Physical activity participation: social cognitive theory versus the theories of reasoned action and planned behaviour. *Journal of Sport and Exercise Psychology*, 1990; **12**: 388-405.

28. Wurtele, S.K. and Maddux, J.E. Relative contributions of protective motivation theory components in predicting exercise intentions and behaviour. *Health Psychology*, 1987; **6**: 453-466.

29. Department of Health and Human Services. *Promoting health/preventing disease: objectives for the nation.* Washington, DC: US. Government Printing Office, 1980.

30. Godin, G., Shephard, R.J. and Colantonio, A. The cognitive profile of those who intend to exercise but do not. *Public Health Reports*, 1986; **101**: 521-526.

31. Riddle, P.K. Attitudes, beliefs, behavioural intentions, and behaviours of women and men toward regular jogging. *Research Quarterly for Exercise and Sport*, 1980; **51**: 663-674.

32. Pender, N.J. and Pender, A.R. Attitudes, subjective norms and intentions to engage in health behaviours. *Nursing Research*, 1986; **35**: 15-18.

33. Olson, J.M. and Zanna, M.P. *Predicting adherence to a programme of physical exercise: an empirical study.* Toronto: Government of Ontario Ministry of Tourism and Recreation, 1982.

34. Godin, G and Shephard, R.J. Physical fitness promotion programmes: effectiveness in modifying exercise behaviour. *Canadian Journal. of Applied Sport Science*, 1983; **8:** 104-113.

35. Godin, G. and Shephard, R.J. Psycho-social predictors of exercise intentions among spouses. *Canadian Journal of Applied Sport Science*, 1985; **10**: 36-43.

36. Davis, K.E., Jackson, K.L., Kronenfeld, J.J. and Blair, S.N. Intent to participate in worksite health promotion activities: a model of risk factors and psycho-social variables. *Health Education Quarterly*, 1984; **11**: 361-377.

37. Godin, G., Shephard, R.J., Davis, G.M. and Simard, C. prediction of exercise in lower-limb disabled adults: the influence of cause of disability (traumatic or attraumatic). *Journal of Social Behaviour and Personality*, 1989; **4**: 615-623.

38. Kendzierski, D. Decision making versus decision implementation: an action control approach to exercise adoption and adherence. *Journal of Applied Social Psychology*, 1990; **20**: 27-45.

39. Oliver, R.L.and Berger, P.K. A path analysis of preventive health care decisi on models. *Journal of Consumer Research*, 1979; **6**: 113-122.

40. Gatch, C.L. and Kenzierski, D. Predicting exercise intentions: the theory of planned behaviour. *Research Quarterly for Exercise and Sport*, **61** (1): 100-102, 1990.

41. Courneya, K.S. and McAuley, E. Predicting physical activity from intention: conceptual and methodological issues. *Journal of Sport and Exercise Psychology*, 1993; **15:** 50-62.

42. Warshaw and Davis (1985) in K.S. Courneya, and E. McAuley, Predicting physical activity from intention: conceptual and methodological issues. *Journal of Sport and Exercise Psychology*, 1993;**15:** p 51-52.

43. Daltroy, L.H. and Gordon, G. Spouse intention to encourage cardiac patient participation in exercise. *American Journal of Health Promotion*, 1989; **4**: 12-17.

44. Lau, R.R., Hartman, K.A. and Ware, J.E. Health as a value: methodological and theoretical considerations. *Health Psychology*, 1986; **5**:25-43.

45. Wallston, K.A. and Wallston, B. Health locus of control scales. In Lefrourt, H. (Ed.) *Research with the locus of control construct*. Volume One. New York: Academic Press, 1981.

46. Rotter, J.B. Generalised expectancies for internal versus external control of reinforcement. *Psychological Monographs*, 1966; **80**: 211.

47. Janz, N.K. and Becker, M.H. The health belief model: a decade later. *Health Education Quarterly*, 1984;**11**: 1-47.

48. Lindsay-Reid, E. and Osborne, R.W. Readiness for exercise adoption. *Social Science and Medicine*, 1980; **14A**: 139-146.

49. Tirrel, B.E. and Hart, L.K. Patient perceptions in critical care: the relationship of health beliefs and knowledge to exercise compliance in patients after coronary bypass. *Heart and Lung*, 1980; **9**: 487-493.

50. Rakowski, W. and Hickey, T. Late life health behaviour: integrating health beliefs and temporal perspectives. *Research on Ageing*, 1980; **2 (3)**: 283-308.

51. Weinstein, N.D. The precaution adoption process. *Health Psychology* 1988; **7(4)**: 355-86.

52. Weinstein, N. and Sandman, P.M. A model of the precaution process: evidence from the home randon testing. *Health Psychology*, 1992; **11**: 170-180.

53. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. Psychological Review, 1977; **84**: 192-215

54. Dryden, W. and Newell, R. *Adult clinical problems: a cognitive-behavioural approach*. London: Routledge, 1991.

55. Atkins, I., Kaplan, I.M., Timms, R.M., Reinsch, S and Lofback, K. Behavioual exercise programmes in the management of chronic obstructive pulmonary disease. *Journal of Consulting and Clinical Psychology*, 1984; **52**: 591-603.

56. Ewart, C.K., Stewart, K.J., Gillilian, R.E. and Kelemen, M.H. Self-efficacy mediates strength gains during circuit weight training in men with coronary artery disease. *Medicine and Science in Sports and Exercise*, 1986; **18**: 531-540.

57. Gilliam, T.B., Chopra, A.K., Keleman, M.H., Stewart, K.J., Ewart, C.K. et al. Prediction of compliance to target heart rate during walk-job exercise in cardiac patients by a self-efficacy scale. *Medicine and Science in Sports and Exercise* (abstract), 1984; **16**(2): 115.

58. Kaplan, R.M., Atkins, C. and Reinsch, S. Specific efficacy expectations mediate exercise compliance in patients with COPD. *Health Psychology*, 1984**; 3**: 223-242.

59. Sallis, J.F., Haskell, W.L., Fortmann, S.P., Vranizan, K.M., Taylor, C.B., and Solomon, D.S. Predictors of adoption and maintenance of physical activity in a community sample. *Preventive Medicine,* 1986;**15**: 331-341.

60. McCauley, E. and Jacobson, L. Self-efficacy and exercise participation in sedentary adult females. *American Journal of Health Promotion*, 1991; **5** (3): 185-191.

61. Desharnais, R., Bouillon, J. and Godin, G. Self-efficacy and outcome expectations as determinants of exercise adherence. *Psychological Reports*, 1986; **59**: 1155-1159.

62. Bandura, A. and Cervone, D. Self-evaluative and self-efficacy mechanisms governing the motivational effects of goal systems. *Journal of Personality and Social Psychology*, 1983; **45**: 1017-1028.

63. Bandura, A. and Cervone, D. Differential engagement of self-reactive influences in cognitive motivation. *Organisational Behaviours and Human Decision Processes*, 1986; **38**: 92-113.

64. Sanne H.M. Exercise tolerance and physical training of non-selected patients after myocardial infarction. *Acta Medica Scandinavica (Suppl.)*, 1973; **551**: 1-124.

65. Davis, K.E., Jackson, K.L., Kronenfeld, J.J. and Blair, S.N. Intent to participate in worksite health promotion activities: a model of risk factors and psycho-social variables. *Health Education Quarterly*, 1984; **11**: 361-377.

66. Dishman, R.K. Aerobic power, estimation of physical ability, and attraction to physical activity. *Research Quarterly for Exercise and Sport.*, 1978; **49**: 285-292.

67. Sonstroem, R.J. Attitude testing examining certain psychological correlates of physical activity. *Research Quarterly*, 1974; **45**: 93-103.

68. Sonstroem, R.J. The validity of self- perceptions regarding physical and athletic ability. *Medicine and Science in Sports*, 1976; **8**: 126-132.

70. Dishman, R.K. and Gettman, L.R. Psychobiologic influences in exercise adherence. *Journal of Sport Psychology*, 1980; **2**: 295-310.

71. Dishman, R.K. *Exercise adherence: its impact on public health.* Champaign, IL: Human Kinetics.

72. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1(3)**: 237-267.

73. Dishman, R.K. Exercise adherence and habitual physical activity. In Morgan, W.P. and Goldston, S.N. (Eds.) *Exercise and mental health.* Washington DC: Hemisphere, 1986. pp 57-83.

74. Prochaska, J.O. and DiClemente, C.C. Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 1983; **51**: 390-395.

75. Ryckman, R.M., Robbins, M.A., Thornton, B. and Cantrell, P. Development and validation of a physical self-efficacy scale. *Journal of Personality and Social Psychology*, 1982; **42**: 891-900.

76. Ingham, I., Bennett, P. Health psychology in community settings:models and methods. In Bennett, P., Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood Press, 1991. pp 35-61.

78. Leventhal, H. and Nerenz, D. The assessment of illness cognition. In Karoly, P. (Ed.) *Measurement strategies in health psychology*. New York: Wiley, 1985.

79. Aggleton, P., Homans, H. and Warwick, I. *Health Education, sex and AIDS.* Paper delivered at the International Society of Education Conference, Birmingham, 1987.

80. Winett, R.A. Ecobehavioural assessment in life-styles:concepts and methods. In Karoly, P. (Ed.) *Measurement strategies in health psychology*. New York: Wiley, 1985.

81. Dishman, R.K. Sallis, J.F., Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**: 158-171.

82. Godin, G., Shephard, R.J. and Colantonio, A. The cognitive profile of those who intend to exercise but do not. *Public Health Reports*, 1986; **101**: 521-526.

83. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., and Pambianco, G. A Randomised exercise trial in older women: increased activity over two years and factors associated with compliance. *Medicine and Science in Sports and Exercise*, **1986; 7:** 557-562.

84. Ostrow, A. C. and Dzewaltowski, D.A. Older adults' perceptions of physical activity participation based on age role and sex role appropriateness. *Research Quarterly for Exercise and Sport*, 1986; **57**: 167-169.

85. Sports Council and Health Education Authority. *The Allied Dunbar National Fitness Survey*. London: Ancient House Press 1992.

86. Vitulli, W.F. and DePace, A.N. Manifest reasons for jogging and not for jogging. *Perceptual and Motor Skills*, **1992; 75**: 111-114.

87. Connell, C.M., Davies, R.M., Rosenberg, A.M., and Fisher, E.B. Retiree's perceived incentives and barriers to participation in health promotion activities. *Health Education Research*, 1988; **3**(3): 325-330.

88. Howze, E.H., Smith, M., DiGilio, D.A. Factors affecting the adoption of exercise behaviour among sedentary older adults *Health Education Research*, 1989; **4** (2): 173-180.

88a. Siscovick, D.S. Risks of exercising: sudden cardiac death and injuries. In Bouchard, C., Shephard, R.J., Stephens, T., Sutton, J.R. and McPherson, B.D. (Eds.). *Exercise, fitness and health*. Illinois: Human Kinetic Publishers, 1988, pp 707-714.

88b. Shephard, R.J. *Physical activity and aging* (2nd edition). London: Croom Helm Publishing, 1987.

88c. Deobil, S.J. Physical fitness for retirees. *American Journal of Health Promotion*, 1989; **4(2)**: 85-90.

88d. Royal College of Physicians. Medical aspects of exercise: benefits and risks. *Journal of the Royal College of Physicians of London*, 1991; **25 (3)**: 193-196.

88e. Munnings, F. Exercise and oestrogen in women's health: getting a clearer picture. *The Physician and Sports Medicine*, 1988; **16**: 152-161.

89. Faulkner, R.A., Bailey, D.A., and Mirwald, R.L. The relationship of physical activity to smoking characteristics in Canadian men and women. *Canadian Journal of Public Health, 1987;* **78**: 155-160.

90. Stones, M.J., Kozma, A., and Stones, L. Smoking behaviour and participation in organised exercise. *Canadian Journal of Public Health, 1986;* **77**: 153-154.

91. Sidney, K.H., Shephard, R.J. Attitude toward health and physical activity in the elderly: effects of a physical training programme. *Medicine and Science in Sports*, 1987; **8**: 246-252.

92. Shephard, R.J. *Physical activity and aging* (2nd edition). London: Croom Helm, 1987.

93. Stones, M.J., Kozma, A. and Stones, L. Fitness and health evaluations by older exercisers. *Canadian Journal of Public Health*, 1987; **78**:18-20.

94. Godin, G and Shephard, R.J. Physical fitness promotion programmes: effectiveness in modifying exercise behaviour. *Canadian Journal. of Applied Sport Science*, 1983; **8:** 104-113.

95. The Perrier Study. *Fitness in America*. New York: Perrier-Great Waters of France inc., 1979.

96. Sallis, J.F., Haskell, W.L., Fortmann, S.P., Vranizan, K.M., Taylor, C.B., and Solomon, D.S. Predictors of adoption and maintenance of physical activity in a community sample. *Preventive Medicine,* 1986;**15**: 331-341.

97.. Pollock, M.L. Exercise prescription for fitness and adherence. In Dishman, R.K. (Ed.), *Exercise adherence: its impact on public health*. Champaign. Illinois: Human Kinetics, 1988. pp 259-278.

98. Thompson, C.E., and Wankel, L.M. The effects of perceived choice upon frequency of exercise behaviour. *Journal of Applied Social Psychology*, 1980;**10**:436-443.

99. Department of Health and Human Services. *Promoting health/preventing disease: objectives for the nation.* Washington, DC: US Government Printing Office, 1980.

100. Dishman, R.K., Ickes, W. and Morgan, W.P. Self-motivation an adherence to habitual physical activity, *Journal of Applied Social Psychology*, 1980;**2**: 115-132.

101. Sensenig, P.E. and Cialdini, R.B. Socio-psychological influences on the compliance process: implications of behavioural health. In Matarazzo, J.D., Weiss, S.M., Herd, J.A., Milner, N.E. and Weiss, S.M. (Eds.), *Behavioural Health : a handbook of Health Enhancement and Disease prevention*. New York: John Wiley, 1984. pp 384-392.

CHAPTER FOUR

STUDY ONE. TOWARDS A METHOD FOR ASSESSING EXERCISE BEHAVIOUR, BELIEFS AND ATTITUDES OF THE ELDERLY: THE DEVELOPMENT OF THE LONDON HEALTH AND FITNESS QUESTIONNAIRE

4.1 INTRODUCTION.

An interest by researchers in the measurement of exercise behaviour in general populations is notable from the 1960s onwards. Since this time, over thirty different tools have been identified for measuring activity [1]; methods include calorimetry, time motion analysis, job classification, pedometers, diaries and questionnaires. The assessment of exercise behaviour by questionnaire has been and still is, the most popular and practical method of quantifying physical activity levels in large scale population surveys. Physical activity questionnaires are often used in large scale surveys as a proxy for a direct measure of fitness.

Research interest in developing questionnaires to measure physical activity in a valid and reliable way, seems set to stay. Some of the reasons for this are, the growing evidence of the importance of physical activity in preventive medicine [2 3 4]; the necessity of establishing a knowledge base of activity behaviour for forming health promotion policies [5] and an emphasis on evaluating the benefits of health promotion initiatives (many of which contain an exercise component) [6 7].

Existing questionnaires measure a range of activity types, including habitual activity [14], leisure-time activity [10 13], habitual and leisure-time activity [12] occupational and leisure-time activity [8 9 11 19] and occupational, habitual and leisure time activity [17]. Whether self-completed or interviewer-administered, they all rely on gathering information on activity behaviour using respondents' own reports. Questionnaires range in length from a 99 item checklist [9], through to a questionnaire including just one item [20]. There is a small amount of evidence to suggest some researchers have adapted existing questionnaires for use in their own studies [13 16] but in the main there are a plethora of questionnaires available which all claim to measure physical activity, but in different ways.

Unfortunately at present there is no standardised methodology for assessing physical activity in the elderly. Many of the existing questionnaires available for measuring exercise behaviour are unsuitable for use with the elderly. This is because the majority of questionnaires have been developed by researchers for specific use in large-scale epidemiological community studies to examine the relationship between physical activity, coronary heart disease and early mortality amongst middle-aged males. Consequently, figures attesting to the reliability and validity for these questionnaires have been generated almost exclusively for this specific population and questionnaire content is largely inappropriate.

Questions pertaining to occupational activity and job classification are redundant with a retirement population. Similarly, questionnaires for the elderly need to concentrate on measuring lighter recreational and habitual activities rather than vigorous ones. Research has highlighted the problem of obtaining reliable data if age-neutral as opposed to age-specific physical activity questionnaires are used. It has been found that estimates of physical activity amongst the elderly using age neutral questionnaires has underestimated the amount of time spent on physical activities by approximately two hours and twenty minutes per day [21]. The error was most noticeably marked for least strenuous physical

activities such as house-work and sedentary sport/recreational activity such as golf and gardening . These activities are most likely to be engaged in by elderly people [5]. In addition, it is now thought that reported associations between education and physical activity [40] in elderly samples may be in part, a function of the higher educated respondents being more able to complete complex activity questionnaires designed for a younger population, rather than a real difference existing between physical activity behaviour and education.

Some recommendations for producing more accurate data from activity questionnaires for the elderly include: giving attention to demands of memory recall, eye-sight and writing abilities of recipients; using a categorical response format which minimises the need for writing and is presented in large print; and precise definitions of activities detailing frequency and intensity using a short recall period [21].

4.1.1 The need for an age-specific questionnaire for the elderly - the development of the London Health and Fitness Questionnaire.

The author wanted to examine the relationship between exercise behaviour and variables such as health status and personal beliefs and attitudes towards exercise in a large population of elderly women. In terms of methodology, a self-complete questionnaire which could collect this kind of data in a valid and reliable way using a postal survey method was desired.

As intimated earlier, the majority of questionnaires available are not suitable for use with the elderly. This is because: they have often been designed specifically for measuring occupational and leisure-time activity amongst middle-aged males in studies examining the relationship between CHD and activity; correlation coefficients reported in studies examining the reliability and validity of existing activity questionnaires pertain largely to male, middle-aged populations; vigorous physical activity rather than the domains of activity most likely to be performed by older people such as lighter, non-strenuous physical activities are emphasised, (without this, activity levels for the elderly may be underestimated); they ask about occupational activity and this is not appropriate for elderly retired populations; and special design features such as closed response categories, short recall periods and large print are important for the elderly.

The review of the literature revealed that there have been few attempts to capitalise on the use of existing activity questionnaires. With this in mind, an attempt was made to find a suitable existing questionnaire and adapt that, rather than starting from scratch by developing a new one.

Of the few existing questionnaires which have been used to assess physical activity in older people, many of these were originally designed for use with younger populations [5 16 40]. One notable exception has been an interviewer administered questionnaire containing 318 items and designed to collect information on customary physical activity amongst the elderly [41]. Customary physical activity was defined as those activities which were carried out for a minimum of three minutes, at least weekly, in the previous six weeks. This

questionnaire aptly focuses on low intensity exercise in a sample of elderly people, however the interview schedule was thought to be too long and complex for use in a postal questionnaire.

Another activity questionnaire considered, but in the end thought not to be suitable, was a physical activity questionnaire for the elderly developed in Holland by Voorrips and colleagues [16]. This questionnaire was originally designed by Dutch colleagues and validated in young adults [17]. Although reported reliability and validity were satisfactory, the main problem was that the questionnaire asks respondents to report on habitual activity in detail over a twelve month period, which was thought to be too complex and likely to produce not only a poor response rate but inaccurate data. In addition, all reports of reliability and validity were conducted on Dutch samples of elderly men and women; the possibility of cultural differences means that further testing for suitability in this country would be needed. In addition, the questionnaire is limited because it only collects information on physical activity.

The existing tool which seemed to be closest to the one needed to conduct the proposed study was the questionnaire used in a national fitness survey conducted in England and Wales[5].

4.1.2 The National Fitness Survey.

The National Fitness Survey (NFS) was launched in 1990. One of the objectives of the NFS was to provide a picture of physical activity and health in a representative sample of the nation (approximately 12,000 people) aged sixteen through to seventy years plus. In addition, this national survey aimed to provide researchers with a tested and validated method of conducting local health surveys in their own populations.

There were a number of things which appealed in particular about this questionnaire. First, it was developed for use in the UK, it had a separate part to be completed with older people and reports of reliability and validity were satisfactory. In addition, it was designed to collect information on socio-demographic information, health status, personal health beliefs, health-related attitudes and behaviour, and barriers to taking more exercise *as well as* physical activity; these extra variables were considered important to include because of their potential contribution to determining activity behaviour [39]. By using this questionnaire it would be possible to make some comparisons between the two data sets as similar information would be collected. Furthermore there was a chance to contribute towards the process of developing a more standardised methodology of measuring physical activity in older people.

A full discussion describing the components of the NFS, why they were included and how the questionnaires were tested for validity and reliability can be found in the literature [5] and won't be revisited in great detail in this chapter.

4.2 METHOD.

Some adaptations and further testing of reliability and validity of the questionnaire were necessary. The main reasons for the adaptations were that the NFS questionnaire was designed to be interviewer-administered and a self-complete postal questionnaire was needed. It was also decided to include a section developed for use with younger adults on health beliefs, attitudes and barriers because of the potential relationship of these variables with exercise behaviour [39].

Questions were used from the followings sections of the interview schedules used in the NFS: past and current exercise behaviour, personal beliefs, attitudes and perceived barriers towards exercise, health-related behaviour, health status and socio-demographic details.

Physical activity was grouped into three basic categories: home activities (for example, house-work and gardening); habitual activity (for example, walking for errands and climbing stairs); and sports/recreational activities (for example, swimming, cycling and bowls). Information on activity type, frequency, duration and intensity were collected so that individuals could be later categorised into activity groups rather than make an estimate of their total energy expenditure.

Information on physical activity behaviour was collected because it plays a part in determining current fitness levels and future health [41a], and because of its potential relationship to other variables in the elderly such as health status and socio-economic status [41b]. Information on past participation in sports such as exercise done at school and after leaving school were included because early participation is thought to be strongly influential of later involvement in sports participation [5 41c]. Questions about perceived barriers were included because of their link with attitudinal information [43 43a].

As far as possible the wording of the questions was kept the same. However, there was a need to make two adaptations to the existing schedule. Firstly the NFS asks about the type, amount and intensity of current exercise performed over the last four weeks prior to the interview. The LHFQ was to be used specifically with an older population and to be completed without any prompts from an interviewer. It was decided that if amount and intensity were confined to the previous week, the reliability of the information being recalled would be improved and less time and effort would be needed to record the answers. In addition, respondents were asked to reply using specific time points to classify how much exercise they had done in the last week. For example the time points, less than one hour, less than two hours and so on were used, as opposed to asking for an open ended time response.

The second main alteration centred around the questions about past participation in sports. The NFS questionnaire asks people to rate the amount and type of continuous regular exercise activity they have carried out over any two year period since leaving school. This section was not included because it would be too difficult to answer without interviewer prompts and problems with reliability were anticipated.

The validity and reliability of the questionnaire was carried out primarily in two stages - both of which involved testing the questionnaire in postal surveys of older people.

4.2.1 Development of the LHFQ: Stage one.

The questionnaire was posted to a random sample of 130 women of pensionable age, drawn from the computerised age/sex register of a General Practice in Wapping, East London. It was accompanied by a covering explanatory letter and a stamped addressed envelope. Non-respondents were followed up with two further re-mailings after three and six weeks.

Test re-test reliability

A sub-sample of thirty respondents were visited and the questionnaire was administered by the author, a week later. Test-retest reliability of the questionnaire was analysed using Cohen's kappa (κ statistic).

Construct validity

Two specific types of activity were added to the questionnaire to provide a simple internal validity check with other questions in the questionnaire: leaving the house daily ('going out') and walking twenty to thirty minutes on most days in the last month ('organised activity'). Construct validity of the questionnaire was examined by comparing the exercise behaviour, personal health beliefs and attitudes among subjects who went out daily and those who did not; those less than and older than the average age of the sample; and those who said they did and did not take a daily brisk walk.

4.2.2 Development of the LHFQ: Stage two.

The second questionnaire incorporated computerised form design, a formal title and a logo. This questionnaire was used in a survey of a random selection of members belonging to the Marks and Spencer Retirement Service Association (RSA) in Norwich (n=118). RSAs from other Marks and Spencer area groups were going to form the sample in study three, so this provided an ideal opportunity to test the questionnaire on a sample from a similar population. Questionnaires were posted with a personalised introductory letter which included an assurance of confidentiality, and a stamped addressed envelope. Non-responders were followed up with two repeat mailings.

Criterion validity

Criterion validity was tested by randomly selecting sixteen people from the group to keep an exercise diary for a week. In the diary, they were asked to record the amount and type of exercise they did each day. When the diary was completed and returned, these people were then sent a questionnaire to complete so that a comparison could be made between the two sets of answers. There was a time delay of one week between receiving the diaries and sending the questionnaire.

Test re-test reliability

Reliability was tested using a test-retest design in which nineteen people were randomly asked from the group to complete a second identical questionnaire after they had returned their first one. Also included in this design were a further twelve people who were randomly selected to be interviewed face-to-face, so that a comparison could be made between their written and verbal answers.

There was an interval of two weeks between sending the first and second questionnaires and an interval of one month between receiving the first questionnaire and carrying out the set of interviews.

4.3 RESULTS.

4.3.1 Development of the LHFQ: Stage one.

Of the 130 subjects sent a questionnaire, six had moved house and one had died, leaving an effective sample of 123. Eighty-three questionnaires were returned, providing a response rate of 68%. The median age of respondents was sixty-seven years (with a range of sixty to eighty-nine years). The majority were white (91%) and living with other household members (64%).

Kappa coefficients of agreement between postal and interview administration were acceptable but lowest for personal beliefs about the benefits of exercise and highest for exercise behaviour. The correlations between hours spent on domestic activity and sport/recreational activity were high and recorded as 0.92 and 0.76 respectively. The mean (sd) differences in hours between postal questionnaire and interview assessments for the domestic and sporting/recreational activities were -.06 (2.2) hours and 0.1 (1.4) hours respectively. Kappa values are shown in table 4.1.

Table 4.1 **The concordance between responses from self-completed and interview administered versions of the London Health and Fitness Questionnaire.**

Topic	Kappa (κ)
Perceived health and fitness	
Self assessed health	0.63
Self assessed fitness	0.56
Could walk a mile	0.83
Activities undertaken	
Going out of the home	1.00
Walking 20/30 minutes a day	0.54
Organised activity	1.00
Social activity	0.79
Personal health beliefs/attitudes	
Do you exercise enough to keep fit ?	0.22
Is exercise beneficial in old age ?	0.45

Personal exercise beliefs and attitudes towards exercise were more positive and participation in all forms of regular exercise were higher in those subjects who went out each day, those who were younger and those who took a daily walk. These results are recorded in table 4.2.

Table 4.2 **The construct validity of the London Health and Fitness Questionnaire.**

	Organised activity		Going out Daily		Daily brisk walk		Age	
	Yes	No	Yes	No	Yes	No	<69	70+
Self-assessed health /fitness in %								
Good / average health	78	45	52	33	48	48	52	46
Very/fairly fit	100	76	89	44	91	59	86	72
Able to walk a mile	80	43	60	0	62	18	61	28
Do enough exercise	80	59	69	27	69	46	61	61
Duration of activity in hours								
Domestic activity	8.1	6.5	9.8	3.2	11.5	6.2	8.4	4.7
Sport/recreational	3.3	1.2	2.4	0.8	3.9	1.1	3.5	2.2
Attitudes: % agreeing								
I'm not the sporty type	33	65	60	64	50	63	64	58
I haven't got the time	22	33	33	25	33	27	38	19
I'm too old	0	40	21	80	21	59	16	65
I have a disability that stops me	11	50	34	85	39	55	34	60
I haven't got the energy	10	59	40	92	40	74	41	67

4.3.2 Development of the LHFQ: Stage two.

108 people returned their questionnaires which gave a response rate of 93%. Most of the sample were women (94%) and the mean age of respondents was sixty-five years (with a range of fifty to eighty-four years). Most members had worked in the capacity of sales assistants (64%), were married (70%) and owned their own homes (73%). The demographic details of this group were broadly similar to the general population[44].

A comparison of the RSA group with a group identified in the General House-hold Survey (GHS)[44] was made. Both groups were shown to be similar, with two exceptions. The Marks and Spencer RSA group has a lower school leaving age and fewer educational qualifications than the general population. These results can be seen in appendix B.

The validity and reliability concordance figures for stage two of the development of the LHFQ can be seen in Table 4.3.

Table 4.3 **Concordance between LHFQ answers and responses from interview, repeat administration and exercise diary. Figures are values of Cohen's Kappa (κ).**

	INTERVIEW	REPEAT QUESTIONNAIRE	EXERCISE DIARY
PERCEIVED HEALTH AND FITNESS			
Health	1.0	1.0	NA
Fitness	1.0	1.0	NA
Able to walk a mile ?	1.0	.76	NA
Able to run a mile ?	1.0	1.0	NA
Able to climb 2 flights of stairs ?	.63	1.0	NA
PERSONAL BELIEFS SCORE	.78	.78	NA
CURRENT BEHAVIOUR			
Doing house-work	1.0	1.0	1.0
Hours of House-work	1.0	1.0	1.0
Doing errands	1.0	1.0	1.0
Hours of errands	1.0	.65	.83
Gardening	1.0	.86	1.0
Hours of gardening	.84	.86	1.0
Recreational exercise	1.0	.85	1.0
Hours of recreational exercise	1.0	.86	.65
PAST BEHAVIOUR			
Sport done at school	.47	.58	NA
BARRIERS TO EXERCISE			
Range of questions	.3 - 1.0	.63 - 1.0	NA

Where N/A applies under the diary section, it means that the information was not asked for.

The results obtained from the analysis of the sixteen returned diaries suggest that there is a high consistency between reporting exercise activity in the diary and in the pilot questionnaire one week later. The lowest kappa is recorded for number of hours spent doing errands and recreational exercise.

The results from the face-to-face interviews show that there is a close correspondence between the interview answers and the self-report questionnaire. However some problems were highlighted. The lowest kappas were once again found on the items where respondents were asked to classify past exercise activity performed at school and on the questions asking about current barriers to exercise.

Additional comments given by people during the interviews suggested that the questionnaire contained high face validity, and that the questionnaire format was easy to understand and complete.

4.4 DISCUSSION

4.4.1 Summary of findings.

This study set out to develop a valid and reliable postal questionnaire which could measure physical activity behaviour and variables such as exercise attitudes, beliefs and other health-related behaviour, in an elderly population. It was necessary to develop a new questionnaire because existing ones are largely unsuitable. Since activity questionnaires have historically been developed for use with male, middle-aged samples to study the epidemiology of coronary heart disease and included questions on occupational and vigorous exercise activity, which is inappropriate for an elderly, retired population. Rather than start from scratch with designing a new questionnaire, the interview schedules used in the National Fitness Survey, conducted in the UK, were adapted and tested in two studies with elderly samples.

The results obtained from testing the London Health and Fitness Questionnaire (LHFQ) for validity and reliability are encouraging. The response rates for the postal survey questionnaires were reasonable with 68% and 93% being recorded for studies one and two, respectively. Kappa figures for re-test reliability for stage one were lowest for personal beliefs about exercise (for example, κ = .22 and .45) and highest for reports of daily activity behaviour (κ =1.0). In stage two, kappa values were satisfactory for number of hours spent on carrying out errands and recreational exercise (κ =1.0); kappa values were lowest when respondents were asked to report past exercise behaviour performed at school and shortly after leaving school (κ = .47 and .58) and identifying the barriers which prevented them from participating in more exercise (for example .63 -1.0).

Some similarities can be seen between the results found in this study and those found by researchers developing the NFS questionnaire. For example, stability of activity behaviour was also reported in both sport/recreational activities and other activities such as gardening and house-work. Using a test re-test design researchers in the NFS found individuals varied the nature of their physical activity from week to week, but the total level and duration of activity appeared to be fairly stable. Consistency in reporting was found for all activities, with the exception of walking.

It is interesting to note in stage one that low reliability was observed in response to the two personal belief questions. The kappa values for the questions 'do you do enough exercise to keep fit?' and 'is exercise beneficial in old age?' were 0.22 and 0.45 respectively. One theory for why the test re-rest reliability was low is that some respondents changed their answers between questionnaires from a definite 'agree' or 'disagree' the first time to a "don't know" on the second occasion. In stage two, the "don't know" option was taken out and this appeared to increase reliability. A new insert was placed next to this set of questions stating that there were no right or wrong answers. This change in emphasis was intended to make people feel more confident about their answers.

Low agreement was also recorded in stage one, for the questions where respondents were asked to rank in order of severity, the barriers which prevented them from currently taking

more exercise. Probing during the interview revealed that the reason for the low repeatability in scores for the questions asking about barriers to exercise, was due to a lack of understanding concerning the ranking system. It was too complicated. In the light of comments the ranking system was simplified from asking respondents to rank order all barriers to identifying just three of the most personal barriers.

One of questions giving the lowest amount of agreement was where people were asked to quantify the amounts of exercise taken whilst at school. Exercise amounts were classified quite crudely as for example, 'a lot', and 'a moderate amount'. It is perhaps not surprising that reliability should be relatively lower for this question when one considers that the majority of the group had left school at the age of fourteen years and were now on average sixty-five years old. Respondents are therefore being asked to recall what they did some fifty years ago.

Ambiguous and difficult to complete sections were highlighted in stage one because they contained a large amount of missing data. Modifications centred around eliminating the ambiguity in questions and making questions more closed and straightforward to answer.

4.4.2 Methodological Limitations of the questionnaire/study.

The reliability and validity of the questionnaire.

This study has relied solely on self-report of physical activity in developing the questionnaire, which is a limitation. Ideally such data need corroborating by more objective sources. The direct measurement of maximum oxygen uptake during aerobic exercise (VO_{2max}) is seen as the gold standard measure of cardiorespiratory fitness [22] and avoids the problem of report bias. However, practical problems such as lack of expensive equipment to measure VO_{2max}, time, resources and sometimes acceptability to individuals, means that direct measures of physical fitness using more objective techniques are not always feasible or desirable. The use of self-reports of physical activity in studies exploring the health effects of exercise remains problematic, due to the wide potential for confounding. The problem of self-reporting has been highlighted by research which has examined both the relationship between reported physical activity and incident of coronary heart disease (CHD), and fitness and CHD. Results suggest that it is the fitness-CHD relationship which appears stronger than the physical activity-CHD relationship [34-36]. The implication being that direct measurement (of fitness) is more reliable than data collected from self reports.

In the Welsh Heart Health Survey, a strong relationship was found between reported leisure-time physical activity and social class but only weak, generally non-significant relationships between fitness (measured by VO_{2max}), and social class, and health-related behaviour such as smoking and social class [33]. Reporting error by elderly respondents of activity behaviour has also found to be related to socio-economic status [21]; those with higher levels of educational attainment and annual income were able to report more accurately on a physical activity questionnaire. The research evidence suggests that activity patterns and fitness may not vary according to social class as much as once

thought, but rather, that people with higher socio-economic status are more able to record activity behaviour.

Objective measures which limit individual bias may be more reliable measures of activity level and fitness; although as acknowledged earlier these methods are not always possible, especially in large scale epidemiological studies. Much development work therefore centres around demonstrating the construct validity of activity questionnaires. Indirect methods such as activity and dietary diaries, skinfold measurements, the assessment of cardiorespiratory fitness, body composition and blood pressure have been used to make comparisons with self-report activity data. Although some attempt was made to collect activity data from a diary method, it is a criticism of this study that no attempt was made to measure fitness directly. On reflection, in developing the LHFQ it would have been a good idea to have taken some physiological measures with a small sample to allow a comparison to be made between self-reports on physical activity and more objective measures. In this way construct validity of the LHFQ could have been demonstrated using correlational methods.

Empirical evidence also suggests that it is likely that engaging in (and reporting of) leisure-time physical exercise is related toward other health related behaviours. For example, subjects who are believers in the benefits of exercise, and report engaging in more leisure-time activity, have been found by some researchers to engage more in other health related behaviours [45]. Furthermore, some researchers suggest that older people may report physical activity in accordance with activity norms and expectations they believe are appropriate for their age group. Elderly people (in comparison with younger adults) are thought to underestimate their physical capabilities, overestimate the value of exercise they get and the danger that physical exertion poses to their health [46]. This has implications for future studies which use the questionnaire, since a response bias may occur, with those who believe in and/or engage in exercise, overestimating their engagement in other positive health behaviours. Unfortunately, no attempt to check for a response bias was built in to this study.

Depending on how activity data is analysed, either energy expenditure is calculated using activity specific energy cost values, expressed in metabolic equivalents (METS) or kilocalories, or, respondents are classified into activity groups according to the reported frequency and intensity of their behaviour. Less agreement exists however over what time period respondents should be asked to recall their activity behaviour. Some variations in recall periods include two days [10], one week [12 19], four weeks [5] and one year [9 11 13]. Even within specific age cohorts such as the elderly there is disagreement. Some researchers suggest that because of the likelihood of short-term memory problems amongst the elderly, more reliable activity data can be collected over a year [16]; others argue that recall and therefore reliability is enhanced when the time frame is short, such as one week [21].

The LHFQ asks people to describe the frequency of the different activities they participated in during the previous week by using categories such as less than one hour, less than two hours and so on. In order to gain a measure of physical activity intensity respondents were asked to say whether they felt their body was working hard according to

each activity described. This is a crude way of eliciting data on frequency and intensity of activity, which limits its use. Using this method, there is a lot of room for variability and misinterpretation. For example, the phrase less than one hour may give a range of time spent on a particular activity from one to fifty-nine minutes. Whether a person perceives that their body was working hard during an activity will depend upon an individual's threshold for exercise and may be related to their initial fitness level; at best, information is subjective and is open to a huge variation in interpretation. The developers of the NFS adopted a system whereby activities were assigned one score based on published energy costs of activities and another score according to the individual's declaration of intensity of effort during that activity [5]. However, this method is not without its flaws; even, if energy expenditure for each individual and for each activity is calculated, the information collected is only as good as a person's word.

In the NFS, the phrase 'getting out of breath and working up a sweat' was used as the intensity of effort marker attached to each activity. Initially this wording was adopted in the LHFQ as a measure of intensity. However, flaws with its use became apparent during the interviews conducted to examine test re-test reliability in stage two. All the females interviewed had answered 'no' to the question 'did you work hard enough to work up a sweat and get out of breath'. It was discovered that the sample did not want to identify with sweating. For example, one lady remarked 'I don't sweat, I perspire'. Second, the words 'to get out of breath' were perceived in a negative way. It was associated with being a sign of poor health and as indicating a lack of fitness. Images of people wheezing and gasping for breath, rather than positive images of fit people working hard were conjured. An alternative way of conceptualising intensity of activity was therefore needed. Thus the terminology 'did you feel that your body was working hard' became the replacement and seemed more valid for this group. Nevertheless, this does not solve what is seemingly an impossible task, that is defining precisely and unanimously the intensity of physical activity. This point is further emphasised if one turns to the NFS once again.

The developers of the NFS during the analysis stage looked at three moderately vigorous exercise activities: swimming, keep fit exercises and cycling. 38%, 57% and 44% of the people who had carried out these three activities in that order respectively said that the activity made them out of breath or sweaty. Further investigation revealed that it was consistently younger people who were more likely than older people to say the effort of each of these activities made them out of breath or sweaty. They infer from this finding that this intensity question is more a reflection of variations in the physical efforts of the young rather than in their physical conditions. Results from this study however, suggest that the elderly may not identify with this intensity criteria. It may be more suitable for a younger, perhaps male population, rather than being sensitive in helping older females to express the intensity they experience whilst taking exercise. Alternatively, unfit people may be assigned the higher intensity score on the wrong basis, since lack of fitness or ill-health could be a reason for breathlessness and an increase in perceived effort.

It was noted that respondents changed their responses between questionnaires when asked about their attitudes towards taking part in exercise using a five point Likert scale. The questionnaire offers a range of responses from strongly disagree through to strongly agree

for each attitude statement. It was found that on the re-test, answers often changed from a more extreme answer to a less extreme one. For example, if a person answered 'strongly disagree' on the first questionnaire to an attitude statement, on the second questionnaire this answer usually became diluted to a 'disagree'. So, attitudes remained constant in direction but the intensity of the attitude declined. Cook and Campbell [47] suggest that there is a tendency for extreme scores on any measure to revert (or regress) toward the mean of a distribution when the measurement device is re-administered. Thus it is possible, that this pattern can be observed in this study.

The response rates of the postal surveys from both samples were acceptable with the second sample recording a high rate of 93 %, which is noteworthy. However, the two samples used in developing the LHFQ were quite limited. The samples used consisted primarily of females, suggesting caution when generalising results to elderly men. The first sample, although drawn at random from the age/sex registers of GPs, consisted primarily of white lower middle class women aged sixty to eighty-nine years based in the East End of London. The results need to be replicated with different cohorts, since age, socio-economic groups and regional variations effect exercise behaviour. In the second sample, all elderly respondents had worked for the same large retail company, in Norwich. Thus once again, this sample may be different from other cohorts of elderly women who have never obtained occupational status. Although, when compared with a large sample from the general population of a similar age, on socio-demographic details, this sample of women were found to be broadly similar, with the exception of age left school and educational qualifications. The sample used in the development of the LHFQ tended to leave school earlier and had fewer educational qualifications than a sample of the general population.

Based on the fact that few people had difficulties with answering the questionnaire, it is likely that others from outside this retirement service association group, who are more educated, would be able to complete it. It is important to acknowledge however, that the LHFQ sample was highly motivated (many had been employees of the company for over twenty years and were keen to participate) and this factor may be equally as important as educational qualifications.

The information available on the development of the LHFQ is limited. To date, it has only been developed with small numbers (n= 130 and 118 for stage one and two respectively) using self-report methods and will inevitably benefit from further testing with larger groups of people, incorporating objective measures for comparison. At this stage only tentative claims can be made with regards it's reliability and validity; but the results are promising.

4.4.2 Summary of the London Health and Fitness Questionnaire.

The LHFQ is 16 pages long and measures people's personal beliefs about exercise behaviour using a series of positive and negative statements. Attitudes towards exercise are measured using a Likert scale (strongly disagree through to strongly agree). Exercise behaviour is measured as the amount of time spent in the previous week on domestic

activity (for example, light and heavy gardening/housework) and sport/recreational activity (for example walking, cycling and swimming). Activity is categorised into time intervals of no time at all, less than one hour, less than two hours, less than three hours, and three hours or more. Intensity was rated by asking people whether they felt that their body was working hard whilst carrying out specific listed activities.

The advantages of a postal questionnaire for assessing exercise behaviour, personal health beliefs and attitudes towards exercise include the relatively low cost. The cost of the LHFQ for example is less than £2 (inclusive of postage and a stamped addressed envelope). One of the main disadvantages is the problem of relying solely on self-report data of activity and the use of relatively crude methods available for categorising frequency and intensity of activity behaviour. Reliability and validity of activity questionnaires will by their nature have a tendency to be 'good enough' as opposed to exceptional because of the opportunity for huge variation in individual interpretation, recall and recording. The LHFQ is no exception.

Since the publication of a paper citing the development of the LHFQ [48], there have been many requests for copies of the questionnaire. The LHFQ will inevitably benefit from further testing. In time, it may fulfil the research need for a standard physical activity assessment instrument suitable for the elderly, for use in large scale postal surveys. In the meantime, it is considered to improve on existing questionnaires and be 'good enough' for use in studies two and three of this thesis. To my knowledge, it represents the first questionnaire in the UK, designed to be used with elderly women to collect data on exercise behaviour *and* health related behaviour, status, attitudes and beliefs, in a postal survey.

The final version of the LHFQ can be seen in appendix C.

4.5 REFERENCES.

1. LaPorte, R.E., Montoye, H.L. and Caspersen, C.J. Assessment of physical activity in epidemiological research: problems and prospects. *Public Health Reports*, 1985; **100**:131-146.

2. Shaper, A.G., Pocock, S.J., Walker, M., Cohen, N.M., Wale, C.J. and Thompson, A.J. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *British Medical Journal*, 1981; **283**: 179-86.

3. Chow, R.K., Harrison, J.E. and Notarius, C. Effect of two randomised exercise programmes on bone mass of healthy post-menopausal women. *British Medical Journal*, 1987; **295**:1441-44.

4. Hardman, A.E. Benefits of low-intensity exercise in women. *Sports Medicine and Soft Tissue Trauma,* 1991; **33**(1): 14-15

5. Sports Council and Health Education Authority. *Allied Dunbar National Fitness Survey: Main findings*. London: Ancient House Press, 1992.

6. Secretary of State for Health. *The Health of the Nation*. London: HMSO, 1991.

7. World Health Organisation (WHO). *Ottawa Charter for Health Promotion*. New York: WHO, 1986.

8. Shapiro, S., Weinblatt, E., Frank, C.W. and Sager, R.V. The HIP study of incidence and prognosis of coronary heart disease. *Journal of Chronic Diseases*, **18**: 527-558, 1965.

9. Reiff, G.G., Montoye, H.J., Remington, R.D., Napier, J.A., Metzner, H.L. et al. Assessment of physical activity by questionnaire and interview. *Journal of Sports Medicine and Physical Fitness*, **7**: 135-142, 1967.

10. Alderson, M.R. and Yasin, S. Measuring habitual lesiure time activity: a questionnaire method suitable for epidemiological studies. In Evang and Anderson (Eds.) *Physical activity in health and disease*, pp. 215-221, Williams and Wilkins Co., Baltimore, 1966.

11. Saltin, B. and Grimby, G. Physiological analysis of middle-aged and former athletes. *Circulation;* **38**:1104-1114, 1968.

12. Paffenbarger, R.S., Wing, A.L. and Hyde, R.T. Physical activity as an index of heart attack risk in college alumni. *American Journal of Epidemiology* **108**; 161-171, 1978.

13. Taylor, H.L., Jacobs, D.R., Schuker, B., Knudsen, J., Leon, A.S. et al. A questionnaire for the assessment of leisure-time physical activity. *Journal of Chronic Diseases* **31**:741-755, 1978. 1978.

14. Kamel, W.B. and Sorlie, P. Some health benefits of physical activity. *Archives of Internal Medicine* **139**: 857-861, 1979.

15. Morrison, J.F., Van Melsen, S. and Noakes, T.D. Leisure-time physical activity levels, cardiovascular fitness and coronary risk factors in 1,015 , white Zimbabweans. *South African Medical Journal* **65**: 250-256, 1984.

16. Voorrips, L.E., Ravelli, A.C.J., Dongelmans, P.C.A., Deurenberg, P. and Staveren, W.A.V. A physical activity questionnaire for the elderly. *Medicine and Science in Sports and Exercise*, 1991;**23**(8): 974-979.

17. Baecke, J.A.H. Burema, J., Frijters, J.E.R. A short questionnaire for the measurement of habitual physical activity in epidemiological studies. *American Journal of Clinical Nutrition* **36**: 932-942, 1982.

18. Stephens, T., Jacobs, D. and White, C. A descriptive epidemiology of leisure-time physical activity. *Public Health Reports*, 1985;**100**(2):147-158.

19. Sallis, J.F., Haskell, W.L., Wood, P.D., Fortmann, S.P. and Rogers, T. et al. Physical activity assessment methodology in the five-city project. *American Journal of Epidemiology* **121**: 91-106, 1985.

20. Godin, G., Jobin, J. and and Bouillon, J. Assessment of leisure-time exercise behaviour by self-report: a concurrent validity study. *Canadian Journal of Public Health,* **77**: 359-362, 1986.

21. Washburn, R.A., Jette, A.M., and Janney, C.A. Using age-neutral physical activity questionnaires in research with the elderly. *Journal of Aging and Health*, 1990;**2**(3): 341-356.

22. Shephard, R.J., Allen, C., Benade, A.J.S., Davies, C.T.M., Diprampero, P.E., Hedman, R., Merriman, J.E., Myhere, K. and Simmons, R. The maximum oxygen uptake- an International standard of cardiorespiratory fitness. *Bulletin of the World Health Organisation*, **38**: 757-764, 1968

23. Skinner, J.S. Benson, H., McDonough, J.R. and Hames, C.R. Social status, physical activity and coronary proneness. *Journal of Chronic Diseases,* **19**: 773-783, 1966.

24. Buskirk, E.R., Harris, D., Mendez, J., Skinner, J. Comparison of two assessments of physical activity and a survey method of caloric intake. *American Journal of Clinical Nutrition,* **24**: 1119-1125, 1971.

25. Sobolski, J., DeBacker, G., Degre, S., Kornitzer, N. and Denolin H. Physical activity, physical fitness and cardiovascular diseases: design of a prospective epidemiological study. *Cardiology* **67**: 38-51, 1981.

26. LaPorte, R.E., Cauley, J.A., Kinsey, Corbett, W., Robertson, R. et al. The epidemiology of physical activity in children, college students, middle-aged men, menopausal females and monkeys. *Journal of Chronic Diseases* **35**: 787-795, 1982.

27. Sobolski, J., Kolesar, J.J., Kornitzer, M.D., DeBacker, G.G. and Mikes, Z. et al. Physical fitness does not reflect physical activity patterns in middle-aged workers. *Medicine and Science in Sports Exercise* **20**: 6-13, 1988.

28. Leon, A.S., Jacobs, D.R.DeBacker, G. and Taylor, H.L. Relationships of physical characteristics and life habits to treadmill exercise capacity. *American Journal of Epidemiology* **113**: 653-660, 1981.

29. Taylor, C.B., Coffey, T., Berra, K., Iaffaldano, R., Casey. K. et al. Seven-day activity and self-report compared to a direct measure of physical activity. *American Journal of Epidemiology* **120**: 818-824, 1984.

30. Blair, S.N., Haskell, W.L., Ho, P., Paffenbarger, R.S., Vranizan, K.M. et al. Assessment of habitual physical activity by a seven day recall in a community survey and controlled experiments. *American Journal of Epidemiology* **122**: 794-804, 1985

31. Forde, O.H.,Thelle, D.S., Arnesen, E.S. and Mjos, O.D. Distribution of high density lipoprotein cholesterol according to relative weight, cigarette smoking and leisure time physical activity. *Acta Medica Scandinavica* **219**: 167-171, 1986.

32. Dishman, R.K. and Steinhardt, M. Reliability and concurrent validity for a seven-day recall of physical activity in college students. *Medicine in Science and Sports and Exercise* **20**: 14-25, 1988.

33. Davey-Smith, G. *Physical fitness and risk factors for coronary heart disease.* Cambridge University: MD thesis, 1993.

34. Sobolski, J., Kornitzer, M., DeBacker, G., Dramaix, M., Abramowicz, M. et al. Protection against ischaemic heart disease in the Belgian physical fitness study: physical fitness rather than physical activity? *American Journal of Epidemiology* 1987; **125**: 601-610.

35. Slattery, M.L. and Jacobs, D.R. Physical fitness and cardiovascular disease mortality: the US railroad study. *American Journal of Epidemiology* 1988**; 127**: 571-580.

36. Slattery, M.L. Jacobs, D.R. and Nichaman, M.Z. Leisure time physical activity and coronary heart disease death. *Circulation* 1989*;* **79**: 304-311.

36a. Lamb, K.L. and Brodie, D.A. The assessment of physical activity by leisure time physical activity questionnaires. *Sports Medicine*, 1990; **10**(3): 159-180.

37. Cauley, J.A., LaPorte, R.E., Black-Sandler, R., Schramm, M.M. and Friska, A.M. Comparison of methods to meaure physical activity in post-menopausal women. *American Journal of Clinical Nutrition* 1987; **45**: 14-22.

38. Folsom, A.R., Jacobs, D.R., Caspersen, C.J., Gomez-Marin, O. and Knudsen, J. Test re-test reliability of the Minnesotae leisure-time physical activity questionnaire. *Journal of Chronic Diseases* 1986; **39**:505-511.

39. Dishman, R.K., Sallis, J.F. and Orenstein, D. The determinants of physical activity and exercise. *Public Health Reports* 1985; **100**(2):158-171.

40. La Porte, R.E., Black-Sandler, R., Cauley, J.A., Link, M., Bayles, C. et al. The assessment of physical activity in older women: analysis of the inter-relationships and reliability of activity monitoring, activity surveys and caloric intake. *Journal of Gerontology*, 1983; **38**: 394-397.

41. Dallosso, H.M., Morgan, K., Bassey, E.J., Ebrahim, S., Arie, T. and Fentem, P. Levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**:121-7.

41a. Bouchard, C. Shephard, R.J., Stephens, T., Sutton, J.R. and McPherson, B.D. (Eds.). *Exercise fitness and health: a consensus of current knowledge.* Illinois: Human Kinetic Books, 1990.

41b. Fentem, P.H., Bassey, E.J. and Turnbull, N. *The new case for exercise.* London: Health Education Authority and Sports Council, 1988.

41c. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. *Psychological Review*, 1977; **84**: 192-215.

43. Rutter, D.R. and Bunce, D.J. The theory of reasoned action of Fishbein and Ajzen: a test of Toriss's amended procedure for measuring beliefs. *British Journal of Social Psychology*, 1989; **28**: 39-46.

43a. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508.

44. Office of Population Censuses and Surveys. *General House-hold Survey*, 1983. London: HMSO, 1986.

45. Davey Smith, G., Catford, J., Nutbeam, D. and Phillips, K. *The relationship between health beliefs and health behaviours.* I.E.A. XI Scientific Meeting, Helsinki, Abstract 351., 1987.

46. Ory, M.G. Considerations in the development of age-sensitive indicators for assessing health-promotion. *Health Promotion*, 1988; **3**(2): 139-149.

47. Cook, T.D. and Campbell, D.T. (Eds.) *Quasi-experimentation: design and analysis issues for field settings*. Chicago:Rand McNally, 1979.

48. Rowland, L., Dickinson, E.J., Newman, P., Ford, D. and Ebrahim, S. Look After Your Heart programme: impact on health status, exercise knowledge, attitudes and behaviour of retired women in England. *Journal of Epidemiology and Community Health*, 1994; **48**(2), pp 123-128.

CHAPTER FIVE

STUDY TWO. A RANDOMISED CONTROLLED TRIAL OF A SIX MONTH BRISK WALKING PROGRAMME: AN EVALUATION OF THE EFFECTS OF THE PROGRAMME ON THE WELL-BEING AND EXERCISE ATTITUDES OF ELDERLY WOMEN.

5.1 INTRODUCTION

The research evidence reviewed in chapter two, revealed that there has been relatively little work carried out examining specifically the benefits of exercise programmes for promoting the well-being of elderly women. This in spite of the fact that there are indications from early work, that adopting a more physically active life style may alleviate or prevent chronic illness. More specifically, physical activity may contribute to increasing functional capacity,[1-3] health status [4] cardiovascular fitness [5 6], bone density [7 8], physical self-efficacy [9] and self-esteem[10]. However, at the moment the research evidence is confusing. In chapter one it was shown that a discrepancy exists over the exact intensity, frequency and duration required to bring about beneficial effects. Existing exercise studies have often been imprecise in defining tight exercise prescriptions, for example,[5 6]. In addition there are a plethora of major methodological problems with research designs of exercise intervention studies, including the use of small samples of volunteers [11 12], not randomly allocated to treatments [11] and inadequate control groups [13 14].

In terms of the elderly, the research findings which indicate that low intensity, low frequency exercise may be of benefit are particularly exciting and need replicating. This is because low intensity exercise is safer for a wide range of elderly people. It is also associated with a higher rate of adherence amongst the elderly [15 16]. A clearer and more convincing case based on scientific evidence, of the benefits of participating in exercise, may help to inform public and professional opinion, and encourage wider participation in exercise by elderly women. Moreover it may increase the chances of achieving the goals set by the World Health Organisation and the Government to achieve health for all [17] and add years to life and life to years [18]. This study sets out therefore, to improve upon the research designs of previous exercise studies and to contribute further to knowledge concerning the relationship between low intensity exercise and well-being, in elderly women. More specifically, this study aims to determine whether a six month programme of brisk walking:

1. produces physical benefits in terms of increasing stamina (cardio-vascular fitness) and strength (leg strength)

2. produces psychological benefits in terms of increasing physical, social and emotional subjective health status.

3. changes attitudes towards exercise and increases perceived physical self-efficacy.

5.2 METHOD.

5.2.1 Study design.

A randomised experimental design was chosen as the method for assigning subjects to two conditions: a low intensity walking exercise treatment group and a homeopathic exercise control group. The main reason for adopting this method was to rule out selection bias and therefore limit the threat to the internal validity of the study findings.

5.2.2 Rationale for choosing the exercise treatment groups.

Chapter two highlighted the fact that older women encounter more barriers to exercise than any other group [19]. In addition, past exercise experience, [20 21] perceived physical self-efficacy [22] and behavioural control [23] were shown to be important factors in influencing uptake and adherence to any exercise regime. Walking is a type of exercise which fulfils all these criteria, since it is a customary exercise used in everyday living. Moreover, it is a form of low intensity exercise which is safe and acceptable to elderly women [24] and ethically, there is some evidence to suggest that it is capable of producing beneficial effects [25]. Thus walking was considered to be a suitable exercise treatment for the experimental group.

In chapter two, recommended treatment options for a comparison group were shown to include a homeopathic dose of exercise [26] rather than a control group which receives social activity [27 28] or no treatment [29]. It was decided therefore to include a control group whereby members would be asked to perform a programme of light relaxation including gentle mobility exercises which would be insufficient to bring about any changes in measures of well-being but would be sufficient to sustain group members' interest in the programme.

5.2.3 Subjects.

This six month study was part of a larger two year study designed to detect whether walking leads to increases in bone density in post-menopausal women. The subjects were therefore all women aged fifty-five years plus (latest age for the menopause). They were recruited from an orthopaedic fracture clinic at the Royal London Hospital. 100 women presenting with a fracture to the upper limb (a leg fracture may have meant that the walking option was not feasible) during the first part of the year 1991 and who fulfilled the above criteria, were invited to attend a separate appointment to find out about the study after their fracture had healed. Access to medical records at the hospital meant the sample was easy to identify and avoided the sample from explicitly volunteering to take part in an exercise programme.

Final sample sizes for Group 1 was thirty-five women and for Group 2, forty-one women. The ages of the women across both groups ranged from fifty-five years to ninety-two years. The mean age for women in Group 1 and 2 was sixty-six years.

5.2.4 Procedure.

The cue to the women becoming involved in the study was a personally addressed letter sent to 100 women selected from the fracture clinic. The letter informed them where their names had been obtained, a brief description of the research project and an invitation to attend an individual appointment at the Royal London hospital to have the study explained in more detail. The Royal London hospital was the local community hospital for the majority of women. The women were informed that travel expenses would be paid and an appointment did not mean that they would be under any obligation to participate.

From the total 100 women who were approached to join the study, seventy-six of these women took up the invitation to attend a baseline interview. Of the twenty-four women who declined to participate in the study, eighteen did not reply and the remaining six replied but said no. The reasons given were either because they were too ill (n=2), because they were too busy at work (n=3) and no reason (n=1). It is possible that of those women who did not reply at all, some may have moved house and therefore not received the letter or some may have chosen to ignore the letter.

All appointments were carried out on an individual basis with the author in a private room attached to the outpatients department at the hospital. On a few occasions, especially on the first meeting, some of the women were accompanied by husbands or friends. At the first meeting, the information given to the women in the initial recruitment letter was reified. It was explained that the selection criteria chosen (that is, being female, aged fifty-five years plus and having a recent fracture) was based on research which suggested that these were risk factors for developing osteoporosis. However, the women were assured that their participation in the study did not mean that they had or were likely to have osteoporosis.

It was explained that research is now suggesting that exercise could be independently beneficial for preventing or controlling osteoporosis and essentially that the possibility of this was being investigated in the study. It was emphasised that the women did not have to take any drugs or have any injections, and that if they wanted, a letter would be sent to their own doctor informing them of their participation.

It was explained to the women that there were going to be two types of group in the study and that each one was going to carry out a different type of exercise.

The women were assigned randomly to groups by selecting a piece of paper with the word 'walking' or 'personalised exercise' on it. Neither group knew whether they were in the experimental or the control group. After they were assigned to one of the two groups a clear explanation was given about the impact of the programme on their time and the types of measurements which were to be taken. It was made clear that they could leave the study at any time without any obligation if they wished to do so. All women signed a consent form drawn up by the hospital ethics team.

All seventy-six women who came to the baseline appointment agreed to take part in the study. Group 1 were asked to plan a programme of walking. They were asked to keep a daily diary of all the exercise they did each week, with a particular emphasis on the frequency and duration of their planned walking activity.

Group 2 formed the 'personalised exercise' control group. In practice this meant that a home-based exercise plan was worked out with each person. Group 2 were asked to keep a diary of when they carried out their exercise plan and to note any other exercise they did each day.

Most of the baseline interviews took place in June and July 1991. The majority of women in group 1 started their walking programme in the summer months and continued for six months until December.

Six weeks after entry into the study, women were contacted by phone,(or by letter if they were not on the phone). This provided an opportunity to clarify any problems in the early stages of the study. After the women had been in the study for three months, they were invited to attend another appointment. This appointment was used to discuss their diaries and exercise activity and to plan the next three months. Three month follow-up appointments typically lasted for thirty minutes.

At baseline and six months, physical health measures including stamina and strength, and psychological measures including physical, social and emotional subjective health status and changes in attitudes towards exercise, were taken.

At baseline, additional information on health behaviour such as smoking, alcohol consumption and height and weight were recorded. Diaries were given to all the women at the baseline appointment. Baseline and six month appointments took approximately one hour to complete.

5.2.5 Defining the exercise prescriptions and monitoring compliance.

Walking.

Women in group 1 were asked to walk at a pace which they considered to be brisk for approximately twenty minutes three times a week, for six months. Time was given for a practice session during the baseline assessment to ensure that everyone fully understood and was capable of the activity. They were given help with planning a programme. For example they were given guidance on how to incorporate a programme into their existing lifestyle and ideas were suggested on where to walk and what to wear.

Light exercise

Time was spent with women in group 2 going through some relaxation exercises which they could carry out at home. The emphasis was placed on individual, light non-weight bearing exercises such as rotation of the wrist, foot and neck, rather than activities which were social or could build strength or stamina.

Diaries.

The women in groups 1 and 2 were given diaries at the baseline appointment, to record the exercise they did each week. Advice was given on how to complete them. A copy of the diary sheets given to women can be seen in appendix D.

5.3 OUTCOME MEASURES.

5.3.1 Stamina.

A nine inch high box (with surrounding rails which people could hold on to for safety) was used to test stamina. Women were asked to step in time to a metronome voice which said 'up, down, up, down'. The metronome started slowly at twenty steps per minute and constantly increased by fifteen paces after a three minute stage. This continued until the final stage - stage six where women were asked to step up and down at a pace of 135 steps per minute for three minutes. The idea is to keep building one stage onto another without resting until nearing exhaustion, and in so doing to produce a personal best measure of stamina fitness. A note was made of the number of steps and stage completed by each person at each session.

All women were asked to wear a small ear clip which was attached to a machine to measure heart rate. At the start of the step test exercise a measure of resting heart rate was taken, and again at the end of each stage until they had reached their personal exercise limit. Heart rate at rest was taken to given an indication of cardiovascular fitness (the lower the heart rate, generally the fitter the person).

Heart rate was monitored during exercise to give the author a physiological measure of how each woman was feeling during this strenuous exercise.

5.3.2 Leg strength

Leg strength was measured using a rig that measures power output across the hip joint using a simple seat and pedal on which each person has to push in an explosive way. At the end of the push, the leg is fully extended. The movement is made seated so that the forces are contained between the buttocks and the foot. The seat position is adjusted for leg length and the push is transmitted by a lever and a chain to spin a flywheel. The gearing is such that the resistance to the movement remains nearly constant throughout the extension. The final angular velocity of the flywheel is measured by an optoswitch and used to calculate the average leg extensor power (LEP) in the push. The unit of measurement is watts. The feasibility, reliability and validity of the rig has been tested and has proved satisfactory [30] .

In this study, women could choose which leg they started with, and when they were in position were asked to push against the pedal as hard as possible. This was repeated five times on the same leg and then they were asked to change legs. A short rest was given between each push, to allow for the rig to be reset. All five attempts were recorded at the time, for each leg, but when it came to the final coding of the information, only the best attempt on each leg was entered into the database. It was thought that with five attempts, it would ensure that the women would be given enough time to practise and produce a valid and reliable measure representing their best performance.

5.3.3 Physical, social and emotional health status.

As described in chapter two, the Nottingham Health Profile [31] was used to measure psychological well-being. The NHP is self-administered and takes on average ten minutes to complete. It is in two parts. Part 1 asks thirty-eight questions about how a person's health, in particular their: physical mobility, energy, sleep patterns, social isolation, emotional reactions and pain. Each of the six dimensions are scored as separate sub-scales and are not aggregated; each of the 38 statements has a weighted score attached to it. Part 11 asks about how a person's health is affecting daily activities in six areas such as looking after the home and interests and hobbies. No weights are attached to the statements, rather, an affirmative response is calculated for each area. Well-being is indicated by a low score on both parts of the NHP. The NHP is a standardised measure of well-being in the elderly and has norms for women in this age group. In addition, women were asked to rate their health and fitness in relation to their peers using section one of the London Health and Fitness Questionnaire (see chapter four and appendix C).

5.3.4 Attitudes towards exercise.

Section four of the London Health and Fitness Questionnaire (reviewed in chapter four) was used to measure attitudes towards exercise. The section includes question concerning perceived physical self-efficacy and perceived social, practical and financial barriers to taking exercise. It was shown in chapter four to have satisfactory reliability and validity with women in this age group.

5.3.5 Smoking and alcohol behaviour.

Information on smoking behaviour - past and present, and alcohol consumption per week was also collected. For ex-smokers, an estimate of the number of cigarettes smoked in the years as a smoker was calculated by dividing the number of cigarettes that used to be smoked per day by ten (1/2 a full pack of cigarettes) and then by multiplying this against the number of years smoked per person. A pack year total was then obtained for each ex-smoker.

Current level of weekly alcohol consumption was calculated into units using the following formula: 1 pub measure of spirit, and 1/2 pint of beer = 1 unit. Each home measure of spirit was calculated as double a pub measure and was therefore calculated as 2 units.

5.4 RESULTS

After a description of some demographic and other background details of the study participants, the results are presented in order of the study aims as outlined in the introduction: stamina fitness, leg strength, subjective health status and attitudes towards exercise.

5.4.1 Study withdrawals.

During the six month period, only one woman withdrew from the study. She was in group 1 and her reason for withdrawing was that she did not have the time to do the brisk walking exercise.

5.4.2 Demographic details of Groups 1 and 2.

The breakdown of demographic details for each group can be seen in table 5.1. A one-way analysis of variance (ANOVA) was applied to detect if there was a difference between groups in terms of the ages of the women. A chi-squared test was used to show if there was a difference between the housing occupied by the two groups.

Table 5.1 **A comparison of the demographic background of Groups 1 and 2, data taken at baseline.**

	Group 1 (n=36)	**Group 2** (n=41)	**F**	**df**	**p**
Mean age in years (sd)	66 (8.4)	66 (7.8)	.03	1	.86
Ethnicity					
Caucasian	97%	98%			
Housing in %:			χ^2	**df**	**p**
own house	44	44	.93	3	.81
Rent privately	4	13			
Rent from council	44	41			
Other	8	2			

In terms of age, ethnicity and housing there were no significant differences between the groups. The mean age for both groups was sixty-six years. The ethnic composition of the groups was similar, with most women being white British. The breakdown of figures for housing shows that just under half of the women in both groups either own their own homes, or rent from the local council. This suggests that in terms of this variable of socio-economic status, the groups were reasonably similar.

5.4.3 Smoking and alcohol behaviour.

A chi-squared test was used to find whether there were any differences in the smoking behaviour between the two groups. Table 5.2 shows that 17% of both groups were current smokers at the start of the study. A greater, although not significant percentage of people, were ex-smokers in group 2. A one-way ANOVA was used to find whether there were any group differences in the mean number of cigarettes smoked and the amount of alcohol that is consumed. No significant differences were found between the groups on either factor.

Table 5.2 **A measure of current and past health behaviour for Groups 1 and 2, taken at baseline.**

	Group 1 (n=36)	**Group 2** (n=41)	χ^2	**df**	**p**
Smoking behaviour in %:					
current smokers	17	17	1.1	2	.58
ex smokers	33	44			
non smokers	50	39			
			F	**df**	**p**
Mean no. of **pack years** smoked (sd)**:**	16.1 (29.8)	20.9 (27.5)	.7	1	.40
Alcohol consumption per week, **in Units:** (sd)	2.25 (1.8)	1.27 (1.8)	1.9	1	.17
			χ^2	**df**	**p**
Current drinkers in %:	53	49	.1	1	.72

5.4.4 Height, weight and body mass index.

Table 5.3 shows the mean height and weight scores for groups 1 and 2 at baseline and 6 months. The table also shows that body mass index ratio scores generated for each person within each group, placed everyone within the normative range of weight to height ratio at both time points. That is, no-one was considered to be either under or overweight in either group at baseline or at the end of the six month period.

Table 5.3 Mean scores (sd) for height, weight and body mass index of Group 1 and 2 at baseline and six months.

	Baseline		**6 months**	
	Group 1 (n=36)	**Group 2** (n=41)	**Group 1** (n=35)	**Group 2** (n=41)
Height in CMs (sd)	160.3 (6.2)	158.6 (6.0)	161.2 (6.7)	159.2 (5.9)
Weight in KGs (sd)	66.9 (13.1)	66.7 (16.0)	67.0 (12.8)	66.3 (16.1)
Body Mass Index Score between 21 and 25 points	100%	100%	100%	100%

A repeated measures ANOVA was used to detect whether there were any differences in weight between and within the two groups over the six month period. Table 5.4 shows that there were no significant differences between or within groups for weight over time.

Table 5.4 Repeated measures ANOVA for weight by group.

Source of variation	SS	DF	MS	F	sig of F
Between-Subjects Effects					
Within Cells	30887.7	74	417.4		
Group status	5.69	1	5.69	.01	.91
Within-Subjects Effects					
Within Cells	1358.5	74	18.4		
Weight	.46	1	.46	.02	.88
Group status by weight	4.04	1	4.04	.22	.64

5.4.5 Step test stamina.

Table 5.5 shows the mean scores recorded for the two groups for step test stamina at both time periods. Standard deviation scores indicate that there was a wide variety of ability *within* each group.

Table 5.5 Mean number of steps and stage (sd) completed on the stamina step test and resting heart rate for Groups 1 and 2 at baseline and six months.

	Baseline:		**6 months:**	
Mean no. of:	**Group 1** (n=36)	**Group 2** (n=41)	**Group 1** (n=35)	**Group 2** (n=41)
steps completed (sd)	**201.0** (140.6)	**179.0** (129.5)	**253.9** (152.5)	**196.6** (129.2)
stages completed (sd)	**2.2** (1.2)	**2.2** (1.2)	**2.7** (1.2)	**2.3** (1.2)
heart beats per min. at rest (sd)	**73.8** (9.4)	**77.2** (11.3)	**74.3** (10.5)	**78.2** (11.3)

A repeated measures ANOVA was used to determine if there were any differences between and within groups for step test stamina and resting heart rate over six months. Table 5.6 shows that no significant between group differences were found but an interaction effect between stamina and group status is approaching significance (p(F) = .08). The mean scores in table 5.5 indicate that it is group 1 which has changed the most over time, increasing their score on average from 201 steps at baseline to 254 steps at six months. Group 2's mean score changed from 179 to 197 steps. The within subject-effects for step test stamina were found to be significant. That is, there was an increase in performance across both groups over time. No significant differences were found between or within groups for resting heart rate.

Table 5.6 Repeated Measures ANOVA for stamina fitness and resting heart rate for groups 1 and 2.

Source of variation	**SS**	**DF**	**MS**	**F**	**sig of F**
Between-Subjects Effects					
Stamina					
Within Cells	2574141.9	74	34785.7		
Group status	64142.9	1	64142.9	1.84	.18
Resting heart rate					
Within Cells	12597.7	73	172.6		
Group status	507.7	1	507.7	2.94	.09
Within-Subjects Effects					
Stamina					
Within Cells	234075.7	74	3163.2		
Stamina	42754.3	1	42754.3	13.5	.00 **
Group status by stamina	9713.3	1	9713.3	3.1	.08
Resting heart rate					
Within Cells	4106.2	73	56.3		
Heart rate	28.9	1	28.9	.51	.48
Group status by heart rate	1.41	1	1.4	.03	.87

** significant at the $p \leq 0.001$ significance level.

5.4.6 Leg strength

Table 5.7 shows the mean leg strength for women at baseline and six months, in watts. The standard deviations for both groups on the leg strength measurements are large. This suggests that there was a wide variety of ability *within* each group in terms of leg strength.

Table 5.7 Mean leg strength (sd) in watts for Groups 1 and 2 at baseline and six months.

	Baseline:		**6 months:**	
	Group 1 (n=36)	**Group 2** (n=41)	**Group 1** (n=35)	**Group 2** (n=41)
Leg strength in watts:				
Right leg (sd)	**77.5** (32.5)	**77.1** (26.2)	**86.9** (37.2)	**83.9** (30.7)
Left leg (sd)	**79.4** (36.9)	**78.5** (27.6)	**90.1** (42.7)	**87.8** (27.9)

Mean leg strength was analysed for between and within groups changes using a repeated measures ANOVA. Table 5.8 shows the results.

Table 5.8 **Repeated measures ANOVA for left and right leg strength by group.**

Source of variation	SS	DF	MS	F	sig of F
Between-Subjects Effects					
Left leg					
Within Cells	140204.66	74	1894.66		
Group status	43.27	1	43.27	.02	.88
Right leg					
Within Cells	111457.6	74	1506.18		
Group status	39.71	1	39.71	.03	.87
Within-Subjects Effects					
Left leg					
Within Cells	30146.46	74	407.38		
Left leg	4119.82	1	4119.8	10.11	.02 *
Group status by left leg strength	59.2	1	59.2	.15	.70
Right leg					
Within cells	35615.4	74	481.3		
Right leg	2897.5	1	2897.5	6.02	.02*
Group status by right leg strength	139.3	1	139.3	.29	.59

* significant at the $p \leq 0.05$ significance level

A significant within groups effect is noted for left and right leg strength. Table 5.7 confirms that group 1 and 2 increased their leg strength in both legs over the six month period. No significant interaction effect between groups status and left or right leg strength was found.

5.4.7 Physical, social and emotional health status.

Table 5.9 shows how the women in both groups rated their health and fitness at baseline and six months. Figures are shown as percentages. The majority of women in both groups at both time periods considered themselves to be in good health, fairly fit and to able to walk a mile non-stop. A number of authors, for example Winer [31a] have advocated that measurement data of this kind can be appropriately analysed using normal parametric ANOVA procedures, if data is rank ordered. Following this recommendation, a repeated measures ANOVA was applied to the data. The mean scores can be seen in table 5.9 and the results of the ANOVA in table 5.10.

Table 5.9 Health and fitness ratings of Group 1 and 2 at baseline and 6 months, in percent and mean scores.

	Baseline		**6 months**	
	G 1 (n=36)	**G 2** (n=41)	**G 1** (n=35)	**G 2** (n=41)
Perceived health:				
good	64	63	72	57
fair	36	37	25	40
poor	0	0	3	3
Mean score	**1.7**	**1.7**	**1.7**	**1.6**
(sd)	(.48)	(.48)	(.53)	(.5)
Perceived fitness:				
very fit	25	24	28	23
fairly fit	72	61	72	68
not very fit	0	12	0	7
not at all fit	3	2	0	2
Mean score	**2.3**	**2.1**	**2.3**	**2.2**
(sd)	(.4)	(.69)	(.46)	(.53)
Walk a mile?	53	66	77	80
Mean score	**.79**	**.85**	**.84**	**.82**
(sd)	(.41)	(.36)	(.37)	(.39)

Table 5.10. Repeated measures ANOVA for health, fitness and ability to walk a mile by group over time.

Source of variation	SS	DF	MS	F	sig of F
Between-Subjects Effects					
Health					
Within Cells	25.1	73	.34		
Group status	.19	1	.19	.55	.46
Fitness					
Within Cells	29.8	73	.41		
Group status	.94	1	.94	2.31	.13
Walk a mile					
Within Cells	14.5	67	.22		
Group status	.00	1	.00	.00	.97
Within-Subjects Effects					
Health					
Within Cells	13.3	73	.18		
Health	.05	1	.05	.26	.61
Group status by health	.15	1	.15	.85	.36
Fitness					
Within Cells	13.9	73	.19		
Fitness	.10	1	.10	.53	.47
Group status by fitness	.02	1	.02	.11	.75
Walk a mile					
Within Cells	3.9	67	.06		
Walk a mile	.02	1	.02	.40	.53
Group status by walk a mile	.02	1	.02	.40	.53

Table 5.10 shows there were no significant between or within group differences for self-rated health, fitness or ability to walk a mile. Table 5.10 shows that the degrees of freedom for ability to walk a mile has dropped from 73 to 67. This is because, one of the options for answering this question was to say 'don't know,' as well as yes or no. 'Don't know' responses were recoded as missing data and thus reduced the number of people included in the analysis.

Table 5.11 shows the mean scores obtained by both groups on the NHP (Part 1) at baseline and six months.

Table 5.11 Mean (sd) scores on the Nottingham Health Profile (Part 1) for Groups 1 and 2 at baseline an 6 months.

Dimension	Baseline		6 months	
	Group 1 (n=36)	Group 2 (n=41)	Group 1 (n=35)	Group 2 (n=41)
energy	**14.5** (30.6)	**16.6** (25.1)	**5.3** (14.1)	**18.6** (27.3)
pain	**19.5** (25.3)	**19.7** (27.9)	**14.4** (21.3)	**18.8** (28.6)
emotions	**9.7** (12.4)	**11.9** (14.6)	**8.9** (13.9)	**13.4** (19.4)
sleep	**23.4** (29.6)	**15.5** (21.9)	**18.1** (28.1)	**19.3** (25.2)
isolation	**6.6** (13.3)	**12.3** (20.9)	**6.9** (17.9)	**11.1** (19.5)
mobility	**17.7** (17.5)	**15.7** (17.9)	**10.9** (20.6)	**17.3** (18.3)

A lower score indicates fewer perceived health problems and therefore better well-being. Large standard deviations are noted, these can be attributed in part to the fact that for each of the 38 statements which make up the six sub-scales, a weighted score is attached to each which range from 5.83 to 39.20.

A repeated measures ANOVA was used to analyse whether there were any significant differences between or within the group mean scores over time on the NHP dimensions (part 1). Table 5.12 and table 5.13 illustrate the results for the between and within subject effects respectively.

Table 5.12 Repeated measures ANOVA for Between-Subjects Effects on dimensions in the NHP (Part 1) by group.

Source of variation	SS	DF	MS	F	sig of F
Between-Subjects Effects					
Energy					
Within Cells	65356.9	72	907.7		
Group status	2961.4	1	2961.4	3.3	.07
Pain					
Within Cells	91478.5	73	1253.1		
Group status	91.11	1	91.11	.07	.78
Emotions					
Within Cells	25151.1	73	344.5		
Group status	443.11	1	443.11	1.29	.26
Sleep					
Within Cells	84971.9	73	1164.0		
Group status	446.1	1	446.1	.38	.54
Isolation					
Within Cells	41684.6	72	578.95		
Group status	946.5	1	946.5	1.63	.21
Mobility					
Within Cells	43418.66	72	603.04		
Group status	222.84	1	222.84	.37	.55

No significant between group differences are shown in table 5.12.

Table 5.13 Repeated measures ANOVA for Within -Subjects Effects on the dimensions in the NHP (Part 1) by group.

Source of variation	SS	DF	MS	F	sig of F
Within-Subjects Effects					
Energy					
Within Cells	19402.3	72	269.5		
Energy	192.6	1	192.6	.71	.40
Group status by energy	657.3	1	657.3	2.4	.12
Pain					
Within Cells	8702.2	73	119.2		
Pain	290.1	1	290.1	2.43	.12
Group status by pain	239.3	1	239.3	2.0	.16
Emotion					
Within Cells	5095.9	73	69.81		
Emotion	.87	1	.87	.01	.91
Group status by emotion	30.6	1	30.62	.44	.51
Sleep					
Within Cells	16847.2	73	230.8		
Sleep	24.0	1	24.0	.10	.75
Group status by sleep	656.9	1	656.9	2.9	.09
Isolation					
Within Cells	7319.5	72	101.7		
Isolation	1.0	1	1.0	.01	.92
Group status by isolation	66.4	1	66.4	.65	.42
Mobility					
Within Cells	6588.3	72	91.5		
Mobility	146.9	1	146.9	1.61	.21
Group status by mobility	482.9	1	482.9	5.3	.02 *

* significant at the 0.05 significance level

The results in table 5.13 show there was a significant interaction effect between groups status and mobility. Group 1 significantly improved their well-being score on the mobility dimension, reducing their mean score on this dimension from 17.7 at baseline, to 10.9 at six months. Meanwhile, group 2 experienced a slight increase in mean score from 15.7 to 17.3. An interaction effect between group and sleep is approaching significance (p (F) = 0.09). Group 1 experienced a decrease in mean

score from 23.4 to 18.1, whilst group 2, increased their score from 15.5 to 19.3, over time.

Table 5.14 shows the percentage of people agreeing that health was causing a problem with activities of daily living and mean scores for each group on the Nottingham Health Profile (part 11) at baseline and six months.

Table 5.14 The percentage of people in groups 1 and 2 agreeing with health statements on the Nottingham Health Profile (Part 11) and mean scores (sd) at baseline and six months.

	Baseline				**6 months**			
Activities of daily living	**G 1** (n=36)		**G 2** (n=41)		**G 1** (n=35)		**G 2** (n=41)	
	%	mean score (sd)	**%**	mean score (sd)	**%**	mean score (sd)	**%**	mean score (sd)
House-work	**16.7**	.17 (.38)	**14.6**	.15 (.36)	**11.1**	.11 (.32)	**12.5**	**.13** (.34)
Social life	**11.1**	.11 (.32)	**7.3**	.08 (.27)	**11.1**	.11 (.32)	**5**	.05 (.22)
Home life	**0**	.00 (.00)	**2.4**	.03 (.16)	**2.8**	.03 (.17)	**0**	.00 (.00)
Sex life		**11.1** (.32)	.11	**12.2** (.34)	.13	**13.9** (.36)	.14	**12.5** (.34) .13
Interests/hobbies	**8.3**	.09 (.28)	**7.3**	.08 (.27)	**8.3**	.09 (.28)	**12.5**	.13 (.33)
Holidays	**2.8**	.07 (.27)	**0**	.00 (.00)	**4.2**	.04 (.21)	**3.3**	.03 (.18)

Following Winer's [31a] suggestion, data was analysed using repeated measures ANOVA statistical procedures. The results for the between and within subjects effects can be seen in tables 5.15 and 5.16 respectively.

Table 5.15 Repeated measures ANOVA for Between-Subjects Effects on NHP (Part 11) for Groups 1 and 2.

Source of variation	SS	DF	MS	F	sig of F
Between-Subjects Effects					
House-work					
Within Cells	14.6	73	.20		
Group status	.00	1	.00	.01	.94
Social life					
Within Cells	10.3	73	.14		
Group status	.10	1	.10	.71	.40
Sex life					
Within Cells	12.1	73	.17		
Group status	.00	1	.00	.00	.96
Home life					
Within Cells	.97	73	.01		
Group status	.00	1	.00	.01	.93
Interests and hobbies					
Within Cells	8.7	73	.12		
Group status	.01	1	.01	.06	.80
Holidays					
Within Cells	1.3	32	.04		
Group status	.05	1	.05	1.1	.30

Table 5.15 shows that no significant between-group differences were found on the NHP (Part 11). Table 5.15 and table 5.16 show that the degrees of freedom for the question, 'do health problems prevent you from going on holiday' is 32 rather than 73. This is because a large number of people did not go on holiday and so the question was inappropriate. The data was recoded as missing data for this analysis and thus reduced the number of cases processed.

Table 5.16 Repeated measures ANOVA for Within-Subjects Effects on the NHP (Part 11) for Groups 1 and 2.

Source of variation	SS	DF	MS	F	sig of F
Within-Subjects Effects					
House-work					
Within Cells	3.4	73	.05		
House-work	.06	1	.06	1.34	.25
Group status by house-work	.00	1	.00	.01	.94
Social life					
Within Cells	1.5	73	.02		
Social life	.01	1	.01	.29	.59
Group status by social life	.01	1	.01	.29	.59
Sex life					
Within Cells	4.5	73	.06		
Sex life	.01	1	.01	.12	.73
Group status by sex life	.01	1	.01	.12	.73
Home life					
Within Cells	.97	73	.01		
Home life	.00	1	.00	.01	.93
Group status by home life	.03	1	.03	2.1	.16
Interests and hobbies					
Within Cells	3.9	73	.05		
Interests/hobbies	.02	1	.02	.43	.51
Group status by interests/hobbies	.02	1	.02	.43	.51
Holidays					
Within Cells	1.5	32	.05		
Holidays	.01	1	.01	.20	.66
Group status by holidays	.01	1	.01	.20	.66

Table 5.16 shows that no significant within group differences were found on the NHP (part 11) over the six month period.

5.4.8 Attitudes towards exercise.

Table 5.17 shows the percentage of women agreeing with a range of exercise attitude statements at baseline and six months and the mean score for each attitude statement. Data was coded '1' if someone disagreed with the statement and '0' if they agreed with it.

Table 5.17 Percentage of agreement and mean scores (sd) on exercise attitude statements for groups 1 and 2 at baseline and six months.

Attitudes	Baseline				6 months			
	G 1 (n=36)		G 2 (n=41)		G 1 (n=35)		G 2 (n=41)	
	%	Mean score (sd)	%	Mean score (sd)	%	Mean score (sd)	%	Mean score (sd)
Physical self-efficacy:								
Not the 'sporty' type	**61**	**.39** (.49)	**71**	**.29** (.46)	**75**	**.23** (.43)	**88**	**.12** (.33)
Too shy	**17**	**.83** (.38)	**27**	**.73** (.45)	**8**	**.91** (.28)	**35**	**.65** (.48)
Haven't got the energy	**28**	**.72** (.45)	**32**	**.76** (.43)	**14**	**.83** (.38)	**15**	**.83** (.38)
Have a disability	**33**	**.67** (.48)	**29**	**.71** (.46)	**33**	**.66** (.48)	**26**	**.74** (.44)
Too old	**11**	**.89** (.32)	**2**	**.98** (.16)	**3**	**.97** (.17)	**5**	**.95** (.22)
Health not good	**17**	**.83** (.38)	**0**	**1.0** (.00)	**11**	**.89** (.32)	**15**	**.85** (.36)
Might get injured	**8**	**.92** (.28)	**2**	**.98** (.16)	**8**	**.91** (.28)	**8**	**.92** (.27)
Wouldn't keep it up	**25**	**.72** (.45)	**27**	**.68** (.47)	**19**	**.80** (.41)	**25**	**.75** (.44)
Too fat	**28**	**.72** (.45)	**32**	**.68** (.47)	**14**	**.86** (.36)	**30**	**.70** (.36)
Need to rest	**75**	**.25** (.44)	**59**	**.41** (.50)	**58**	**.43** (.50)	**55**	**.45** (.50)
Other barriers:								
No-one to do it with	**44**	**.56** (.50)	**49**	**.51** (.51)	**36**	**.63** (.49)	**45**	**.55** (.50)
Don't enjoy exercise	**19**	**.81** (.40)	**15**	**.83** (.38)	**14**	**.86** (.36)	**20**	**.80** (.41)
No local facilities	**33**	**.47** (.51)	**17**	**.56** (.50)	**43**	**.53** (.51)	**10**	**.67** (.47)
Haven't got equipment	**22**	**.78** (.42)	**15**	**.85** (.36)	**11**	**.89** (.32)	**13**	**.87** (.33)
Not got the time	36	**.64** (.49)	29	**.71** (.46)	33	**.66** (.48)	35	**.65** (.48)
Can't afford it	**11**	**.89** (.32)	**15**	**.85** (.36)	**6**	**.94** (.24)	**15**	**.85** (.36)

Using Winer's [31a] method again, a repeated measures ANOVA statistical test was applied to detect whether there were any significant differences between and within subjects' exercise attitudes over time. The results for the between group effects for physical self-efficacy and general exercise attitude statements (other barriers) can be seen in table 5.18 and table 5.19 respectively.

Table 5.18 Repeated measures ANOVA for Between-Subjects Effects for physical self-efficacy exercise attitudes by group over time.

Source of variation	SS	DF	MS	F	sig of F
Not the sporty type					
Within Cells	17.9	73	.25		
Group status	.39	1	.39	1.6	.21
Too shy					
Within Cells	17.8	73	.24		
Group status	1.5	1	1.5	6.0	.02*
No energy					
Within Cells	14.2	73	.19		
Group status	.00	1	.00	.00	.98
Have an injury					
Within Cells	19.6	72	.27		
Group status	.20	1	.20	.73	.39
Too old					
Within Cells	4.5	73	.06		
Group status	.04	1	.04	.69	.41
Health not good					
Within Cells	6.1	73	.11		
Group status	.17	1	.17	1.6	.22
Might get injured					
Within Cells	4.3	72	.06		
Group status	.04	1	.04	.74	.39
Wouldn't keep it up					
Within Cells	19.2	73	.26		
Group status	.13	1	.13	.49	.49
Too fat					
Within Cells	21.9	73	.30		
Group status	.47	1	.47	1.6	.21
Need to rest					
Within Cells	21.3	73	.29		
Group status	.25	1	.25	.86	.34

* significant at the 0.05 significance level.

Table 5.18 shows that a significant between group difference was found for the exercise statement 'I am too shy/embarrassed to exercise'. Mean scores in table 5.17 show that significantly more people in group 1 disagree with the statement (mean = .91) than in group 2 (mean = .65) at six months.

Table 5.19 Repeated measures ANOVA for Between-Subjects Effects for general exercise attitudes by group over time.

Source of variation	SS	DF	MS	F	sig of F
No-one to do it with					
Within Cells	21.9	73	.30		
Group status	.09	1	.09	.29	.59
Don't enjoy it					
Within Cells	16.6	73	.23		
Group status	.01	1	.01	.04	.84
No local facilities					
Within Cells	23.5	72	.33		
Group status	.47	1	.47	1.4	.24
Haven't got equipment					
Within Cells	14.9	73	.20		
Group status	.04	1	.04	.21	.65
Not got the time					
Within Cells	24.3	73	.33		
Group status	.01	1	.01	.04	.85
Can't afford it					
Within Cells	10.7	73	.15		
Group status	.15	1	.15	1.1	.31

Table 5.19 shows that no significant between group differences were found on the general exercise attitude statements.

The results for the repeated measures ANOVA for within group differences on the physical self-efficacy and general exercise attitude statements can be seen in tables 5.20 and 5.21 respectively.

Table 5.20 Repeated measures ANOVA for Within-Subjects Effects for physical self-efficacy exercise attitudes by group over time.

Source of variation	SS	DF	MS	F	sig of F
Not the sporty type					
Within Cells	9.4	73	.13		
Not sporty type	1.1	1	1.1	8.7	.00**
Group status by not sporty type	.00	1	.00	.00	.98
Too shy					
Within Cells	6.3	73	.09		
Too shy	.00	1	.00	.03	.85
Group status by too shy	.16	1	.16	1.9	.18
No energy					
Within Cells	10.8	73	.15		
No energy	.24	1	.24	1.6	.21
Group status by energy	.00	1	.00	.01	.93
Have an injury					
Within Cells	11.5	72	.16		
Have an injury	.01	1	.01	.04	.85
Group status by injury	.01	1	.01	.04	.85
Too old					
Within Cells	2.9	73	.04		
Too old	.03	1	.03	.88	.35
Group status by too old	.11	1	.11	2.9	.09
Health not good					
Within Cells	5.5	73	.08		
Health not good	.08	1	.08	1.1	.30
Group status by health	.40	1	.40	5.3	.02 *
Might get injured					
Within Cells	4.9	72	.07		
Might get injured	.02	1	.02	.35	.55
Group status by injured	.02	1	.02	.35	.55
Wouldn't keep it up					
Within Cells	9.3	73	.13		
Wouldn't keep it up	.16	1	.16	1.3	.26
Group status by keep up	.00	1	.00	.02	.88
Too fat					
Within Cells	6.3	73	.09		
Too fat	.18	1	.18	2.1	.15
Group status by too fat	.07	1	.07	.87	.36
Need to rest					
Within Cells	13.4	73	.18		
Need to rest	.46	1	.46	2.5	.12
Group status by rest	.14	1	.14	.75	.39

* $p \leq 0.05$; ** $p \leq 0.001$

Table 5.20 shows that there were significant within-subject effects for groups 1 and 2 on the attitude statement 'I'm not the sporty type' (p (F) = .00), over time. Members of both groups were more likely to agree that they were not the sporty type at six months than at baseline. Table 5.20 also shows a significant interaction effect for group status and 'health not good enough to exercise'. 100% in group 2 (n = 41) disagreed with the statement at the start of the

study, whilst at six months only 85% (n = 35) disagreed. Whilst 83% (n = 29) of members of group 1 disagreed at the start of the study that their health was not good enough to exercise, this number increased to 89% (n = 31) at the end of six months.

Table 5.21 Repeated measures ANOVA for Within -Subjects Effects for general exercise attitudes by group over time.

Source of variation	SS	DF	MS	F	sig of F
No-one to do it with					
Within Cells	14.9	73	.20		
no-one	.11	1	.11	.56	.46
Group status by no-one	.03	1	.03	.17	.68
Don't enjoy it					
Within Cells	5.4	73	.07		
Don't enjoy it	.01	1	.01	.13	.72
Group status by enjoy	.06	1	.01	.04	.84
No local facilities					
Within Cells	12.1	72	.17		
No facilities	.31	1	.31	1.8	.18
Group status by facilities	.04	1	.04	.24	.63
Haven't got equipment					
Within Cells	4.3	73	.06		
No equipment	.18	1	.18	3.1	.08
Group status by equipment	.07	1	.07	1.3	.26
Not got the time					
Within Cells	8.9	73	.12		
No time	.02	1	.02	.19	.66
Group status by no time	.02	1	.02	.19	.66
Can't afford it					
Within Cells	4.9	73	.07		
Can't afford it	.03	1	.03	.45	.5
Group status by afford	.03	1	.03	.45	.5

Table 5.21 shows that there are no significant within group differences for general exercise attitudes.

A total mean score for physical self-efficacy for each group at each time point, was calculated and analysed using a repeated measures ANOVA. The results are shown in table 5.22.

Table 5.22 **Mean score (sd) for physical self-efficacy exercise attitude statements for groups 1 and 2 at baseline and six months and repeated measures ANOVA for between and within-subjects effects for physical self-efficacy.**

Attitudes	**Baseline**		**6 months**	
	G 1 (n= 36)	**G 2** (n=41)	**G 1** (n=35)	**G 2** (n=41)
Physical self efficacy				
Mean (sd)	**6.9** (1.9)	**6.9** (1.7)	**7.5** (1.7)	**7.2** (1.5)

	SS	**DF**	**MS**	**F**	**sig of F**
Between-Subjects Effects					
Within Cells	306.6	72	4.3		
Group status	1.4	1	1.4	.32	.57
Within-Subjects Effects					
Within Cells	108.8	72	1.5		
Physical self-efficacy	.47	1	.47	.31	.58
Group status by efficacy	4.4	1	4.4	2.9	.09

Table 5.22 shows that there were no significant between or within group differences for physical self-efficacy statements, over time. Although an interaction effect between group status and efficacy is approaching significance (p (F) = 0.09). The mean scores indicate that both groups experienced increases in physical efficacy over the six month period: group 1 increased their score slightly more than group 2, from 6.9 to 7.5, whilst group 2 increased from 6.9 to 7.2.

5.5 DISCUSSION

5.5.1 Summary of the findings.

There is a paucity of research examining the benefits of exercise activity for elderly women. Where research has been performed, there is a lack of clarity over the exact intensity, frequency and duration an exercise prescription might take to confer benefits. Methodological flaws with study designs, including the overuse of volunteer samples, non-random allocation to treatment conditions and lack of control groups, has further limited the nature of the recommendations that can be made. Using a randomised experimental design, this study set out to ascertain whether a six month low intensity, low frequency exercise programme would have a significant impact on the well-being of elderly women. More specifically, the aim of the study was to determine whether a six month brisk walking programme would improve cardiovascular fitness, leg strength, subjective health status and attitudes towards exercise.

At baseline, women were broadly similar on variables such as age, ethnicity, housing, weight, body mass index, health, fitness and health behaviours such as smoking and alcohol consumption. However, repeated measures analyses of variance for cardiovascular fitness, leg strength, subjective health status and exercise attitudes revealed that significant between and within groups changes occurred over the six month period.

On the measure used to detect cardiovascular fitness, the stamina step test, significant within group changes were found for both groups. Group 1 increased the mean number of steps completed by a greater magnitude than group 2 over time. The mean score for group 1 at the start of the study was 201 steps, this increased to 254 steps at six months. Over the same time period, group 2 increased the mean number of steps completed from 179 to 197 steps. No significant between group differences were noted, although an interaction effect between group status and step test stamina was approaching significance ($p\ (F) = 0.08$). Standard deviation scores indicated that there was a wide variety of ability within each group. Resting heart rate remained stable for both groups over the study period.

On the other physical well-being measure, leg strength, significant within group differences were also observed. An increase in right and left leg strength was recorded for both groups. For group 1, right leg strength increased from 77.5 to 86.9 watts and left leg strength increased from 79.4 to 90.1 watts. Group 2's scores increased from 77.1 to 83.9 (right leg) and from 78.5 to 87.8 (left leg). No significant between group or interaction effects were found.

In terms of broad measures of subjective health status, no significant differences were found between groups for perceived health, fitness or walking ability. Similarly no significant differences were found between groups on the Nottingham Health Profile (Part 11). However, on all six dimensions of the NHP (Part 1) group 1 consistently reported less problems than group 2 at six months. On one dimension, energy, a between group difference was approaching significance ($p\ (F) = 0.07$). At six months, the mean score for

group 1 on this dimension was 5.3 compared to 18.6 for group 2. A significant interaction effect between group status and mobility (p (F) = 0.02) was detected. Perceived mobility significantly improved for group 1 at the end of the six month walking programme. Their mean score on this dimension had changed from 17.7 (at baseline) to 10.9 at the six month stage. Meanwhile, the mean score for the control group started at 15.7 and increased to 17.3 at six months. There was also some evidence that group 1 members experienced a reduction in the number of problems they were having with sleep over the study period. Since an interaction effect between group and sleep was almost significant (p (F) = 0.09). Group 1 decreased the mean number of problems on this dimension from 23.4 to 15.5, whilst group 2 increased their mean score from 18.1 to 19.3. Large standard deviation scores attached to the means for each dimension were observed, caused in part by the weights assigned to each statement making up the sub-scales and perhaps also indicating that the groups were heterogeneous.

A significant between group difference was noted on the exercise attitude statement ' I am too shy/ embarrassed to exercise' and a significant interaction effect between group status and the exercise attitude 'my health is not good enough to exercise' was also found. At six months, significantly more people in group 1 were likely to disagree that they were too shy/embarrassed to exercise compared to group 2 (mean score = .91 and .65 for group 1 and 2 respectively). Similarly, people in group 2 were less likely to say they disagreed with the statement: 'health was good enough to exercise' at the end of six months (mean = .85) compared to at the start of the study (mean = 1.0). An interaction effect between group status and physical self-efficacy was approaching significance (p (F) = 0.09). Group 1 increased their mean score on these attitude statements from 6.9 to 7.5 over six months, whilst at the same time, group 2 increased their mean score from 6.9 to 7.2. A significant within-subjects effect was found for the attitude 'I am not the sporty type'. At six months, members of group 1 and group 2 were more likely to agree that they were *not* sporty compared to at baseline. Group 1 changed their mean score from .39 (at baseline) to .23 (at six months). Meanwhile, group 2 changed their mean score from .23 to .13.

In summary, the six month intervention programme of brisk walking appears to have produced mixed results. Group 1 appeared to improve in step test stamina and leg strength over time, but improvements were also found for group 2 as well. Improvement in stamina was more marked for group 1, but not sufficient to produce a significant difference between the two groups. Similarly, on the NHP (Part 1), group 1 improved on five dimensions, but a significant interaction effect for group 1 only occurred for physical mobility. At six months, significantly more people in group two said they were too shy to exercise and were more likely to state that their health was *not* good enough to exercise, compared to baseline. However no other significant between group effects occurred for exercise attitudes and interestingly, significant within-subject effects occurred whereby members of both groups, were more likely to decide they were *not* the sporty type at the end of both exercise programmes.

5.5.2 Methodological limitations of the study.

Although attempts were made to carefully design the experiment before the start of the study, so that the results could be attributed with little ambiguity to the effects of the intervention (the brisk walking programme), threats to the validity of the study findings have occurred. Several types of threats to internal and external validity have been identified by Cook and Campbell [31b]. They suggest that factors or influences other than the independent variable that could explain the results are called threats to internal validity. This includes a consideration of selection bias, attrition, testing, maturation, diffusion of treatment and reaction of controls. External validity refers to the extent to which the results of an experiment can be generalised beyond the conditions of experiment to other populations, settings and conditions. Threats to external validity include sample and stimulus characteristics, contextual characteristic such as reactivity of experimental arrangements, reactivity of assessment and time of measurement and treatment effects. Construct and statistical conclusion validity are also important concepts. Kazdin [31c] states that features associated with the intervention that interfere with drawing inferences about the basis of the differences between groups, such as attention and contact with clients and cues of the experimental situation, are referred to as threats to construct validity. Whereas statistical conclusion validity 'refers to those facets of the quantitative evaluation that influence the conclusions we reach about the experimental condition and its effect' [31d]. Variability in procedures, subject heterogeneity, unreliability of the measures, multiple comparisons and error rates all pose threats to statistical conclusion validity. The above concepts are all inter-related [31c]. Discussion of the limitations of this study are carried out with these points in mind.

Threats to the validity of the study findings

The randomisation process appeared to control for any selection bias of allocation of women to the two different treatment conditions. The mean age of women in both groups was sixty-years, and each group contained a similar spread of ages. There were no significant group differences either in terms of ethnicity, socio-economic status, health behaviours (smoking and drinking alcohol), height, weight or body mass. Measurements taken at baseline and six months indicated that there was large variability *within* the groups themselves. Examples of this can be seen clearly in the results for the mean number of steps completed on the step test and for leg strength. The fact that none of the women volunteered to participate in a specific exercise intervention but were invited to join the study after attending a fracture clinic, may account for why the groups were heterogeneous. On reflection, it would have been helpful to have recorded current levels of physical activity at the start of the study. If this extra data were available, it would have been possible to pool the groups and examine the differential effects of any of the exercise programmes, taking into account how active the women already were.

One of the major problems associated with a study which randomises people into exercise groups is the fact that you cannot ask people to stop exercising, for example taking brisk walks, just because they are randomly allocated to the non-brisk walking group. It is also

difficult to ensure that even if people agree to carry out an exercise programme, they actually do it in practice. This potential problem is exacerbated in a study such as this because the women were autonomous exercisers; they did not attend specific taught exercise classes. Frequency and intensity of the exercise therefore could not be observed by the researcher. The main method devised to monitor the frequency and intensity of the exercise performed by both groups during the six month period, was a diary. The women in group 1 were asked to write down each time they went for a brisk walk plus any other exercise that they did. In addition they were asked to record how long they exercised for and to describe any feelings they had either before or after the exercise. It was intended that this information would be used at follow-up appointments to check on compliance to the exercise programme and to help the women themselves monitor the amount of exercise they were doing between appointments.

However, major difficulties were encountered using this method. Only a quarter of the women at the three month follow up appointments had attempted to record their exercise activities. Many women said they had forgotten to bring their diaries with them (even though a letter a week earlier was sent to remind them). Other women said they had felt guilty for not completing them. Furthermore some people said that they had been deterred from continuing in the study because they found it hard to keep their diaries up to date. At six months, the number of people keeping exercise diaries had further decreased.

Apart from the fact that attendance at appointments was excellent and attrition from the study was low (n=1), anecdotal evidence (all women were able to offer a plausible account of their exercise regime) at follow-up appointments is the only indication of whether the women actually kept to their exercise plan. Therefore it is difficult to be sure whether the significant group differences shown by the women in the intervention group was due to the brisk walking plan or some other factor. Similarly, it is difficult to be clear about what exercise boundaries existed between the control and the intervention groups (diffusion of treatment). The use of a homeopathic dose of exercise has its drawbacks. Since there is some evidence to suggest that home-based activities [32] and activities which include very light exercises [33 34] could have benefits. In an unsupervised exercise study such as this, it is essential to have had a good method of monitoring activity. It could be argued that the personalised exercise programme prescribed for group 2 was not really a control group, but really *another* form of intervention. One might expect the differential effects between groups to be blurred since a positive increase in some variables measured, such as attitudes towards exercise, could be conceivable for the personalised exercise and the brisk walking exercise group.

On reflection, a three month period was too long to ask women to record exercise activity. Studies have shown that older women are unable to keep a log of their exercise activities for just a two week span [19]. In another randomised exercise trial looking at the effects of increased activity on the well-being of older women [36], researchers were much tougher with participants. Individuals who failed to send in a log at the end of a month period were considered in the analysis as walking zero miles for that month.

Alternative strategies may have included asking people to wear pedometers to measure the amount of distance walked; asking participants to describe a 'typical' exercise week in detail, for the week preceding the assessment appointment; gathering weekly activity information from participants using telephone contact or adopting a part supervised, part unsupervised approach like Hardman [8]. She arranged to meet with women in the walking intervention group once a week, to help maintain their interest and monitor compliance. This last strategy has its own problems however, since a threat to the validity of a study's finding may occur, if control groups do not receive equivalent attention to the intervention group.

This study was only single blind, that is, the author knew whether women were in the brisk walking or placebo group, but members of the group were lead to believe that both groups were equivalent. Kazdin [31c] suggests that a threat to validity may occur if groups receive preferential attention and contact. The author certainly undertook to be professional and objective in her interactions with all women. In addition, the procedures of the interviews did not vary across groups. Women all undertook the same assessments and the duration of each appointment (contact time) lasted for the same amount of time. In fact it could be argued that women in group 2 received more attention with regards to their exercise programme. Since each women in group 2 had a tailor-made exercise plan involving considerable thought and time. The fact that none of the women dropped out of the control group over the six month period could be seen as partial evidence for their belief in the programme. However no systematic attempt was made to assess the women's beliefs in the efficacy of the exercise programme they were undertaking. Kazdin [31c] suggests that people who doubt the benefits of a particular treatment are less likely to adhere to that programme.

Another method of determining the adherence of women to their exercise prescription may have been to measure their motivation to exercise. The theory of self-motivation, or the tendency to persevere in the absence of extrinsic reinforcement, has been identified as one of the most important factors related to exercise adherence when multiple factors are considered [21 37a].

One cannot also rule out a possible response bias occurring from women in the study. Since at the baseline interview all women, cues of the experimental situation were given. That is, women were informed that the role of exercise in controlling the development of osteoporosis was being investigated. If one has an expectation that change should occur or would be beneficial, on self-report measures there is scope to give a better score to please the experimenter and bring about the desired result. Thus reactivity to the experimental arrangements could have occurred in both groups. There were signs that women in both groups appeared were honest. For example, in terms of their attitude towards exercise, women in both groups were more likely to admit at the end of the six month programme, that they were not the sporty type and group 2 members were more likely to say their health was not good enough to exercise at six months, than at the start of the study. It would have been harder to invoke a response bias on the physiological, non self-report tests.

The significant within group changes that were observed for leg strength and step test stamina could perhaps be explained best, not as a response bias but in terms of the women becoming more familiar and increasing their confidence with the techniques used to assess physical well-being, over time (testing and maturation). For example, the leg extension rig is a type of machine which none of the women were familiar with at the start of the study. The machine works on the basis of explosive power, whereby one foot is placed on the rig at a time and then the leg is stamped forwards as hard as possible. At six months the women may have been more practised at using the machine. It is feasible that the significant increase in mean scores at six months is due to this factor rather than any beneficial effects of the walking exercise programme. This may help to explain why increases in leg strength were found in both groups.

The step test stamina exercise was, once again another type of exercise which the women were not familiar with. However unlike the leg strength test, this test involves climbing steps; all women have some prior experience of this. Nevertheless, women would have had different exercise intensity thresholds, with some women being more cautious about pushing themselves than others. Ideally the practise effects should have been controlled by allowing the women sufficient time to adjust to the different measures before starting to record scores properly. A small pilot study asking for qualitative feedback from the women and examining specifically the reliability and validity of the measurement tools would have helped to control for these effects. This approach would be recommended if designing any future exercise intervention studies.

Cook and Campbell [31b] suggests that the time of day in which measurements are taken can have implications for the generalisability of any findings. In this study, assessments took place in the morning and afternoon, and women who had a baseline appointment in the morning or afternoon kept the same appointment time in follow-up interviews. In theory, the results from this study could be generalised more widely. However, it was noted that some women reported feeling fresher in the morning than in the afternoon.

It was suggested in chapter one that women who volunteer to take part in exercise may be qualitatively different from those who decide not to participate, in that they may have a higher level of fitness and be more motivated [38] . Thus a volunteer sample would limit the external validity of any findings. The sample characteristics of women in this study are that they were neither regular exercisers nor did they sign up to a specific exercise programme. All women were recruited from the fracture clinic of a local hospital and they had all received treatment for a fracture to the arm. However, whilst this overcomes some problems with generalisability, it does not answer all of them. In one sense the group of women in this study could be considered to be better motivated than other groups. Using the Health Belief Model [39] or the precaution adoption process model [40], the women could be considered to be more motivated than other women. For example, the women were all potentially at risk from osteoporosis, (that is they were post-menopausal and had suffered a bone fracture), and it is possible that the recruitment letter and the baseline appointment

scoring on average 7/10 on these attitude statements. The majority of women also rated their health as good, saw themselves as being fairly fit and estimated they could walk a mile.

Although it has been shown that there is a tendency for people to overate their health and fitness [45] in comparison to the norms on the Nottingham Health Profile for women of a similar age [46], the women in this study do appear to experience less health problems than a sample drawn from a general practitioner population of the same age and sex. Thus these personal and programme factors have to be taken into account when generalising the results to other groups of women, and when thinking about the specific benefits of the exercise programme. It is possible that the findings of this study can only be generalised to women who are in reasonably good health to start with. Replication studies with different groups of women would serve to clarify the influence of these factors.

A large number of statistical tests were carried out when analysing the data in this study. Kazdin [31c] advises that the more tests that are performed, the more likely a chance difference will be found, even if there are no true differences between conditions. Thus it is possible that type 1 errors, or spurious associations have occurred because of this. This is more likely when a 0.05, as opposed to a 0.01 significance level is chosen. Some caution must be taken therefore when interpreting the results. On reflection, it may have been helpful to have followed a suggestion by Kazdin [31c] to use the Bonferroni adjustment, to control for the overall experiment-wise error rate.

5.5.3 Implications.

Clearly, a number of threats to the validity of the study findings cannot be ruled out and when considering the implications of the study findings, these factors must be borne in mind and caution taken.

The high uptake and low drop out rate of women in this study, plus evidence of some significant changes between and within groups over the study period, helps to challenge some of the popular myths outlined in chapter one by opponents of health promotion interventions for the elderly. Namely that the elderly are difficult to recruit to exercise studies because they are not interested in adapting their behaviour or investing time in an exercise programme, and any effects would be insignificant and therefore not cost effective. It also lends support to the theory of Rakowski and Hickey [47] who suggest that the interaction between perceived severity (for example, developing osteoporosis), age and actual or perceived time pressure, may have a significant impact in determining whether a person engages in a particular health behaviour. On the surface, it does not appear to support Dishman's [48 49] findings that 50% of older people drop out of exercise programmes before six months. However, because difficulties were experienced with monitoring compliance to the exercise interventions in this study, it is not possible to be sure whether remaining in the study equated with actual adherence.

In terms of cardiovascular fitness and leg strength, this study supports the findings of others [50] in that a low intensity, low frequency exercise such as walking was insufficient to produce any significant between group differences for step test stamina or leg strength. This finding

contradicts the findings of others [51-53]. However, it is possible that with greater sample sizes, closer monitoring of compliance to the walking programme and minimising reliability problems with outcome measures such as the leg extension rig, that a significant effect may have been found.

There is some evidence to suggest that the six month walking programme was sufficient to significantly reduce the number of physical mobility problems experienced, thereby improving subjective health status and well-being. This finding supports the work of others [54-56] who have found that a slight increase in physical activity above a personal norm has a beneficial impact on functional fitness. The finding contrasts with the work of Morgan and associates [4], who found that customary low intensity exercise incurred benefits for elderly men but not women. However, differences between the stimulus conditions of this study and theirs may account for the discrepancy in findings. Their study for example, looked at customary physical activity in general and included washing up and shopping. By contrast, this study focused on brisk walking.

The finding that members of the brisk walking programme experienced significantly fewer problems with functional fitness activities such as dressing and climbing stairs is particularly exciting. Since greater functional fitness may increase an individual's capacity for independent living and ward off a drop in self-esteem and a vulnerability to depression[58]. Moreover, impaired mobility has been found to be the best physical indicator of subsequent mortality in depressed older adults [59] and people who report fewer physical symptoms have been shown to have higher well-being scores [60]. Thus it seems especially important to find ways to sustain the physical mobility of the elderly living at home. Low intensity exercise such as increasing walking may be one way.

In common with other studies, participation in an exercise programme appeared to have a weak and inconsistent association with attitudes towards exercise [61] [62]. There is some evidence to suggest that women in the control group experienced a decline in their physical self-efficacy since, at the end of the six month period they were more likely to say they were too shy/embarrassed to exercise and that their health was not good enough to exercise, compared to at the start of the study. However, over time, both groups increased some doubt in their physical self-efficacy. For example, at the end of the study period, members of both groups experienced a negative shift in attitude and were more likely to state that they were not the sporty type. Thus the evidence is not strong enough to either support or refute the positive findings of others who have examined the relationship between exercise participation and physical self-efficacy [63-65].

This study set out to improve upon the research designs of other studies and to contribute further to knowledge concerning the relationship between low intensity exercise and well-being amongst elderly women. This study whilst managing to recruit a non-explicit volunteer sample and randomise women across two experimental conditions relatively successfully, has run into a number of methodological problems which make it impossible to be clear about the exact relationship between a low intensity exercise programme such as brisk walking and well-being. In common with other researchers who have tried to conduct similar studies, there were problems with: small sample sizes [68] [69], describing tight definitions of exercise for each

group [67 68] and adequate methods of monitoring compliance to the exercise prescription [51 52]. In addition, in this study, although standardised physiological measures were chosen, there was inadequate time given to testing of the reliability and validity of physiological measurements with the study sample before the start of the study.

Although sample sizes exceeded thirty in each group, large variations between groups in terms of physical ability meant that the samples were too small to detect between group differences. Between group differences and interaction effects between groups and different variables were often approaching significance. Larger samples, clearer distinctions between groups and recording and controlling for existing exercise activity levels amongst all group members, may have helped to ensure that any differential effects between groups came through stronger.

Thus this study has highlighted the kind of problems which researchers face when designing community-based exercise intervention studies. These challenges would be present irrespective of the age and sex of the sample. A clearer and more convincing case based on scientific evidence of the benefits of participating in exercise may occur if future studies concentrate on the following: recruiting larger samples of women; allowing more time at the start of the study to test the reliability and validity of physiological tests to be used in measuring outcomes; being more prescriptive about the exercise programmes (perhaps using an exercise manual); controlling for within group variability and being more explicit about the monitoring procedures. It would pay to take time and be creative over piloting a number of methods for monitoring compliance rather than rushing in to start an exercise intervention programme. Methods may include piloting the use of pedometers, diaries, telephone contact and increasing face-to-face contact time. Methods would have to be equitable across all groups to avoid threatening the internal validity of the study findings. A number of control groups would be useful, not only including a group which receives a homeopathic dose of exercise, since this may be beneficial in itself. In addition, attention should be given to testing how efficacious group members think their treatment option is and to monitoring motivation to adhere to the particular programme.

5.6 REFERENCES.

1. Bassey, E.J., Fentem, P.H., MacDonald, J.C. and Scriven, P.M. Self-paced walking as a method for exercise testing in elderly and young men. *Clinical Science Medicine*, 1976; **51**: 496-502.

2. Plowman, S.A., Drinkwater, B.L. and Horvath, S.M. Age and aerobic power in women: a longitudinal study. *Journal of Gerontology*, 1979; **34**: 512-520.

3. Serfass, R.C. Physical exercise and the elderly. In Studd, G.A. (Ed.), *Encyclopedia of physical education, fitness and sports: training, environment, nutrition and fitness*. Salt Lake City: Brighton, 1980.

4. Morgan, K., Dallosso, H.M., Arie, T., Byrne, E.J. and Waite, J. Mental health and psychological well-being among the old and very old living at home. *British Journal of Psychiatry*, 1987; **150**: 801-807.

5. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

6. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218.

7. Chow, R.K., Harrison, J.E., Brown, C.F. and Hajek, V. Physical fitness effect on bone mass in postmenopausal women. *Archives of Physical Medical Rehabilitation*,1986; **67** : 231-34.

8. Hardman, A.E. Benefits of low intensity exercise in women. *Sports Medicine and Soft Tissue Trauma*, 1991; **3(1)**: 14-15.

9. Hogan, P.I. and Santomier, J.P. Effect of mastering swimming skills on older adults'self-efficacy. *Research Quarterly for Exercise and Sport*,1984; **55**: 294-296.

10. Loomis, R.A. and Thomas, C.D. Elderly women in nursing home and independent residence: health, body, attitudes, self-esteem and life satisfaction. *Canadian Journal of Aging*, 1991; **10 (3)**: 224-231.

11. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10(2)**: 125-131.

12. Perri, S. and Templer, D.I. The effects of an aerobic exercise programme on psychological variables in older adults. *International Journal of Aging and Human Development*, 1985; **20**: 167-172.

13. Emery, C.F. and Gatz, M. Psychological and cognitive effects of an exercise programme for community-residing older adults. *The Gerontologist*, 1990; **30(2)**: 184-188.

14. Olson, M.I. *The effects of physical activity on the body image of nursing home residents.* Unpublished master's thesis. U.S.:Springfield College,1975.

15. Royal College of Physicians. Medical aspects of exercise: benefits and risks. *Journal of the Royal College of Physicians*, 1991; **25(3)**: 193-196.

16 Dishman, R.K., Sallis, J.F. and Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100:**158-171.

17. World Health Organisation (WHO). *Ottawa charter for health promotion.* New York: WHO, 1986

18. Secretary of State for Health. *The health of the nation. A strategy for health in England.* London: HMSO, 1991.

19. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., and Pambianco, G. A Randomised exercise trial in older women: increased activity over two years and factors associated with compliance. *Medicine and Science in Sports and Exercise*, **1986; 7:** 557-562

20. Sports Council and Health Education Authority. *The Allied Dunbar National Fitness Survey*. London: Ancient House Press, 1992.

21. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1**: 237-267.

22. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. Psychological Review, 1977; 84: 192-215.

23. Ajzen, I. (1985) From intentions to actions: a theory of planned behaviour. In J. Kuhl and J. Beckman (eds.). *Action-control: from cognition to behaviour.* Heidelberg, Germany: Springer, pp 12-39.

24. Sallis, J.F., Haskell, W.L., Fortmann, S.P., Vranizan, K.M., Taylor, C.B., and Solomon, D.S. Predictors of adoption and maintenance of physical activity in a community sample. *Preventive Medicine,* 1986;**15**: 331-341.

25. Hardman, A.E., Hudson, A. Walking for health: a closer look at exercise. *Health Trends*, 1989; **21**: 91-2.

27. Ransford, C.P. A role for amines in the antidepressant effect of exercise: a review. *Medicine Science and Sports Exercise*, 1982; **14**: 1-10.

28. Jasnoski, M.L., Holmes, D.S., Solomon, S. and Aguiar, C. Exercise changes in aerobic capacity, and changes in self-perception: an experimental investigation. *Journal of Research in Personality*, 1981; **15**: 460-466.

29. Garfield, S.L. Critical issues in the effectiveness of psychotherapy. In Walker, C.E. (Ed.). *Clinical practice of psychology*. Oxford: Pergamon Press, 1981.

30. Bassey, E.J. and Short, A.H. A new method of measuring power output in a single leg extension: feasibility, reliability and validity. *European Journal of Applied Physiology*, 1990; **60**: 385-390.

31. Hunt, S.M., McEwen, J. and McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

31a. Winer, B.J. *Experimental design and statistics*. New York: McGraw-Hill, 1971.

31b. Cook, T.D. and Campbell, D.T. *Quasi-experimentation: design and analysis issues for field settings*. Chicago: Rand McNally.

31c. Kazdin, A.E. *Research design in clinical psychology* (2nd edition). London: Allyn and Bacon, 1992.

32. Shephard, R.J. *Physical activity and ageing* (2nd edition). London: Croom helm, 1987.

33. Loomis, R.A. and Thomas, C.D. Elderly women in nursing home and independent residence : health, body, attitudes, self-esteem and life satisfaction. *Canadian Journal of Ageing*, 1991; **10(3)**: 224-231.

34. Olson, M.I. The effects of physical activity on the body image of nursing home residents. Unpublished master's thesis. U.S.:Springfield College,1975.

35. Matteson, M.A. Effects of a cognitive behavioural approach and positive reinforcement on exercise for older adults. *Educational Gerontology*, 1989; **15** (5): 497-513.

37a. Dishman R.K. Ickes W and Morgan W.P. Self-motivation and adherence to habitual physical activity. *Journal of Applied Social Psychology*, 1980; **10**: 115-132.

38. Dishman, R.K., Sallis, J.F. and Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**:158-171.

39. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508.

40. Weinstein, N.D. The precaution adoption process. *Health Psychology* 1988; **7(4)**: 355-86.

41. Faulkner, R.A., Bailey, D.A., and Mirwald, R.L. The relationship of physical activity to smoking characteristics in Canadian men and women. *Canadian Journal of Public Health, 1987;* **78**: 155-160

42. Stones, M.J., Kozma, A., and Stones, L. Smoking behaviour and participation in organised exercise. *Canadian Journal of Public Health, 1986;* **77**: 153-154.

43. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. *Psychological Review*, 1977; **84**: 192-215.

45. Sports Council and Health Education Authority. *Activity and Health Research in the Allied Dunbar National Fitness Survey: a report on activity patterns and fitness levels: main findings* . London: Ancient House Press, 1992.

46. Hunt, S.M., McEwen, J. and McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

47. Rakowski, W. and Hickey, T. Late life health behaviour: integrating health beliefs and temporal perspectives. *Research on Ageing*, 1980; **2 (3)**: 283-308.

48. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1:** 237-267.

49. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., and Pambianco, G. A Randomised exercise trial in older women: increased activity over two years and factors associated with compliance. *Medicine and Science in Sports and Exercise*, **1986; 7:** 557-562 .

50. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10(2)**: 125-131.

51. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

52. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218.

53. Morey, M.C., Cowper, P.A., Feussner, J.R., DiPasquale, R.C. and Crowley, G.M. Evaluation of a supervised exercise programme in a geriatric population. *Journal of the American Geriatric Society*, 1989; **37**: 348-354.

54. Wheat, M.E. Exercise in the elderly. *Western Journal of Medicine*, 1987; **147**: 477-480.

55. Price, J.H. and Luther, S.L. Physical fitness: its role in health for the elderly. *Journal of Gerontological Nursing*, 1980; **6(9)**: 517-523.

56. Markides, K.S. and Lee, D.J. Predictors of well-being and functioning in older Mexican Americans and Anglos: an eight year follow-up. *Journal of Gerontology*, 1990; **45 (1)**: 69-73.

58. Murphy, E. Social origins of depression in old age. *British Journal of Psychology*, 1982; **141**: 135-142. 1982 .

59. Burvill, P.W. and Hall, W.D. Predictors of increased mortality in elderly depressed patients. *International Journal of Geriatric Psychiatry*, 1994; **9**: 219-227.

60. Watson, D. and Pennebaker, J.W. Health complaints, stress and distress: exploring the central role of negative affectivity. *Psychological Review*, 1989; **96**: 234-254.

61. Dzewaltowski, D.A. Toward a model of exercise motivation. *Journal of Sport and Exercise Psychology*, 1989; **11**: 251-269.

62. Dzewaltowski, D.A. Toward a model of exercise motivation. *Journal of Sport and Exercise Psychology*, 1989; **11**: 251-269.

63. Hogan, P.I. and Santomier, J.P. Effect of mastering swimming skills on older adults' self-efficacy. *Research Quarterly for Exercise and Sport*,1984; 55: 294-296.

64. Hughes, J.R. Psychological effects of habitual aerobic exercise: a critical review. *Preventive Medicine*,1984;13: 66-84.

65. Weinstein, W.S. and Meyers, A.W. Running as a treatment for depression: is it worth it ? *Journal of Sports Psychology*,1983; 5: 228-301.

66. DeVries, H.A. and Adams, G.M. Electromyographic comparison of single dose exercise and meprobamate as to effects on muscular relaxation. *American Journal of Physical Medicine*, 1972; **51**: 130-141.

67. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist,* 1990; **30(2)**: 189-192

68. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218

69. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10**(2): 125-131.

CHAPTER SIX

STUDY THREE. TOWARDS A NEW STRATEGY FOR HEALTH PROMOTION: INFLUENCES ON ELDERLY WOMEN'S PARTICIPATION IN DOMESTIC AND SPORTING PHYSICAL ACTIVITY.

6.1 INTRODUCTION.

Health promotion emphasises the importance of exercise for physical and mental health as it may reduce the risks of cardiovascular disease [1 2], osteoporosis [3 4], stroke [5] and hypertension [6] and be of value in people with chronic physical ill-health [7]. Mental health benefits include reductions in anxiety and depression [8 9] and improved satisfaction with body image and personal appearance [10]. Exercise does appear to be beneficial, even at older ages. Randomised controlled trials have demonstrated increases in muscle strength in both fit and frail elderly people up to the age of 98 years [11 12], and maximal oxygen consumption may be improved to the same extent as in younger subjects at least up to age of 70 years [13].

The Allied Dunbar National Fitness Survey (ADNFS) [14] showed that whilst the majority of people in England expressed a strong belief in the value of exercise in maintaining and increasing health and fitness, only a minority engaged regularly in physical activity of a moderate or vigorous intensity. Improving exercise uptake and adherence will require an understanding of exercise determinants.

Psychological models of exercise behaviour such as the Theory of Planned Behaviour (TPB) [15], Health Belief Model (HBM) [16] and theory of Self-Efficacy (SE) [17] have been largely unsuccessful at explaining exercise uptake and adherence. Some reasons for their lack of success may be because the models have been developed to explain health behaviour in general rather than exercise behaviour specifically [18]; the components of the models are based on professional opinion rather than lay people's conceptualisation of health behaviour [19 20] and the models view exercise as a linear, rather than a cyclical behaviour [21-23].

Scientific knowledge of exercise determinants is almost exclusively restricted to research based on North Americans aged 18 to 64 years [21 25 26]. In the UK little attention has been given to examining the influences of exercise and other health-related behaviours on the elderly. Thus knowledge of the factors and processes which encourage some older people to exercise, whilst others remain sedentary, is lacking.

If increased physical activity targets outlined in the *Health of the Nation* [1] are to be met, one of the first steps will be to study the determinants of physical activity in relevant populations, such as elderly women, followed by designing specific health promotion interventions to meet their needs. Health promotion programmes developed without this preparatory work have been widely adopted, although their efficacy is now thought to be limited [27 28].

Researchers have called into question some early work which has examined the determinants of physical activity amongst the elderly, because of the use of age-neutral questionnaires in measuring variables [29]. This study looks at the levels of

domestic and sporting physical activity amongst elderly women and the influences on their participation in that activity, in a large sample of retired women, using a questionnaire which has been tested for reliability and validity for an elderly population (see chapter four). This study has an overall aim of increasing the knowledge base in the UK, of the factors which are associated with exercise activity in elderly women. More specifically, this study sets out to examine:

1. the role that the following factors play in influencing elderly women's participation in domestic and sporting exercise: health status, health-related behaviour, past exercise experience, exercise beliefs, attitudes and barriers, age and socio-economic status.

6.2 METHOD.

A large sample of women (n=820) were drawn randomly from lists supplied by the retirement service associations distributed throughout England of a major national retail company. Women were sent the London Health and Fitness Questionnaire (LHFQ). As was seen in chapter four, where the development of it was outlined, the LHFQ has satisfactory reliability and validity. The questionnaire shows high concordance between responses obtained by self and interview administration and for questionnaire test-retest repeatability, and has satisfactory construct validity. Subjects were sent up to two mailings.

The LHFQ comprises: demographic and social details, information about the amount and type of physical activity taken, personal beliefs and attitudes towards exercise and specific barriers to increased physical activity, previous sports participation and self-reports of health, fitness, body weight and height. Women were also asked to complete the Nottingham Health Profile [30], as a measure of subjective health status.

The women were grouped into tertiles (thirds) according to how much time (number of hours) they spent on domestic and sporting activity. That is, low, medium and high domestic and sporting activity groups were formed. Domestic activity comprised the time spent on house-work, gardening and shopping. Whilst sporting activity comprised predominantly walking, cycling, bowls and swimming. Vigorous exercise was defined as activity that made 'your body feel as if it was working really hard'. Respondents were asked to simply say yes or no as to whether they had participated in *any* exercise like this for 20 minutes or more in the last week (see appendix C, page 11). If they answered yes to this question, they were then asked a further question on the amount of time spent in hours on this type of exercise. No attempt was made to ascertain what type of exercise comprised vigorous activity. Time spent on domestic and sporting activity (low, medium or high) was used as dependent variables to examine the relationship between exercise behaviour and the following variables: age, socio-economic status, health, fitness and well-being, health-related behaviour such as smoking and past exercise experience, personal exercise beliefs and attitudes

and barriers to exercise. Enquiry into whether respondents had participated in vigorous exercise was a one off question and was not used as a dependant variable in any analyses.

6.2.1 Statistical analyses

Data was analysed in two main ways. First, the associations between different amounts of time spent (low, medium and high) on domestic and sporting activity, and variables such as health status, demographic details, belief and attitudinal variables, were analysed using chi-square analysis (χ^2) or one way ANOVA depending on whether the variables were dichotomous or continuous.

For purposes of χ^2 analysis, variables measured using the LHFQ were recoded and put into new categories. Age was sub-divided into two categories: those people younger than the average age of the whole sample and those average age (66 years) or above; housing tenure was divided into two categories: those who owned their own house and those who rented either privately or from the council; people who said their health status was poor/fair were grouped separately to those who said their health was good or excellent; women who reported being not very fit/not at all fit were categorised separately to those who stated they were very/fairly fit; women who said they could walk a mile or climb two flights of stairs were contrasted with those who said they could not; current smokers and those who drank alcohol daily were categorised separately to those who did not smoke or take alcohol daily; people who were considered to be overweight according to their body mass index score (25.0+kg/m^2) formed one category whilst, those who were not overweight formed another; women who said they had attended a health prevention programme (Look After Your Heart) were separated from those who had not; women who said they had done a lot/moderate amount of sport and had been very/fairly physically active at school and up to the age of 25 years, were categorised separately to those who said they had done a little or none at all. Personal belief statements and attitudes towards exercise were grouped into total scores so that higher scores represented stronger personal beliefs in the benefits of exercise and less positive attitudes respectively.

Secondly, stepwise multiple regression analyses were computed using the time spent on domestic and sporting activity as dependent variables and the variables suggested by the χ^2 and ANOVA tests of significance to be strongly related to high levels of domestic *and* sporting activity as independent/predictor variables. The regression analyses were computed separately for each of the dependent variables, with the same predictor variables being used in each model. For each variable in the two models, standardised regression coefficients (β), their p-values and the R^2 values were computed.

6.3 RESULTS.

Out of 820 women contacted, 739 responded (90%), of whom 704 (86%) provided questionnaires with sufficient data for analysis. The women ranged in age from 55-93 years with a mean (sd) age of 66 (7.3) years. The mean (sd) level of domestic and sporting physical activity was 12.3 (4.1) and 4.8 (3.3) hours per week respectively. The most commonly reported domestic activities were house-work, shopping, running errands and gardening. Walking, bowls, swimming and cycling were the most frequently reported sporting activities. Older women (66 + years) and those living in council or rented property were more likely to be in the low domestic and sports activity groups.

6.3.1 Influences on activity: Health status

Table 6.1 shows a pattern: the greater the number of hours spent on domestic and sporting activity, so women are significantly more likely to report their health and fitness as good or excellent and that they are able to walk a mile and climb two flights of stairs. The pattern is more pronounced for sporting rather than domestic activity. Low mean scores on the NHP indicate better perceived subjective health status. Table 6.1 indicates that women with high activity levels were less likely to have problems identified by the NHP. For example, on the dimensions energy and mobility, the mean scores for low, medium and high sporting activity groups are 20.2, 12.1 and 3.4, and 12.4, 7.1 and 2.2 ($F=23.0$, $p<0.001$ and 25.8, $p<0.001$), respectively. The mean NHP scores show high standard deviation scores associated with them. This is because all 38 items on the NHP are assigned individual weighted values (which range from 5.83 to 39.20).

Table 6.1 Numbers (percentage) of subjects reporting aspects of self-rated health and fitness and the time spent in domestic and sporting activity. Mean (sd) scores on the NHP.

	Domestic activity				Sporting activity			
	Low (n=269)	Medium (n=221)	High (n=224)	χ^2	Low (n=251)	Medium (n=273)	High (n=180)	χ^2
Age 66+ years	164 (61)	93 (42)	82 (38)	30.4**	159 (64)	120 (44)	60 (33)	42.3**
Owner occupier	183 (68)	179 (81)	179 (84)	19.5**	180 (72)	205 (75)	156 (87)	14.5**
Health status poor	103 (38)	56 (25)	39 (18)	24.9**	104 (41)	77 (28)	17 (9)	52.7**
Fitness poor	43 (16)	16 (7)	5 (2)	28.3**	39 (16)	23 (8)	2 (1)	26.7**
Unable to walk a mile	97 (36)	45 (20)	31 (14)	33.0**	112 (45)	46 (17)	15 (8)	88.8**
Unable to climb two flights of stairs	126 (47)	59 (27)	45 (21)	41.3**	125 (50)	79 (29)	26 (14)	62.4**
NHP dimensions Mean score (sd)				**F**				**F**
Energy	**18.7** (32.3)	**10.9** (23.5)	**7.3** (18.0)	12.4 **	**20.2** (31.6)	**12.1** (25.4)	**3.4** (13.0)	23.0 **
Pain	**12.7** (24.5)	**7.8** (17.8)	7.7 (19.6)	4.6 **	**14.4** (26.1)	**8.9** (19.3)	**4.1** (13.8)	12.8 **
Emotion	**9.6** (19.2)	**5.8** (12.6)	**5.8** (14.3)	4.9 **	**9.9** (18.1)	**7.2** (15.9)	**3.6** (11.6)	8.5 **
Sleep	**22.6** (28.4)	**21.1** (26.9)	**19.1** (26.3)	.95 ns	**24.3** (28.6)	**20.8** (27.2)	**16.9** (25.0)	3.9 *
Isolation	**6.9** (16.6)	**2.5** (8.4)	3.2 (11.3)	8.5 **	**7.2** (15.8)	**3.5** (11.7)	**1.9** (9.6)	10.0 **
Mobility	**12.1** (19.6)	**5.6** (11.6)	**4.4** (9.9)	19.1 **	**12.4** (19.5)	**7.1** (13.1)	**2.2** (7.2)	25.8 **

Significance levels by χ^2 or F: **p<0.001, *p<0.05. Degrees of freedom = 2.

6.3.2 Health Related Behaviour

Table 6.2 shows that being a non-smoker and not drinking alcohol on a daily basis did not have a significant influence on time spent on domestic or sporting activity. However, women in low domestic and sporting exercise activity groups report that they are less likely than women who spend more time exercising, to attend a clinic for health screening ($p < 0.001$). Women in the high sporting activity group were also less likely to be overweight ($p<0.05$) and have taken part in a Look After Your Heart exercise programme ($p<0.001$) compared to women in the lower sports groups. These last two variables did not seem to influence participation in high domestic activity.

6.3.3 Past experience

Table 6.2 also shows that previous sporting activity was significantly associated with high levels of sporting activity ($p<0.001$) but not domestic activity ($p = 2.4$). Doing a lot/moderate amount of sport after leaving school to age 25 years, appears to be significantly associated with high domestic and sporting activity ($p = 0.05$ and <0.001 respectively).

Table 6.2 Numbers (percentage) of women with positive health behaviours, participation in sports at school and as young adults by time spent in current domestic and sporting activities.

	Domestic activity			χ^2	Sporting activity			χ^2
	Low (n=269)	Medium (n=221)	High (n=224)		Low (n=251)	Medium (n=273)	High (n=180)	
Current non-smoker	220 (84))	185 (85)	191 (89)	2.6 ns	205 (83)	234 (87)	157 (89)	3.6 ns
Attend health screens	138 (57)	176 (82)	169 (80)	46.0 **	146 (62)	189 (73)	148 (84)	23.8 **
Alcohol less than daily	172 (65)	147 (68)	146 (69)	.58 ns	165 (67)	182 (68)	118 (66)	0.14ns
Body Mass Index 25.0+ kg/m^2	121 (46)	99 (46)	6 (46)	.00 ns	123 (51)	125 (48)	68 (38)	6.8 *
Attendance at 'Look After Your Heart' course	59 (22)	68 (31)	61 (29)	5.1 ns	49 (20)	72 (27)	67 (37)	16.2 **
Past experience:								
School sport: a lot and moderate	179 (67)	136 (62)	146 (68)	2.4 ns	144 (57)	178 (65)	139 (77)	18.3 **
Sport to age 25: a lot and moderate	93 (35)	67 (30)	89 (42)	6.1 *	73 (29)	89 (33)	87 (48)	18.2 **

Significance tests: **$p<0.001$, *$p<0.05$. degrees of freedom = 2.

6.3.4 Personal exercise beliefs and attitudes.

Table 6.3 indicates that women in all groups expressed a positive belief in the value of exercise, scoring on average 10 out of 12 on belief statements. Those women who took most domestic and sporting activity seem to have slightly higher beliefs than those in the lower exercise groups ($p<0.05$ and <0.001 for domestic and sport respectively). In contrast, attitudes towards exercise were fairly negative across all groups, with a mean attitude score of 34 and a range of 15 (most positive attitudes) to 49 (least positive). Amongst the fifteen attitudinal statements, ten statements alluded specifically to physical self-efficacy (see appendix C). Table 6.3 shows the mean attitude scores for all fifteen attitude statements and the ten physical self-efficacy statements separately. Women taking part in high levels of sporting activity were more positive in their attitudes than women in the lower sporting groups ($p<0.001$). Although attitudes towards exercise do not appear to be significantly different between members of different domestic activity groups.

Table 6.3 Personal beliefs, attitudes and barriers to exercise by time spent on domestic and sporting activities. Figures are means (sd) or percentages as indicated.

	Domestic activity				**Sporting activity**			
	Low (n=269)	Medium (n=221)	High (n=224)	**F**	Low (n=251)	Medium (n=273)	High (n=180)	**F**
Personal beliefs mean (sd)	9.3 (2.3)	9.7 (2.2)	9.8 (1.9)	4.1 *	9.1 (2.4)	9.7 (2.1)	10.0 (1.8)	11.4 **
All attitudes Mean (sd)	34.5 (5.9)	34.0 (5.3)	33.9 (5.7)	.64 ns	36.4 (4.8)	34.6 (5.4)	30.8 (5.6)	48.4 **
Physical self-efficacy attitudes Mean (sd)	23.3 (4.5)	22.6 (3.7)	22.4 (4.1)	2.7 ns	24.5 (3.8)	23.0 (3.9)	20.5 (3.9)	50.3 **
				χ^2				χ^2
Currently do enough exercise (%)	150 (57)	96 (44)	107 (50)	8.3 *	120 (49)	138 (51)	95 (53)	.69 ns
Did vigorous exercise in last week (%)	49 (19)	49 (22)	76 (36)	19.9 **	40 (16)	58 (21)	76 (43)	40.9 **
Barriers to exercise								
Lack of time (%)	41 (15)	43 (19)	64 (30)	15.9 **	35 (14)	69 (25)	44 (24)	11.8 **
No interest (%)	69 (26)	58 (26)	61 (29)	.53 ns	88 (35)	82 (30)	18 (10)	36.2 **
Lack of money (%)	44 (16)	27 (12)	33 (15)	1.7 ns	39 (16)	46 (17)	19 (11)	3.6 ns
No-one to go with (%)	51 (19)	45 (20)	47 (22)	.66 ns	64 (25)	59 (22)	20 (11)	13.9 **
Pain in joints (%)	101 (38)	61 (28)	66 (31)	5.8 *	107 (43)	95 (35)	26 (14)	39.2 **
Not fit enough (%)	46 (17)	27 (12)	24 (11)	4.1 ns	54 (22)	39 (14)	4 (2)	32.9 **
Lack of energy (%)	58 (22)	29 (13)	27 (13)	9.3 **	58 (23)	46 (17)	10 (6)	23.9 **
Too ill (%)	32 (12)	12 (5)	11 (5)	10. 1 **	31 (12)	23 (8)	1 (1)	20.5 **

Significance tests: **$p<0.001$, *$p<0.05$. Degrees of freedom = 2.

Interestingly, table 6.3 shows that approximately half the women in all groups consider that they do enough exercise to keep fit at the moment. Although a significant difference was found between groups for domestic activity, with women in the low domestic exercise group (57%) more likely to say they do enough compared to women in the medium (44%) and high (50%) groups. As one would expect, women in the high domestic and sports groups were significantly more likely to have taken part in vigorous exercise in the past week.

6.3.5 Barriers to exercise.

Table 6.3 shows that specific barriers to exercise were common across all groups. Women in the high domestic exercise group (30%) were more likely to mention time as a barrier than women in either the low or medium domestic groups (15% and 19%, $p<0.001$, respectively), and time was more likely to be mentioned by women in the medium and high sporting activity groups (25% and 24%) than the low sport group (14%, $p<0.001$). Lack of interest or money did not appear to impact on participation rates in domestic activity, but once again health/fitness factors such as lack of energy and being ill are more likely to be barriers for women in the low, rather than medium and high domestic activity groups ($p<0.001$). The division between the high and medium groups are seen more clearly for sporting activity. Table 6.3 shows that women in the high sporting activity compared to the low and medium activity groups respectively, are less likely to encounter pain (11%, compared to 25% and 22%), energy problems (6% compared to 23% and 17%) and illness (1% compared to 12% and 8%).

6.3.6 Impact of age.

Older women (66+ years) were more likely to have specific barriers to exercise than younger women in the areas of painful joints (37% versus 28%), transport difficulties (25% versus 16%) and lack of energy (21% versus 12%) but had less difficulty with lack of time (18% versus 26%). Older women tended to do less domestic and sporting activity and to be less likely to have taken part in vigorous exercise in the week prior to the study.

6.3.7 Multivariate analyses.

Multiple regression analyses were conducted using time spent on domestic and sporting activity as the dependant variables in two separate models, and the variables suggested by the results of the significance tests in tables 6.1-6.3 to be important influences on activity behaviour, were entered into the equation as predictor variables, using stepwise selection. The same variables were entered for each model, to examine whether selected variables made a differential contribution to explaining participation rates in the two different types of activity. The following continuous variables were entered: age, mobility, pain, energy, emotion and isolation scores on the NHP, exercise belief scores and physical self-efficacy attitude scores and body mass. The following dichotomous variables were ranked (1,0) and entered as well: lot/moderate amount of exercise done from school to age 25 years (versus little/none) and housing tenure (owner occupier (1) versus renting (0)). All variables fulfil the independence assumption necessary for multiple regression analysis. In addition, plots of the data indicated that the following distribution assumptions were met: normality, equality of variance, and the linearity assumption. The size of intercorrelations amongst predictors variables were checked for multicollinearity and singularity and neither were found to be a problem. Correlation matrices of the variables entered in the multiple regression analyses can be seen in appendix E.

In multiple regression analysis the reported beta weights represent the predictive status of each independent variable after the variance associated with all other independent variables has been partialled out. Significant predictors of domestic and sporting activity are shown in table 6.4.

Table 6.4. Beta weights, R^2 values and t values from multiple regression analyses showing the variables which predict domestic and sporting activity (N = 590).

Exercise Type	Predictor variables	Beta	R	R^2	R^2 change	Final beta	Final t value
Domestic activity	Mobility	-.29	.28	.08		-.31	-5.0 **
	Age	-.15	.33	.11	.03	-.13	-3.2 **
	Pain	-.15	.35	.12	.01	-.16	-2.8 **
	Beliefs	.08	.35	.12	.00	.08	2.1 *
	Energy	-.10	.36	.13	.01	-.10	-2.1 *
	Adjusted R^2 = .12; F(5, 584) = 17.29, p<.0001						
Sporting activity	Attitudes	-.36	.36	.13		-.25	-6.3 **
	Mobility	-.18	.40	.16	.03	-.19	-4.8 **
	Experience	.14	.42	.18	.02	.16	4.1 **
	Age	-1.4	.50	.20	.02	-.14	-3.6 **
	Adjusted R^2 =.19; F(4, 585) = 36.59, p<.0001						

**p<0.0001, *p<0.05.

It has been suggested by some statisticians, for example [33], that in large data sets, cases may be dropped and analyses may be better conducted with complete data sets, especially where there are few missing values. Thus following this recommendation, the multiple regression analyses was conducted with a reduced sample size of 590 as opposed to the full data set of 704.

Table 6.4 indicates that predictors of time spent on domestic activity in this sample are: low scores on the physical mobility, pain and energy dimensions of the NHP (suggesting good subjective health status), lower age and positive beliefs in the benefits of exercise ($R = .35$, $F(5,584) = 17.29$, $p = .0000$).

The predictors of sporting activity are: positive attitudes towards exercise (lower scores indicate more positive attitudes), a low score on the physical mobility dimension of the NHP, participation in a lot/moderate amount of sport from school to age 25 years and a lower age ($R = .43$, $F(4,585) = 36.59$, $p = .0000$).

The core influences on both types of exercise activity seem to be health status (good physical mobility) and age (being younger). Past experience of exercise in youth and having positive attitudes towards exercise (on the physical self-efficacy statements) seem to be influential in sporting activity but not domestic activity. Interestingly housing tenure and body mass index score did not seem to contribute to the prediction of domestic or sporting activity.

6.4 DISCUSSION.

6.4.1 Summary of findings.

This study has focused on domestic and sporting activity and has included people over the age of sixty-five years old. The determinants of both domestic and sporting physical activities were examined, as formal participation in exercise programmes and 'sports' is low [31] and psychological theories of exercise/health behaviour have not been able to explain this phenomena adequately. In addition, customary physical activities, such as brisk walking, may have health benefits [32] and be more relevant for health promotion among the target group in this thesis - elderly women.

Chi-squared analyses and ANOVA indicated that age, health status and perceived health barriers were shown to influence participation in domestic and sporting exercise. Women who reported that they had good health and fitness and perceived that they had few health problems/barriers, were significantly more likely to say they spent more time engaged in domestic and sporting activities. Multiple regression analyses confirmed the importance of good health status and being younger for predicting the amount of time spent engaging in domestic and sporting activity and indicated that different factors may influence participation in the two types of activity. For example, positive attitudes towards exercise and past experience seemed to be important for sporting but not domestic activity. Other health-related behaviour such as smoking and drinking alcohol daily was not significantly associated with high levels of domestic or sporting activity, although attending health checks such as smears and breast screening, was. Attendance at a Look After Your Heart exercise class and not being overweight was significantly associated with high sporting activity but not domestic activity.

Women who reported participating in high levels of domestic and sporting activity were found to have more positive beliefs in the benefits of exercise, although in multiple regression analyses, positive exercise beliefs were shown to influence time spent on domestic, rather than sporting activity.

Interestingly, approximately half the women in the low domestic and sporting activity groups expressed a high belief in the value of exercise for maintaining good health but took part in little exercise. In addition, over half of the women in these groups considered that they currently did enough exercise to keep themselves fit.

6.4.2 Methodological limitations of the study.

Threats to the validity of the study.

There is little previous research examining the relationship between physical activity and factors such as past exercise experience, personal beliefs and attitudes amongst elderly women. Thus this study is necessarily exploratory. The study was not experimental in that the author neither created or manipulated the conditions. That is, there was a lack of control over the independent variables in this study and women were not randomised into activity groups. Rather it is a piece of ex post facto research in which the author chose to examine the relationship between existing exercise habits and a set of variables suggested by previous research to be possibly related to exercise participation for elderly women. Within this context, the conclusions that can be drawn from this study are limited, but it is hoped that it may clarify existing research findings and provide an indication of directions for future research.

The large number of statistical tests carried out and the large number of predictor variables chosen for the multivariate analyses, can be justified by this exploratory approach. There is some evidence to suggest that if the sample size is large, multivariate analyses can control to a certain extent for type 1 errors, when multiple measures are used [66]. However, the generally accepted rule is that more tests means that there is an increased chance of spurious associations being found even if there are no true differences between conditions. Thus it is possible that type 1 errors, or spurious associations have occurred because of this. This is more likely when a 0.05, as opposed to a 0.01 significance level is chosen. Some caution must be taken therefore when interpreting the results.

Methods such as multiple regression analyses are only as good as the data to which they are applied. Therefore one has to consider the quality of the data collection method and the amount of error in the original measurements. The main method used to collect data in this study was the London Health and Fitness Questionnaire (LHFQ). The author is mindful of the reliance on questionnaire data. Such data ideally need corroborating by data from other sources, such as by interview and more 'objective' sources.

In chapter four, outlining the development of the LHFQ, it was shown that although validity and reliability was satisfactory, it was lowest for reporting on past exercise experience (κ = .47 and .58) and on rating barriers to exercise (κ = .3-1.0). In addition, chapter four referred to how a researcher is faced with a number of challenges when attempting to measure variables such as exercise intensity, frequency and duration using self-report techniques. In the LHFQ, people are asked to report on activity patterns over the past week using quite crude activity and time categories. The distinction therefore between low and moderate and moderate and high domestic and sporting activity may not be clear cut. Intensity of exercise activity is especially hard to quantify using a questionnaire method. For example, vigorous exercise was defined as activity which 'makes you feel that your body is working really hard'. Statisticians, for example [33] warn that unexpected and quite meaningless relationships may be found between variables if there are problems with data collection methods. Further testing and development of the

LHFQ and replication studies using other cohorts of elderly women, may help to clarify the validity of the results suggested by this study.

A limitation of this study is the lack of objective measures of physical fitness to validate the self-reports of exercise activity and the limited definition of socio-economic health status. Other research has suggested that elderly people with higher levels of educational attainment and annual income may be better able to report accurately on physical activity questionnaires[34]. Thus a significant relationship may exist between social class and reported physical activity but not physical fitness, (measured using more objective methods). Housing tenure was used as a measure of socio-economic status in this study as all women were retired and the majority of women had worked as sales assistants. Therefore occupational status showed little variation. It is possible that the findings may reflect in part, some difference in abilities to accurately complete the LHFQ.

In considering the generalisability of the present results to other populations, it is important to bear in mind factors which may represent biases in the sample. This sample of elderly women was drawn from a retired occupational cohort and thus may be different to cohorts of other elderly women who have not engaged in occupational activity or elderly men. There are indications however, that there is some overlap between this sample of women and others. For example, comparison of popular types of activity (walking, swimming, cycling and bowls) revealed that this cohort showed similarities with the General House-hold Survey [35]. Scores on the Nottingham Health Profile from this sample were similar to a large sample of women with the same mean age randomly drawn from the age/sex register of a general practice [30] and frequency of vigorous exercise in this sample was very similar to that reported by women of a similar age in the ADNFS [14].

Statisticians suggest that following multiple regression analysis, precaution is needed when making predictions about another sample or about cases in the population as a whole. This is because the chances are very good that the predictive power in a sample tends to shrink when one goes beyond that sample [33]. Ideally replication studies would be needed to cross-validate these results including a cohort of women who have never taken up formal occupation and extended to include for example elderly men and younger cohorts of men and women, to confirm the extent to which these findings can be generalised.

6.4.3 Implications for current health promotion.

Health status

The findings emphasise the importance of health status not just for participation in sports but also for engaging in domestic activities, which extends findings from North America [11 36 37] and in the UK where mobility, painful joints and being too ill were often mentioned as barriers to exercise [14]. Since a short-term consequence of increased activity levels may be worsening of musculo-skeletal symptoms and self-perceived health [38] and those people who perceive their health as poor are unlikely to join an exercise

programme [39], it is of considerable importance that health promotion programmes are able to provide diagnosis and symptomatic treatment for health problems.

Since poor health is such an important barrier to all forms of activity, it seems necessary to provide women with an individual exercise or activity 'prescription' appropriate to their type of health problem. This may involve for example, dealing with underlying musculo-skeletal pain and stiffness and avoiding activities that might exacerbate these symptoms, at least initially. For these reasons, health promotion for elderly women may best be placed in primary care where medical diagnosis and treatment are readily available.

These finding also emphasise the dynamic and temporal nature of health. From a theoretical perspective, it may be important to build into any model attempting to explain exercise behaviour, the necessity of good health as a prior requisite before a person can be persuaded or independently makes a decision to take part in physical activity. In addition, the model may need to take into account the fact that a person may be in a position of good health and embark on increased exercise, but at some stage during this process may regress, because of a loss of good health or for other reasons. The very fact that exertion is a necessary component of exercise behaviour may explain in part why models developed to explain health behaviour [15 16 17] such as eating a balanced diet or attending health screening, (which may not be as dependant on good health), are inadequate at explaining exercise behaviour. Stage models of health behaviour such as the precaution adoption process [64] or the transtheoretical model [65] may increase the predictive validity of their models when applying them to exercise settings, if they incorporate the good health/fitness element.

Health behaviours.

Previous work has shown that it is likely that engaging in (and the reporting of) physical exercise is related toward other health related behaviour [40]. For example, relationships between smoking and leisure-time inactivity have been found [41]. The findings in this study do not suggest that sporting and domestic activity form part of a general tendency to follow a healthy lifestyle, as only weak and inconsistent relationships were seen with other health behaviours. Although in this sample, levels of smoking and alcohol consumption were low, perhaps reflecting previous exposure to occupational health promotion.

Previous sports participation.

In common with many other studies [14 32 42-44], the importance of school and early adult life sporting activity as a determinant of later life sports participation was confirmed. Sports participation is increased by choice from a range of activities at any age [45 46] and may be reduced by a self-image of being 'not sporty' [14]. Little can be done about limited previous sports participation in later life, but an awareness of the importance of a person's appraisal of their physical self-efficacy in influencing exercise participation, as stressed by theorists such as Bandura [17], is essential for health promoters.

Government policy on health promotion should take a life-span perspective, providing opportunities at all ages. The importance of school and early adult sports participation with choice from a wide range of activities is of great importance for influencing physical self-efficacy and therefore subsequent activity levels in later life. A narrow focus on competitive team games, a reduction in school sports facilities and reduction in local authority provision for adult sports are not consistent strategies with preventive health policy.

Personal exercise beliefs and attitudes.

Personal beliefs about the benefits of exercise were generally positive However, in common with findings from the ADNFS [14] and others [34], women over estimated the value of exercise they got. Over half the women felt they did enough exercise, although the majority had done no vigorous exercise in the past week. Some of the reasons discussed in chapter two for this discrepancy, included the fact that health aspirations may decline with increasing age [47] ; or if people are unfit and a task takes longer and is more tiring, based on exertion and fatigue, they may over estimate the value of the amount of exercise they are taking [48]. It seems necessary to ensure that elderly women have access to more specific information about expected levels of fitness at different ages and the amount of exercise required to maintain physical capacity. Most women were not contemplating increasing their exercise levels, which suggests that without the women receiving an internal or external cue for action such as developing a personal awareness that they are unfit and/or an opportunity to take part in extra exercise, the uptake of health promotion in this area is likely to be low.

Attitudes towards exercise tended to be negative. Interestingly, in multivariate analyses, attitudes towards exercise did not appear to be influential in predicting time spent on domestic activity, but did appear to be associated with engagement in sporting activity. Although attitudes are considered to play an important part by theoreticians [15-17], a lack of relationship between attitudes and exercise behaviour has been found by many researchers, for example [49-52]. More qualitative work is needed to understand the relationship between exercise attitudes and exercise participation rates, including the development of reliable and valid ways of measuring attitudes. Since it seems logical that attitudes related to physical self-efficacy such as 'I'm not very good at sport', 'I am too fat', 'I might get injured or damage my health' or 'I would never keep up any exercise' would be influential in predicting exercise uptake in sport. It also seems logical that these attitude statements are less likely to relate to domestic activity, where women from this cohort are probably already ensconced in an active domestic role and have gained a sense of physical self-efficacy based on a life-time of experience in activities such as house-work.

Barriers to participation.

Barriers to exercise were most strongly associated with low levels of sporting rather than domestic activity, although lack of time was common to both groups. Companionship, costs and self-perceived fitness also emerge as factors that must be considered in achieving increased uptake of exercise. Once again, these findings are confirmed by

others [54 55 58]. These findings in part, support the theory put forward by the Health Belief Model (HBM) [16] which suggests that behaviour associated with many costs and few benefits is *less likely* to take place, and the social cognitive theory of self-efficacy [17], which emphasises the importance of the 'can do' cognition whereby a person who believes they have control over a behaviour will *more likely* exhibit it.

Barriers such as lack of time may be dealt with by building increased activity levels into daily domestic activity or by performing home-based exercise activities. Previous research suggests that this option may certainly appear more attractive to the elderly than having to find transport to get to an exercise venue [53-55]. Previous work has also found that retirees expressing a lack of interest in exercise were less confident of their physical abilities, more worried about potential injuries and were unhappy exercising in front of others because of how they perceived their body image [36 37]. Supervised programmes may be a deterrent to people who have adverse health behaviours [56]. Exercising at home may over come some of these barriers [57], as might the availability of opportunities for elderly women to build up their existing activity levels in terms of domestic exercise.

The report of lack of interest by women in this study, is probably related to the 'sports' aspect of exercise and it may be useful to promote general activity increases rather than focus on sports or keep fit. The potential health benefits to be gained from participation in low intensity activities [11 12] suggest that increasing uptake of new domestic interests such as gardening, and increasing the intensity and duration of existing activities, may be more successful than promoting sports.

6.4.4 Future studies.

Existing theories of health promotion emphasise individual rather than group factors. For example the theory of planned behaviour [15] predicts that performance of a specific behaviour (for example attending an exercise class), is dependent on an individual's intentions, attitudes, normative beliefs, perceptions of control and capability of success. The findings in this study suggest that whilst personal beliefs in the efficacy of exercise were high, actual participation could be low. Moreover, findings show that domestic exercise participation is independent of attitudes. It is clear that complex social and individual factors are involved. Better exercise promotion strategies will require a more coherent theory of exercise behaviour, as suggested by others [59-61]. The most promising theories maybe theories of physical self-efficacy [17], self or internal motivation, [62 63] the precaution adoption process model [64] or the transtheoretcial model [65]. These theories all require wider empirical testing specifically in relation to exercise behaviour and the elderly. In addition, the development and testing of a theoretical model which incorporates a population as well as an individual perspective seems to be needed. Since findings in this study and elsewhere, draw attention to the importance of health, age and socio-economic status as well as individual experience. Further research might replicate the variables used in this study, or measure a wider range of potential determinants suggested by plausible theoretical models, and might include domestic and customary activity as well as sporting activity.

6.5 REFERENCES.

1. Secretary of State for Health. *The health of the nation*. London: HMSO,1991.

2. Fentem, P.H., Bassey, E.J., & Turnbull, N.B. *The new case for exercise*. London: Health Education Authority, 1988.

3. Hardman, A.E., Hudson, A. Walking for health: a closer look at exercise. *Health Trends*, 1989; 21: 91-2.

4. Chow, R.K., Harrison, J.E., Brown, C.F. and Hajek, V. Physical fitness effect on bone mass in post-menopausal women. *Archives of Physical Medical Rehabilitation*,1986; 67 : 231-34.

5. Paffenbarger, R.S., & Hyde, R.T. Exercise in the prevention of coronary heart disease, *Preventive Medicine*,1984; **13:** 3-22.

6. Siscovick, D.S., LaPorte, R.E., & Newman, J.M. The disease specific benefits and risks of physical training programme, *Medicine and Science in Sports*,1985; **8**: 246-252.

7. Minor, M.A., & Brown, J.D. Exercise maintenance of persons with arthritis after participation in a class experience, *Health Education Quarterly*, 1993; **20:** 83-95.

8. Berger, B.G. and Owen, D.R. Stress reduction and mood enhancement in four exercise modes: swimming, body conditioning, hatha yoga and fencing. *Research Quarterly for Exercise and Sport*, 1988; **59**: 148-159.

9. Raglin, J.S., & Morgan, W.P. Influence of exercise and quiet rest on state anxiety and blood pressure, *Medicine and Science in Sports and Exercise*, 1987; **19:** 455-463.

10. King, A.C., Taylor, C.B., Haskell, W.L., & Debusk, R.F. Influence of regular aerobic exercise on psychological health: a randomised control trial of healthy middle-aged adults, *Health Psychology, 1*989; **8:** 305-324.

11. Fiatarone, M.A., O'Neill, E.F., Ryan, N.D. *et al* Exercise training and nutritional supplementation for physical frailty in very elderly people, *New England Journal of Medicine*, 1994; **330**: 1769-1775.

12. Skelton, D.A., Young, A., Greig, C.A., & Malbut, K.E. Effects of resistance training on strength, power, and selected functional abilities of women aged 75 and over, *Journal of the American Geriatrics Society*,1995; **43:** 1081-1087.

13. Greig, C., & Young, A. Aerobic exercise, in: J.G. Evans & T.F. Williams (Eds.). *Oxford Textbook of Geriatric Medicine.* Oxford: Oxford University Press, 1992, pp. 601-604.

14. Sports Council and Health Education Authority. *Allied Dunbar National Fitness Survey.* London: Ancient House Press, 1992.

15. Ajzen, I. From intentions to actions: a theory of planned behaviour, in: J. Kuhl, & J. Beckman (Eds). *Action-control: from cognition to behaviour,* Heidelberg: Springer, 1985, pp. 12-39.

16. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508

17. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. *Psychological Review*, 1977; **84**: 192-215

18. Oliver, R.L.and Berger, P.K. A path analysis of preventive health care decisi on models. *Journal of Consumer Research*, 1979; **6**: 113-122.

19. Ingham, I., Bennett, P. Health psychology in community settings:models and methods. In Bennett, P., Weinman, J. (Eds.). *Current developments in health psychology*. London: Harwood Press, 1991. pp 35-61.

20. Leventhal, H. and Nerenz, D. The assessment of illness cognition. In Karoly, P. (Ed.) *Measurement strategies in health psychology*. New York: Wiley, 1985.

21. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1(3)**: 237-267.

22. Dishman, R.K. Exercise adherence and habitual physical activity. In Morgan, W.P. and Goldston, S.N. (Eds.) *Exercise and mental health.* Washington DC: Hemisphere, 1986. pp 57-83.

23. Prochaska, J.O. and DiClemente, C.C. Stages and processes of self-change of smoking: toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 1983; **51**: 390-395.

25. Dishman, R.K., Sallis, J.F., & Orenstein, D.R. The determinants of physical activity and exercise, *Public Health Reports,* 1985; **100**: 158-171.

26. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., & Pambianco, G. A randomised exercise trial in older women: increased activity over two years and factors associated with compliance, *Medicine and Science in Sports and Exercise,* 1986; 7: 557-562.

27. Family Heart Study Group. Randomised controlled trial evaluating cardiovascular screening and intervention in general practise: principal results of British family heart study, *British Medical Journal*, 1994; **308**: 313-320.

28. Imperial Cancer Research Fund OXCHECK . Study Group Effectiveness of health checks conducted by nurses in primary care: results of the OXCHECK study after one year, *British Medical Journal*, 1994; **308**: 308-312.

29. La Porte, R.E., Black-Sandler, R., Cauley, J.A., Link, M., Bayles, C. et al. The assessment of physical activity in older women: analysis of the inter-relationships and reliability of activity monitoring, actviity surveys and caloric intake. *Journal of Gerontology*, 1983; **38**: 394-397.

30. Hunt, S.M., McEwan, J., & McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

31. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H., & Arie, T.H.D. Levels of customary physical activity among the old and very old living at home, *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

32. Ebrahim, S., Dallosso, H.M., Morgan, K., Fentem, P.H., & Arie, T.H.D. The causes of handicap among a random sample of old and very old people: possibilities for prevention, *Journal of the Royal College of Physicians of London*, 1988; **22**: 105-107.

33. Hays, W.L. *Statistics, fourth edition*. New York: Holt, Rinehart and Winston inc., 1988.

34. Sobolski, J., Kornitzer, M., DeBacker, G., Dramaix, M., Abramowicz, M. et al. Protection against ischaemic heart disease in the Belgian physical fitness study: physical fitness rather than physical activity? *American Journal of Epidemiology* 1987; **125**: 601-610.

35. Office of Population Census and Surveys *General Household Survey*. London: HMSO, 1992.

36. Connell, C.M., Davies, R.M., Rosenberg, A.M., & Fisher, E.B. Retirees' perceived incentives and barriers to participation in health promotion activities, *Health Education Research*, 1988; **3**: 325-330.

37. Howze, E.H., Smith, M., & DiGilio, D.A. Factors affecting the adoption of exercise behaviour among sedentary older adults, *Health Education Research*, 1989; **4**: 173-180.

38. Ebrahim, S., & Williams, J. Assessing the effects of a health promotion programme for the elderly, *Journal of Public Health Medicine*, 1992; **14**: 199-205.

39. Pender, N.J. and Pender, A.R. Attitudes, subjective norms and intentions to engage in health behaviours. *Nursing Research*, 1986; **35**: 15-18.

40. Davey Smith, G., Catford, J., Nutbeam, D. and Phillips, K. *The relationship between health beliefs and health behaviours.* I.E.A. XI Scientific Meeting, Helsinki, Abstract 351., 1987.

41. Faulkner, R.A., Bailey, D.A., & Mirwald, R.L. The relationship of physical activity to smoking characteristics in Canadian men and women, *Canadian Journal of Public Health,* 1987; **78**: 155-160.

42. Bauman, A., Owen, N., & Rushworth, R.L. Recent trends and socio-demographic determinants of exercise participation in Australia, *Community Health Studies,* 1990; **14**: 19-26.

43. Ostrow, A.C., & Dzewaltowski, D.A. Older adults' perception of physical activity participation based on age role and sex role appropriateness, *Research Quarterly for Exercise and Sport,* 1986; **57**: 167-169.

44. Perrier. *The Perrier Study: Fitness in America.* New York: Perrier-Great Waters of France Inc., 1979.

45. Department of Health and Human Resources. *Promoting health/preventing disease: objectives for the nation.* Washington, DC.: US Government Printing Office, 1980.

46. Thompson, C.E., & Wankel, L.M. The effects of perceived choice upon frequency of exercise behaviour, *Journal of Applied Social Psychology,* 1980; **10**: 436-443.

47. Tornstam, L. Health and self-perception: a systems theoretical approach. *Gerontologist,* 1975; **27**: 264-270.

48. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports,* 1978; **10(2)**: 125-131.

49. Dzewaltowski, D.A. Toward a model of exercise motivation. *Journal of Sport and Exercise Psychology,* 1989; **11**: 251-269.

50. Dzewaltowski, D.A., Nobel, J.M. and Shaw, J.M. Physical activity participation: social cognitive theory versus the theories of reasoned action and planned behaviour. *Journal of Sport and Exercise Psychology,* 1990; **12**: 388-405.

51. Pender, N.J. and Pender, A.R. Attitudes, subjective norms and intentions to engage in health behaviours. *Nursing Research,* 1986; **35**: 15-18.

52. Gatch, C.L. and Kenzierski, D. Predicting exercise intentions: the theory of planned behaviour. *Research Quarterly for Exercise and Sport*, **61** (1): 100-102, 1990.

53. Dishman, R.K. Sallis, J.F., Orenstein, D.R. The determinants of physical activity and exercise. *Public Health Reports*, 1985; **100**: 158-171.

54. Connell, C.M., Davies, R.M., Rosenberg, A.M., and Fisher, E.B. Retiree's perceived incentives and barriers to participation in health promotion activities. *Health Education Research*, 1988; **3**(3): 325-330.

55. Shephard, R.J. *Physical activity and aging* (2nd edition). London: Croom Helm, 1987.

56. Stones, M.J., Kozma, A., & Stones, L. Smoking behaviour and participation in organised exercise, *Canadian Journal of Public Health*, 1986; 77: 153-154.

57. Pollock, M.L. Exercise prescription for fitness and adherence. In Dishman, R.K. (Ed.), *Exercise adherence: its impact on public health*. Champaign. Illinois: Human Kinetics, 1988. pp 259-278.

58. Howze, E.H., Smith, M., DiGilio, D.A. Factors affecting the adoption of exercise behaviour among sedentary older adults *Health Education Research*, 1989; **4** (2): 173-180.

59. Courneyer, K.S., & McAuley, E. Predicting physical activity from intention: conceptual and methodological issues, *Journal of Sport and Exercise Psychology*, 1993; **15**: 50-62.

60. Herbert, L., & teague, M.L. Exercise adherence and older adults: a theoretical perspective, *Activities, Adaption and Aging*, 1989; **13**: 91-105.

61. Kimiecik, J. Predicting vigorous physical activity of corporate employees: comparing the theories of reasoned action and planned behaviour, *Journal of Sport and Exercise Psychology*, 1992; **14**: 192-206.

62. Dishman, R.K., Ickes, W., & Morgan, W.P. Self-motivation and adherence to habitual physical activity, *Journal of Applied Social Psychology*, 1980; **2**: 115-132.

63. Williams, G.C., Quill, T.E., Deici, E.L., & Ryan, R.M. The facts concerning the recent carnival of smoking in Connecticut and elsewhere, *Annals of Internal Medicine*, 1991; **115**: 59-63.

64. Weinstein, N.D. The precaution adoption process, *Health Psychology*, 1988; 7: 355-386.

65. Prochaska, J.O. and DiClemente, C.C. *The transtheoretical approach: crossing traditional boundaries of change*. Homewood, IL:J.Irwin, 1984.

66. Kazdin, A.E. *Research design in clinical psychology* (2nd edition). London: Allyn and bacon, 1992, pp. 338-339.

CHAPTER SEVEN

PROMOTING THE WELL-BEING OF ELDERLY WOMEN THROUGH EXERCISE: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS.

7.1 DISCUSSION.

Demographically, the number of elderly women in the UK is set to increase in the forthcoming years. By the year 2,000, it is estimated that 5.1 per cent of the British population will be over the age of eighty and that there will be approximately eighty-six men for every one hundred women aged over seventy years in the world [1]. Mortality figures for England and Wales [2] show that for each major cause of death, the rate for those over sixty-five years exceeded the cumulative total for all other age groups. Moreover, individual suffering for people who are sick or physically disabled profoundly affects their emotional well-being and life satisfaction [3-6] . For many, the reduction of disability is more important than extending life [7]. Thus as the number of years that people live becomes extended, it seems important to find ways of helping the elderly to enjoy a good quality of life, by maintaining good health, fitness and well-being. This approach is endorsed by the World Health Organisation, who advocate 'Health for All by the Year 2,000' [8] and the British Government, who are committed to finding ways of adding life to years and years to life [9].

Exercise may provide one answer in terms of helping the elderly to maintain good health, fitness and well-being. Since, there are indications that the risks of developing chronic illness and disability in old age may be prevented by adopting a more physically active lifestyle [10-12]. Exercise is thought to be a protective factor in heart disease [13-16], osteoporosis [17 18], stroke [19], and contribute to physical work capacity [20] and functional fitness [21]. In addition, physical self-efficacy [22], body image [23 24], morale [25] and health status [24] may also improve as a result of participation in exercise. However, there has been relatively little research attention given to examining the potential benefits of exercise for the well-being of elderly women. Cohorts of young and middle-aged men are more commonly researched and much of what we know about the benefits of exercise has come from this source. In the few studies which have focused on the elderly, methodological flaws in the study designs means that few definitive conclusions can be drawn. Some examples of flaws include: male only samples [13-16] , small sample sizes [27-29], use of volunteer samples [29 30], non-random treatment assignment [29], lack of adequate control groups [31] and failure to define exercise treatments and monitor compliance precisely [20 23]. In some cases the use of methodology developed for younger cohorts, but applied to the elderly, has resulted in less reliable and valid results [32].

The other current challenge facing those interested in health promotion, is that existing exercise activity levels are low amongst elderly women [33 34]. Older women are highlighted as a group who encounter more barriers to taking up and maintaining exercise [35]. Mechanisms mediating lower levels of physical activity in elderly women have also received little attention. Retrospective analysis, carried out mainly in North America, with the age group 18-64 years, provides an indication of what some of the determinants of exercise behaviour might be for the elderly [36]. However, cultural differences and the fact that data was collected using an age-neutral questionnaire, limits the generalisability of these data to an elderly UK population. Psychological theories/models of health behaviour have been applied to the try and explain exercise

behaviour amongst the general adult population [37-40], rather than the elderly specifically, but with only partial success.

Thus a number of research gaps exist in terms of what is know about exercise and elderly women. The author therefore had an overall aim in this thesis, of wanting to contribute to the knowledge base of what is known about exercise activity, well-being and elderly women. More specifically, the author set out to: develop a valid and reliable questionnaire methodology for assessing the exercise behaviour, beliefs and attitudes of the elderly (study one); derive a better understanding of the relationship between brisk walking (a low intensity exercise) and well-being amongst elderly women (study two) by improving on the research designs of existing studies; explore the factors that may influence elderly women's decisions to participate in exercise in the UK (study three). These aims have only been achieved in part.

The development of the London Health and Fitness Questionnaire (LHFQ; study one) was done primarily in preparation for study three. In study one, the interview schedules used in the National Fitness Survey [33] were adapted and tested for reliability and validity as a postal questionnaire, for assessing exercise behaviour, beliefs and attitudes amongst the elderly. Development of the LHFQ took place in two stages. The first postal survey trial was with a sample of elderly women from the East End of London (n= 130). The women were on average aged sixty-seven years. After amendments, a further trial was conducted with a sample of retirees, (with an average age of sixty-five years), who had worked for a large retail company in Norwich (n =108). The response rate in the second survey was particularly good (93%) and reliability and validity proved reasonably satisfactory. For example, re-test reliability, matching first and second questionnaire responses and questionnaire and interview responses, was best for reports of daily and recreational exercise ($\kappa = 1.0$), but lower for reports about past exercise activity ($\kappa = .47$ to .58) and current barriers to taking more exercise ($\kappa = .63$ to1.0). Construct, content and face validity also seemed satisfactory. However the LHFQ has a number of limitations.

The sole reliance on self-reports of physical activity is problematic because of the wide potential for confounding. Direct measurement of fitness (for example, measuring VO_2 max) appears to be a more reliable way of ascertaining participation rates in exercise, than data collected from self report [41-43] and limits bias from socio-economic status [44] and engagement in other health-related behaviour [45 46]. Whilst difficulties including cost, acceptability and feasibility limit the use of objective measures in large scale epidemiological studies, the construct validity of the LHFQ could have been strengthened, had attempts been made to correlate self-report data with for example, cardio-respiratory fitness, in at least a small sample of elderly women. Related to this, is the fact that data in the LHFQ is elicited using quite crude frequency and intensity categories, leaving a lot of room for variability and misinterpretation in data. For example, the phrase ' did you feel that your body was working hard' was used as a way of ascertaining whether someone had taken part in vigorous activity and respondents are asked to state whether in the past week, they spent no time at all, less than 1 hour, 2

hours and so on, engaged in physical activities such as domestic and sport/recreational exercise.

The external validity of the LHFQ really needs to be tested since the two samples on which the LHFQ were originally developed were quite limited. Women from both samples were mainly white, Caucasian women of lower middle-class status, drawn either from the East End of London or Norwich. In addition, members of the Norwich sample, were all ex-employees from the same retail company. Since socio-economic status and geographical location influences exercise behaviour [33], replication studies using different populations and/or incorporating alternative measures of the same constructs such as direct fitness measures, may build more confidence in the external validity and reliability of the LHFQ.

Study two had an aim of generating more knowledge about the potential benefits of participating in low intensity exercise for elderly women, by improving upon the research designs of earlier exercise intervention studies. In particular the study sought to determine if a group of non-volunteer elderly women who were randomly allocated to a six month brisk walking programme, would benefit significantly from the exercise in terms of improvements in stamina, leg strength, health status and attitude towards exercise. Women who were not allocated to the brisk walking group formed the comparison group and were given a homeopathic prescription of exercise. It was intended that this dose would be suitable to sustain women's interest in the study, but be insufficient to bring about positive changes in the outcome variables under scrutiny.

Repeated measures ANOVA statistical procedures revealed that the biggest impact of the brisk walking programme appeared to be for health status. Those women in the brisk walking group (n=35), reduced their mean scores and therefore improved their well-being on five out of six dimensions on the Nottingham Health Profile (NHP): pain, sleep, emotional reactions, energy and physical mobility. Meanwhile, the placebo group (n=41) remained stable or slightly increased their mean scores on these dimensions. However, the only significant effect was found on the dimension physical mobility. Here, the brisk walkers' mean score decreased from 17.7 (at baseline) to 10.9 at six months, whilst the score for the placebo exercise group increased from 15.7 to 17.3, over the same time period. In terms of other significant between group differences, attitudes towards exercise related to physical self-efficacy changed over time. At six months, brisk walkers were significantly less likely to say 'I am too shy/embarrassed to exercise' and 'my health is not good enough to exercise' compared with members from the placebo group, indicating that brisk walkers increased their confidence in their physical ability over time. Other between group differences approaching significance were found for: step test stamina, energy and sleep dimensions of the NHP and total physical self-efficacy attitude scores, indicating other possible benefits of the brisk walking programme.

However, a wide variety of ability was found within both groups, which meant that the groups were not clean cut samples and any benefits of the brisk walking programme may have been masked due to the heterogeneity of the groups. This may be one of the

costs associated with recruiting a non-volunteer sample and randomly assigning them to an exercise intervention which they may not be capable of or willing to take part in. However, the problem of mixed ability groups in this study, was confounded by several other factors. First, major problems were encountered with monitoring compliance to the different exercise treatments. Since, at follow up appointments, most women in both groups had not adopted the recommended method by the author, of logging the frequency and intensity of their exercise activity, using an activity diary. The exercise intervention was not class based, so there is little hard evidence that women actually adhered to their exercise programmes. It is difficult to be clear therefore about the exercise boundaries between members of the two groups, or to state categorically that the benefits recorded by the brisk walkers were due to the walking programme, rather than some other variable. This problem is confounded by the fact that some researchers have found that very light [41 45], home-based activities [47] (which was the exercise stipulated for placebo exercisers), may have benefits in itself.

Second, no measures were taken to assess how efficacious groups members thought their exercise programme was. This may have helped to clarify the motivation of individual group members to comply with the exercise programmes. Furthermore, problems were encountered with obtaining valid and reliable outcome measures for leg strength and step test stamina. Both groups improved their scores significantly over six months. One explanation for this being, that both groups increased their confidence when using the leg extension rig and when performing the step test exercise, over time.

Thus this study whilst managing to recruit a non-explicit volunteer sample and randomise women across two experimental conditions relatively successfully, has run into a number of methodological problems which make it impossible to be clear about the exact relationship between a low intensity exercise programme such as brisk walking and well-being. In common with other researchers who have tried to conduct similar studies, there were problems with: small sample sizes [48 49], describing tight definitions of exercise for each group [48 50] and adequate methods of monitoring compliance to the exercise prescription. [51 52]

Study three was exploratory in nature. The LHFQ was sent to a large sample of elderly women (n=820), who belonged to the retirement service association of their ex-employer, a major national retail company. In addition the women were asked to complete the NHP. There was a high response rate (90%) and upon return, women were divided into low, medium and high domestic and sporting activity groups (tertiles) according to their exercise activity, using percentile cut off points (33.3, 66.8 and 99.9 respectively). Associations between activity levels and variables such as health status, personal beliefs and attitudes towards exercise, and socio-economic status were then examined. The findings suggest that for elderly women, different factors influence participation rates in the two types of activity. Multiple regression analyses indicated that whilst age (being younger) and good health status (in particular few problems with physical mobility) are important for predicting time spent on sporting and domestic activities, that past exercise experience (in youth) and more positive attitudes towards exercise are important for predicting high sporting but not high domestic activity levels. Personal beliefs in the

benefit of exercise were high across all groups. In multiple regression analysis, high scores for exercise beliefs proved to be a predictor for high participation rates in domestic but not sporting activity. A wide range of barriers to exercise were reported from members of all groups. However, chi-squared analysis indicated that significantly more barriers were associated with women taking low or moderate amounts of sporting activity.

The conclusions that can be drawn from this study are necessarily limited, because: of its exploratory, non-experimental nature, the limitations of the LHFQ as outlined earlier, and the lack of physiological measures of physical fitness to corroborate self-reports of physical activity. In addition, this study, although incorporating a large sample of elderly women, focuses on a specific cohort of elderly women who have worked for a large retail company. Replication is needed to ascertain how far the results of this study can be generalised, incorporating other groups of elderly women who have worked, not worked and perhaps extending the research to include samples of elderly men and younger cohorts of women.

Findings from study three also suggest that it might be useful to investigate further factors such as health status, previous sports participation and perceived barriers to exercise amongst elderly women, using more qualitative methodologies such as semi-structured interview techniques or case study designs. These approaches may offer better insight into the exact processes which operate to influence exercise activity. Longitudinal studies, following women from youth through to old age, if funded, could offer further insight into the determinants of exercise activity amongst women.

A general criticism which can be made against studies two and three is the way well-being was defined. Well-being was measured in these studies using the Nottingham Health Profile (NHP) [60]. Essentially the NHP is a measure of subjective health status which asks people to respond to negative health statements such as ' I'm in pain when I walk' 'everything is an effort' and 'I have trouble getting up and down stairs', rather than positive experiences. Once again, it is primarily a survey tool which relies on self-report and such is not good enough to generate diagnostic data. The NHP provides only a shallow profile, rather than a comprehensive measure of health related quality of life. For this, Bowling [61] suggests the following are needed :

> 'combinations of measures are required: a functional-disability scale, symptom and pain indices, a measure of psychological disturbance, quantitative and more qualitative methods of the impact on social functioning (e.g. work, interpersonal relationships and social support, domestic life etc.).'

Other studies have included measures of life satisfaction and social engagement, morale [34], mood and depression [63] and anxiety [64] .

Contribution to knowledge

The overall aim of this thesis was to contribute to the knowledge base in the UK concerning the relationship between exercise, well-being and elderly women. During this

process, a valid and reliable postal questionnaire has been developed for measuring physical activity and other variables such as exercise beliefs, attitudes and barriers, for use with elderly women. The London Health and Fitness Questionnaire (LHFQ) is based on the interview schedules used in the National Fitness Survey, carried out in the UK[33]. The LHFQ will inevitably benefit from further testing and refinement but could in time fulfil the research niche as a standardised methodology for measuring exercise behaviour in population studies of elderly people. Over a hundred requests for copies of the questionnaire have been made to the author, following reference of the questionnaire in a paper citing its use [67].

Secondly, study two has drawn attention to the difficulties of conducting community-based exercise intervention studies. Studies of this nature are complex and challenging and it is hoped that lessons learnt from this study with hindsight, may be of value in helping others prepare for future research in this area.

Study three is an important study exploring the relationship between activity, well-being and other factors in elderly women. This study provides data on domestic and sporting activity levels in a large sample of elderly women based in the UK, obtained using an age-specific questionnaire which has been shown to have satisfactory reliability and validity. The study indicates that treating exercise as a generic term is not useful since different factors appear to influence participation rates according to activity type. This study supports findings from other studies which emphasise the importance of age and good health status for engagement in physical activity and suggests that past exercise experience and physical self-efficacy may be important factors in predicting uptake of sporting exercise. It is suggested that psychological models of health/exercise behaviour might benefit from incorporating these components into existing models to improve their predictive validity.

Emerging patterns

A number of patterns appear to be emerging from studies conducted in this thesis and other exercise studies. The importance of good health status is a consistent finding amongst many studies [43 53-55], including study three. In study two there were also signs that health status improved in people assigned to the brisk walking group. These findings go against aspects of the theory proposed by the Health Belief Model (HBM) [38] which suggest that if a person becomes aware of a threat to their health (for example, they feel susceptible or are suffering from ill health), they are likely to take part in a positive health behaviour such as exercise. However, other aspects of the HBM such as the emphasis on perceived barriers to exercise are supported by study three and others [56]. For example the HBM predicts that a person may choose to exercise if the perceived benefits outweigh the perceived barriers or costs. The theory of Self-efficacy [40] and Theory of Planned Behaviour [37], share in the theory that a person must believe that participating in exercise will have a beneficial outcome, before taking part. Study three, in line with others [47 54 57 58] also supports the aspect of SE theory which stresses the importance of past experience/accomplishments. In study two, there was also an indication that a positive change in physical self-efficacy occurred for those people taking part in the brisk walking

programme. The relationship between exercise beliefs, exercise attitudes and exercise behaviour however remain confusing. Theoreticians stress the importance of attitudes in influencing behaviour, for example [37]. However, in study three, a lack of relationship between attitudes and high domestic activity, but not sporting activity was found. A lack of relationship between exercise attitudes and exercise participation rates have been found in other studies[68-71]. Whilst having a strong personal belief in the value of exercise emerged as an important predictor of high domestic activity, but not sporting activity. More work is needed to clarify these relationships. It is likely that exercise attitudes and beliefs are being measured in different ways and used to predict different types of activity. For example, if an individual does not think of themselves as a 'sporty type' they may be reluctant to say they are sporty even if they do engage in a high level of physical activity. Thus in this example, a mismatch may occur between attitude and actual behaviour. Conversely, someone who says they believe in the value of exercise may over estimate the actual amount of exercise they engage in or over value the amount they do, to achieve congruence. Thus a discrepancy will occur yet again.

In terms of the relationship between health status and physical activity, the importance of physical mobility has been highlighted as being especially critical, in studies two and three. This extends findings from other studies which have found that impaired mobility is the best physical indicator of subsequent mortality in depressed older adults [77] and that fewer physical symptoms of impaired mobility are associated with high well-being scores[78].

Health status, especially amongst the elderly, is likely to be dynamic and it is anticipated that if health is temporarily or consistently poor, then physical exertion in activities is likely to drop or remain low. Linear stage models of health/exercise behaviour such as the precaution adoption process [72], which predict that people move from contemplation to actual exercise behaviour in a systematic way, are unlikely to ever be successful at explaining exercise behaviour, at least amongst the elderly, whose health may not allow them to act in a logical and systematic way. It may be more helpful to view exercise behaviour as a cycle. The transtheoretical model [73] is another example of a stage model aimed at explaining health behaviour in terms of the stages which people pass through from contemplation through to action and maintenance of action. This model however, unlike the precaution adoption process, allows for people to recycle through the stages if they fail at the action or maintenance stages. The success of this model at explaining exercise behaviour amongst the elderly seems more likely. However, the results shown in study three stress the importance of non-social cognitive variables such as age and past exercise experience, as well as health for influencing current and future exercise behaviour. These findings are in common with many other exercise studies [33 58 74-76].

The relationship between exercise and other health behaviours such as smoking, drinking and attendance at health screening, is interesting and warrants further investigation in its own right. The findings from study three do not suggest that domestic or sporting activity form part of a general tendency to follow a healthy life-style, as only weak and inconsistent relationships were seen with other health behaviours such as smoking and drinking, although these findings have not been found by others [59]. Further investigation

may shed more light on why psychological models generated to explain health behaviours other than exercise, have been relatively unsuccessful at explaining exercise behaviour.

7.2 Conclusions and recommendations.

In the process of conducting the three studies, a number of conclusions have been reached and thoughts on recommendations for future studies have emerged. These are outlined below.

1. Very few exercise intervention studies have been conducted with samples of elderly women and where research has occurred, the majority has been generated from North America, rather than the UK.

2. Whilst there is evidence to suggest that exercise can confer benefits on the well-being of the elderly, because conducting exercise research presents an extreme methodological challenge, it is difficult to be conclusive. For example, it is very difficult to recruit suitable samples and set up good control groups, prescribe an exercise programme precisely in terms of frequency and intensity, monitor compliance and measure outcomes.

3. In some cases it may useful to perform exercise intervention studies by recruiting large volunteer samples of elderly people and dividing them into more homogenous ability groups. In this way within group differences are more likely to be controlled for and it may be easier to detect any between group differences that emerge across treatments. Although the generalisability of findings will be limited.

4. A number of control groups would be useful, not only including a group which receives a homeopathic dose of exercise, since this may be beneficial in itself. It is vital to conduct pilot studies to test the reliability and validity of physiological tests to be used in measuring exercise outcomes.

5. It is necessary to be quite prescriptive about the exact nature of exercise programmes, perhaps piloting the use of an exercise manual, which is flexible enough to fit in with existing lifestyles but robust enough to ensure that clear boundaries exist between different exercise interventions.

6. Effort should be given to ensuring that members of all groups, control or intervention, receive equal attention from the researcher to control for any experimenter bias influencing the results. Attention should be given to testing how efficacious group members think their treatment option is and to monitoring motivation to adhere to the particular programme, where possible

7. Monitoring procedures need to be acceptable to the client group. It would pay to take time and be creative over piloting a number of methods for monitoring compliance rather than rushing in to start an exercise intervention programme. Methods may include

investigating the acceptability of pedometers, diaries, telephone contact and increasing face-to-face contact time.

8. When activity data is collected using self-report, it should be corroborated where possible, with objective physiological measures of fitness, to limit the confounding of variables such as socio-economic status and response bias by those who already engage in other positive health behaviours.

9. Widening the definition of well-being to include positive mental and physical health experiences as opposed to concentrating on negative ones, and incorporating broader measures of quality of life, may change the emphasis from a disability/medical model of health to a more psychological model. Greater use of commonly defined terms, will allow for replication and more consistent conclusions to be drawn.

10. It is speculated that existing psychological models of health behaviour have been relatively unsuccessful at explaining exercise behaviour because exercise has been treated as a generic term rather than specifying the type of exercise behaviour. Moreover, exercise behaviour has been viewed as a linear process. Rather than trying to offer a specific theory about every type of exercise behaviour from relaxation through to aerobic exercise, it might be best to carry out micro studies and build up knowledge in particular areas of exercise activity. In addition, exercise behaviour might best be viewed as a cyclical process. There seems to be an expectation by researchers examining exercise behaviour, that if exercise is started, but then a person drops out, that some kind of personal or programme failing has occurred. Another way of looking at exercise behaviour is as a cyclical process. People may choose to enter or drop out of exercise depending on different factors such as time of year, fluctuation in health or the temporary arrival of other commitments.

11. The importance of past exercise experience, in terms of building up skills and a sense of physical self-efficacy is emerging as an influential factor in determining exercise behaviour. Childhood is thought to be an informative time for many aspects of development and it is anticipated that development of confidence in physical ability is one of them. Existing evidence suggest that children are developing increasingly inactive lifestyles [65 66] which has implications for future generations of elderly cohorts. Little can be done to compensate for the lack of physical skills acquired in earlier years in existing cohorts of elderly women. However, encouraging elderly women to increase their participation in customary and domestic activity, where physical self-efficacy is likely to be highest, may serve to maintain functional fitness and protect against disability and dependency. For those elderly women who wish to increase their participation in sports exercise, initiatives such as national 'sport for all' trial days, aimed specifically at the elderly may be successful at helping them to build skills and acquire confidence in a safe environment, perhaps with primary health care advisors present. The evidence suggests that those people who are older, in poor health, overweight and anticipate they won't enjoy or gain benefits from exercise, are likely to be tougher to reach. However, attempts to maintain or promote physical mobility would not be wasted in terms of increasing quality of life.

12. Qualitative methodologies, case study and longitudinal designs are needed as well as experimental methods, to increase a knowledge and understanding of exercise activity, well-being and elderly women. A longitudinal design would allow data to be collected prospectively and allow more scope for causal associations between variables to be found. Much of what we know about elderly women has been generalised from younger cohorts. Therefore detailed data obtained from individual groups of women, using qualitative techniques would help to build a more comprehensive picture from an original source - the elderly women themselves.

13. The following model is suggested as a new way of understanding exercise behaviour in elderly women.

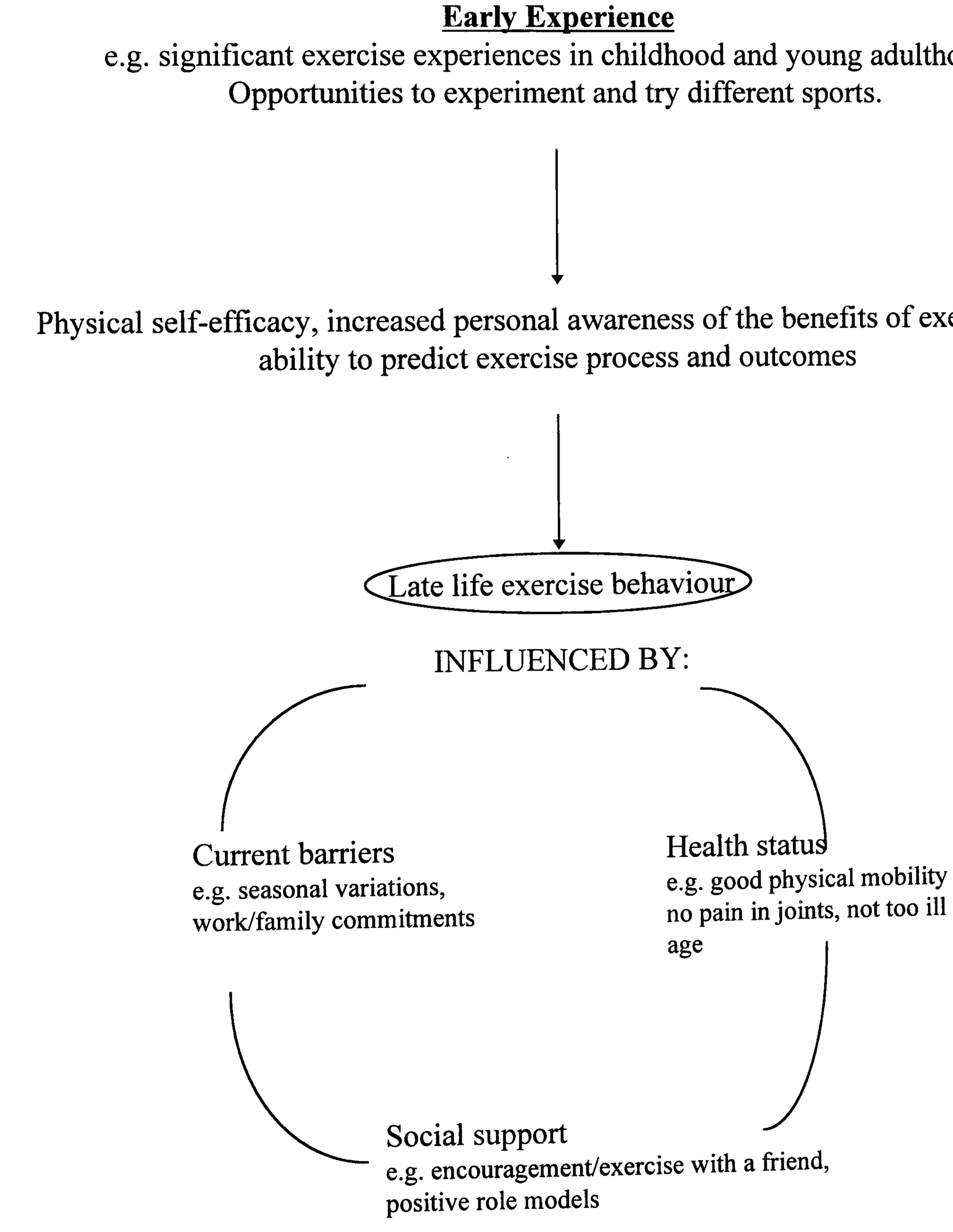

Figure 7.1. Towards a model for understanding exercise behaviour in elderly women.

In summary, there is a need for more exercise studies examining the relationship between different types of exercise activity and well-being (incorporating measures of positive mental and physical health) in samples of elderly women. Experimental methods have their place, but it may be more beneficial in the early stages to conduct detailed research using qualitative methodologies and case study designs. Longitudinal studies using samples of elderly and younger women would also be helpful. Physical self-efficacy is derived in part from exercise experience, thus creative ways have to be found for allowing elderly women who have missed out on the development of physical skills and confidence to experiment in a safe, non-threatening environment, to discover if exercise is for them. Exercise behaviour might best be thought of as a cyclical process, whereby individuals may dip into and out of an individual programme due to seasonal factors (such as reduced motivation to exercise in winter on dark, cold nights) or perhaps due to poor health or family/work commitments.

As we approach the millennium, when the elderly are forecasted to make up at least five percent of the British population, it seems to be a good opportunity to spend research effort on carrying out further studies to understand the relationship between exercise and well-being, as this may represent an important way of adding life to years and years to life for this population.

7. 3 REFERENCES.

1. United Nations Department of International Economic and Social Affairs. *World survey on the role of women in development. report of the commission on the status of women.* New York: United Nations, 1986.

2. Verbrugge, L. A health profile of older women with comparisons to older men. *Research on Ageing,* 1984; **6** (3): 291-322.

3. Larson, R. Thirty years of research on the subjective well-being of older Americans. *Journal of Gerontology*, 1978; **1**: 109-125.

4. Edwards, J. and Klemmack, D. Correlates of life-satisfaction: a reexamination. *Journal of Gerontology*, 1973; **28**: 497-502.

5. Palmore, E. and Luikart, C. Health and social factors related to life satisfaction. *Journal of Health and Social Behaviour*, 1972; **13**: 68-80.

6. Spreitzer, E. and Schneider, E. Correlates of life-satisfaction among the aged. *Journal of Gerontology*, 1974; **29**: 454-458.

7. Chow, R.K., Harrison, J.E. and Notarius, C. Effect of two randomised exercise programmes on bone mass in postmenopausal women. *British Medical Journal*, 1987; **295**: 1441-44.

8. World Health Organisation (WHO). *Ottawa charter for health promotion.* New York: WHO, 1986

9. Secretary of State for Health. *The health of the nation: a strategy for health in England.* London: HMSO, 1991.

10. Gloag D. Exercise, fitness and health. *British Medical Journal,* 1992; **305:** 377-388.

11. Fentem P.H, Bassey E.J, Turnbull N.B. *The new case for exercise.* London: Health Education Authority, 1988.

12. Ebrahim, S., Dallosso, H.M., Morgan, K., Fentem, P.H. and Arie, T. The causes of handicap among a random sample of old and very old people : possibilities for prevention. *Journal of the Royal College of Physicians,* 1988; **22**: 105-7.

13. Morris, J.N., Everitt, M.G., Pollard, R., Chave, S.P.W. and Semmence, A.M. Vigorous exercise in leisure-time: protection against coronary heart disease. *Lancet*, 1980; **II**: 1207-1210.

14. Paffenbarger, R.S., Hyde, R.T., Wing, A.L. and Hsieh, C.C. Physical activity, all-cause mortality and longevity of college alumni. *New England Journal of Medicine*, 1986; **314**: 605-613.

15. Donahue, R.P., Abbott, R.D., Reed, D.M. and Yano, K. Physical activity and coronorary heart disease in middle-aged and elderly men. The Honolulu Heart Programme. *American Journal of Public Health*, 1988; **78** :307-312.

16. Shaper, A.G. Pocock, S.J., Walker, M., Cohen, N.M., Wale, C.J. and Thompson, A.J. British Regional Heart Study: cardiovascular risk factors in middle-aged men in 24 towns. *British Medical Journal*, 1981; **283**: 179-86.

17. Van Sasse, J.L.C.M., Noteboom, W.M.P. and Vandenbroucke, J.P. Longevity of men capable of prolonged physical exercise: a 32 year follow up of 2259 participants in the Dutch eleven cities ice skating tour. *British Medical Journal*, 1990; **301**: 22-29.

18. Palmore, E.B., Nowlin, J.B. and Wang, H.S. Predictors of function among the old-old: a ten year follow-up. *Journal of Gerontology*, 1985; **40**: 244-250.

19. Blair, S.N., Lavey, R.S., Goodyear, N., Gibbons, L.W. and Cooper, K.H. Physiologic responses to maximal graded exercise testing in apparently healthy white women aged 18 to 75 years. *Journal of Cardiac Rehabilitation*, 1984; 4: 459-468.

20. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

21. Plowman, S.A., Drinkwater, B.L. and Horvath, S.M. Age and aerobic power in women: a longitudinal study. *Journal of Gerontology*, 1979; **34**: 512-520.

22. Serfass, R.C. Physical exercise and the elderly. In Studd, G.A. (Ed.), *Encyclopedia of physical education, fitness and sports: training, environment, nutrition and fitness*. Salt Lake City: Brighton, 1980.

23. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218.

24. Morey, M.C., Cowper, P.A., Feussner, J.R., DiPasquale, R.C. and Crowley, G.M. Evaluation of a supervised exercise programme in a geriatric population. *Journal of the American Geriatric Society*, 1989; **37**: 348-354.

25. Morris, J.N., Everitt, M.G., Pollard, R., Chave, S.P.W. and Semmence, A.M. Vigorous exercise in leisure-time: protection against coronary heart disease. *Lancet*, 1980; **II**: 1207-1210.

27. Perri, S. and Templer, D.I. The effects of an aerobic exercise programme on psychological variables in older adults. *International Journal of Aging and Human Development*, 1985; 20: 167-172.

28. DeVries, H.A. and Adams, G.M. Electromyographic comparison of single dose of exercise and meprobamate as to effects on muscular relaxation. *American Journal of Physical Medicine*, 1972; 51: 130-141.

29. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10(2)**: 125-131.

30. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

31. Emery, C.F. and Gatz, M. Psychological and cognitive effects of an exercise programme for community-residing older adults. *The Gerontologist*, 1990; **30(2)**: 184-188.

32. LaPorte, R.E., Montoye, H.L. and Caspersen, C.J. Assessment of physical activity in epidemiological research: problems and prospects. *Public Health Reports*, 1985; **100**:131-146.

33. Sports Council and Health Education Authority. *Allied Dunbar National Fitness Survey: Main findings*. London: Ancient House Press, 1992

34. Dallosso, H., Morgan, K., Bassey, E.J., Ebrahim, S., Fentem, P.H. and Arie, T. levels of customary physical activity among the old and very old living at home. *Journal of Epidemiology and Community Health*, 1988; **42**: 121-127.

35. Kriska, A.M., Bayles, C., Cauley, J.A., LaPorte, R.E., Sandler, R.B., and Pambianco, G. A Randomised exercise trial in older women: increased activity over two years and factors associated with compliance. *Medicine and Science in Sports and Exercise*, **1986; 7:** 557-562.

36. Dishman, R.K. Compliance/adherence in health-related exercise. *Health Psychology*, 1982; **1:** 237-267.

37. Ajzen, I. From intentions to actions: a theory of planned behaviour. In J. Kuhl and J. Beckman (eds.). *Action-control: from cognition to behaviour*. Heidelberg, Germany: Springer, 1985. pp 12-39.

38. Becker, M.H. The health belief model and personal health behaviour. *Health Education Monographs*, 1974; **2**: 324-508.

39. Sonstroem, R.J. Physical estimation and attraction scales: rational and research. *Medicine and Science in Sports*, 1978; **10**: 97-192.

40. Bandura, A. Self-efficacy: towards a unifying theory of behavioural change. *Psychological Review*, 1977; **84**: 192-215.

41. Sobolski, J., Kornitzer, M., DeBacker, G., Dramaix, M., Abramowicz, M. et al. Protection against ischaemic heart disease in the Belgian physical fitness study: physical fitness rather than physical activity? *American Journal of Epidemiology* 1987; **125**: 601-610.

42. Slattery, M.L. and Jacobs, D.R. Physical fitness and cardiovascular disease mortality: the US railroad study. *American Journal of Epidemiology* 1988; **127**: 571-580.

43. Slattery, M.L. Jacobs, D.R. and Nichaman, M.Z. Leisure time physical activity and coronary heart disease death. *Circulation* 1989; **79**: 304-311

44. Washburn, R.A., Jette, A.M., and Janney, C.A. Using age-neutral physical activity questionnaires in research with the elderly. *Journal of Aging and Health*, 1990;**2**(3): 341-356.

45. Davey-Smith, G. *Physical fitness and risk factors for coronary heart disease.* Cambridge University: MD thesis, 1993.

46. Davey Smith, G., Catford, J., Nutbeam, D. and Phillips, K. *The relationship between health beliefs and health behaviours.* I.E.A. XI Scientific Meeting, Helsinki, Abstract 351., 1987.

47. Dishman, R.K. and Steinhardt, M. Reliability and concurrent validity for a seven-day recall of physical activity in college students. *Medicine in Science and Sports and Exercise* **20**: 14-25, 1988.

48. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218

49. Sidney, K.H. and Shephard, R.J. Frequency and intensity of exercise training for elderly subjects. *Medicine and Science in Sports*, 1978; **10**(2): 125-131.

50. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist,* 1990; **30(2)**: 189-192

51. Hopkins, D.R., Murrah, B., Hoeger, W.W.K. and Rhodes, R.C. Effect of low-impact aerobic dance on the functional fitness of elderly women. *The Gerontologist*, 1990; **30(2)**: 189-192.

52. Stevenson, J.S. and Topp, R. Effects of moderate and low intensity long-term exercise by older adults. *Research in nursing and health*, 1990; **13**: 209-218.

53. Fiatarone, M.A., O'Neill, E.F., Ryan, N.D. *et al* Exercise training and nutritional supplementation for physical frailty in very elderly people, *New England Journal of Medicine,* 1994; **330**: 1769-1775.

54. Sports Council and Health Education Authority. *Allied Dunbar National Fitness Survey.* London: Ancient House Press, 1992.

55. Howze, E.H., Smith, M., & DiGilio, D.A. Factors affecting the adoption of exercise behaviour among sedentary older adults, *Health Education Research,* 1989; **4**: 173-180.

56. Dishman, R.K. Exercise adherence and habitual physical activity. In Morgan, W.P. and Goldston, S.N. (Eds.) *Exercise and mental health.* Washington DC: Hemisphere, 1986. pp 57-83.

57. Bauman, A., Owen, N., & Rushworth, R.L. Recent trends and socio-demographic determinants of exercise participation in Australia, *Community Health Studies,* 1990; **14**: 19-26.

58. Perrier. *The Perrier Study: Fitness in America.* New York: Perrier-Great Waters of France Inc., 1979.

59. Faulkner, R.A., Bailey, D.A., & Mirwald, R.L. The relationship of physical activity to smoking characteristics in Canadian men and women, *Canadian Journal of Public Health,* 1987; **78**: 155-160.

60. Hunt, S.M., McEwen, J. and McKenna, S.P. *Measuring health status*. London: Croom Helm, 1986.

61. Bowling, A. *Measuring Health: a review of quality of life measurement scales*. Milton Keynes: Open University Press, 1991, p. 64.

63. McDonald, D.G. and Hodgdon, J.A. *Psychological effects of aerobic fitness training: research and theory*. New York: Springer-verlag, 1991.

64. Long, B.C. and Van Stavel, R. Effects of exercise training on anxiety: a meta-analysis. *Journal of Applied Sport Psychology*, 1995; **7**: 167-189.

65. Armstrong, N., Balding, J., Gentle, P. and Kirby, B. Patterns of physical activity among 11 to 16 year old British children. *British Medical Journal*, 1990; **301**: 203-205.

66. Armstrong, N. and Bray, S. Primary school children's physical activity patterns during autumn and summer. *Bulletin of Physical Education*, 1990; **26**: 23-26.

67. Rowland, L., Dickinson, E.J., Newman, P., Ford, D. and Ebrahim, S. Look After Your Heart programme: impact on health status, exercise knowledge, attitudes and behaviour of retired women in England. *Journal of Epidemiology and Community Health*, 1994; **48**(2), pp 123-128.

68. Dzewaltowski, D.A. Toward a model of exercise motivation. *Journal of Sport and Exercise Psychology*, 1989; **11**: 251-269.

69. Dzewaltowski, D.A., Nobel, J.M. and Shaw, J.M. Physical activity participation: social cognitive theory versus the theories of reasoned action and planned behaviour. *Journal of Sport and Exercise Psychology*, 1990; **12**: 388-405.

70. Pender, N.J. and Pender, A.R. Attitudes, subjective norms and intentions to engage in health behaviours. *Nursing Research*, 1986; **35**: 15-18.

71. Gatch, C.L. and Kenzierski, D. Predicting exercise intentions: the theory of planned behaviour. *Research Quarterly for Exercise and Sport*, **61** (1): 100-102, 1990.

72. Weinstein, N.D. The precaution adoption process. *Health Psychology* 1988; **7(4)**: 355-86.

73. Prochaska, J.O. and DiClemente, C.C. Toward a comprehensive model of change. In W.R. Miller and N. Heather (Eds.) *Treating addictive behaviour: processes of change*. New York: Plenum, 1986.

74. Ebrahim, S., Dallosso, H.M., Morgan, K., Fentem, P.H., & Arie, T.H.D. The causes of handicap among a random sample of old and very old people: possibilities for prevention, *Journal of the Royal College of Physicians of London,* 1988; **22**: 105-107.

75. Bauman, A., Owen, N., & Rushworth, R.L. Recent trends and socio-demographic determinants of exercise participation in Australia, *Community Health Studies,* 1990; **14**: 19-26.

76. Ostrow, A.C., & Dzewaltowski, D.A. Older adults' perception of physical activity participation based on age role and sex role appropriateness, *Research Quarterly for Exercise and Sport,* 1986; **57**: 167-169.

77. Burvill, P.W. and Hall, W.D. Predictors of increased mortality in elderly depressed patients. *International Journal of Geriatric Psychiatry*, 1994; **9**: 219-227.

78.Watson, D. and Pennebaker, J.W. Health complaints, stress and distress: exploring the central role of negative affectivity. *Psychological Review*, 1989; **96**: 234-254.

APPENDIX A

CONFIDENTIAL

HEALTH STATUS

QUESTIONNAIRE

BEFORE YOU START PLEASE BE SURE TO READ THE INSTRUCTIONS.

For Office use only

PART I

We would like you to think about the activities in your life which may be affected by health problems.
In the list below, tick yes for each activity in your life which is being affected by your state of health. Tick no for each activity which is not being affected, or which does not apply to you.

IS YOUR PRESENT STATE OF HEALTH CAUSING PROBLEMS WITH YOUR ....

	YES	NO
1. JOB OF WORK (That is, paid employment)	☐	☐
2. LOOKING AFTER THE HOME (Examples: cleaning & cooking, repairs, odd jobs around the home etc.)	☐	☐
3. SOCIAL LIFE (Examples: going out, seeing friends, going to the pub etc.)	☐	☐
4. HOME LIFE (That is: relationships with other people in your home)	☐	☐
5. SEX LIFE	☐	☐
6. INTERESTS & HOBBIES (Examples: sports, arts and crafts, do-it-yourself etc.)	☐	☐
7. HOLIDAYS (Examples: summer or winter holidays, weekends away etc.)	☐	☐

For Office use only

ART II

isted below are some problems people may have in their daily life. Look down the list
ıd put a tick in the box under **yes** for any problem you have at the moment. Tick the
ɔx under **no** for any problem you do not have. **Please answer every question.** If you are
ɔt sure whether to answer yes or no, tick whichever answer you think is more true at
ıe moment.

	YES	NO
I'm tired all the time	☐	☐
I have pain at night	☐	☐
Things are getting me down	☐	☐

	YES	NO
I have unbearable pain	☐	☐
I take tablets to help me sleep	☐	☐
I've forgotten what it's like to enjoy myself	☐	☐

	YES	NO
I'm feeling on edge	☐	☐
I find it painful to change position	☐	☐
I feel lonely	☐	☐

	YES	NO
I can only walk about indoors	☐	☐
I find it hard to bend	☐	☐
Everything is an effort	☐	☐

	YES	NO
I'm waking up in the early hours of the morning	☐	☐
I'm unable to walk at all	☐	☐
I'm finding it hard to make contact with people	☐	☐

	YES	NO
The days seem to drag	☐	☐
I have trouble getting up and down stairs/steps	☐	☐
I find it hard to reach for things	☐	☐

PLEASE TURN OVER

APPENDIX B

Appendix B.

. comparison between the General House-hold Survey (GHS) and the etirement Service Association (RSA) group for marital status and age.

	Age in years					
	50 - 64		65 - 74		75 - 84	
HS	RSA		GHS	RSA	GHS	RSA
5	87		64	60	36	33
	2		3	8	2	0
l	4		26	26	53	60
	7		7	5	9	7
	0		0	0	0	0
00	100		100	100	100	100

. comparison between the General House-hold Survey (GHS) and the etirement Service Association (RSA) group for age left school.

	GHS	RSA
Years	47	86
	32	7
	9	6
	10	1
	2	0
%	100	100

. comparison between the General House-hold Survey (GHS) and the etirement Service Association (RSA) group for current age by age left hool.

	Age in years					
	50 - 59		60 - 69		70 - 84	
	GHS	RSA	GHS	RSA	GHS	RSA
	40	6	68	46	?	16
	30	10	10	8	?	1
	12	5	10	1	?	3
	5	1	4	2	?	0
	3	1	2	0	?	0
	10	0	6	0	?	0
	0	0	0	0	?	0
	100	23	100	57	?	20
%	? = information not available.					

A comparison between the General House-hold Survey (GHS) and the Retirement Service Association (RSA) group for age by highest qualification.

n	Age in years			
	50 - 59		60 - 69	
	GHS	RSA	GHS	RSA
ions	56	16	63	27
	17	3	12	2
	8	0	4	1
ing certificate	?	11	?	21
	19	5	21	14
	100	**35**	**100**	**65**

= 100%

A comparison between the General House-hold Survey (GHS) and the Retirement Service Association (RSA) group for age by home owner.

	GHS	RSA	GHS	RSA	GHS	RSA
rs	**Own Home**		**Council**		**Private**	
	22	19	19	1	22	2
	12	23	11	4	14	1
	17	21	0	6	6	1
	22	9	19	2	25	3
	11	1	9	1	13	2
	16	0	42	4	20	0
	100	**73**	**100**	**18**	**100**	**9**

= 100%

1. Please read through the questionnaire and answer all the questions.

   There are no right or wrong answers.

   We would like to know **what you think**.

   We would like to know **what you do**.

2. Each question asks you to put a tick in a box.
   Some questions ask you to tick more than one box.

   Please **do not miss out** any questions.

   The answers you give will be confidential. They will only be seen by the research team.

Between leaving school and the age of 25, how much sport did you take part in ?

Please tick one box only.

A LOT ☐ A LITTLE ☐

A MODERATE AMOUNT ☐ NONE AT ALL ☐

Between leaving school and the age of 25, did you do any of the following activities regularly ?

You may tick more than one box.

SWIMMING ☐ BADMINTON ☐

DANCING ☐ RUNNING ☐

WALKING ☐ CYCLING ☐

TENNIS ☐ SQUASH ☐

TEAM SPORTS (E.G rugby, hockey, cricket, football). ☐ GOLF ☐

KEEP FIT ☐ OTHER (SPECIFY) _____

Between leaving school and the age of 25, would you have described yourself as :

Please tick one box only.

VERY PHYSICALLY ACTIVE ☐ NOT VERY PHYSICALLY ACTIVE ☐

FAIRLY PHYSICALLY ACTIVE ☐ NOT AT ALL PHYSICALLY ACTIVE ☐

SECTION THREE : VIEWS ON EXERCISE

We would like to ask you what you think exercise can do for you.

Do you think that it is important to keep fit in retirement ?

Please tick one box only.

YES ☐

NO ☐ DON'T KNOW ☐

Do you think that regular brisk exercise, which makes your body feel that it is working hard, is good for you as you get older ?

Please tick one box only.

YES ☐

NO ☐ DON'T KNOW ☐

Please say whether you agree or disagree with the following questions :

Please answer each question.

Please tick one box per question.

A). Regular brisk exercise ;	AGREE	DISAGREE
Can weaken your bones ?	☐	☐
Helps to prevent heart disease ?	☐	☐
Develops your body strength ?	☐	☐
Gives you high blood pressure ?	☐	☐
Helps you to lose weight ?	☐	☐
Shortens your life ?	☐	☐

REMEMBER : it is your opinion, that we are interested in.

Please say whether you agree or disagree with the following questions :

Please answer each question.

Please tick one box per question.

B). Regular brisk exercise :

	AGREE	DISAGREE
Releases the tensions of every-day stress ?		
Helps you to relax ?		
Can help you to make friends ?		
Is not much fun ?		
Gives you lots of energy for life ?		
Can keep you supple ?		

REMEMBER : it is your opinion that we are interest in.

Please say whether you agree or disagree with the following questions :

Please answer each question.

Please tick one box per question.

C). Regular brisk exercise :

	AGREE	DISAGREE
Helps you to get out of doors ?		
Can make you feel good about life ?		
Generally makes people feel depressed ?		
Can help to improve your health ?		
Gives you aches and pains ?		

REMEMBER : it is your opinion that we are interested in.

SECTION FOUR : CURRENT ACTIVITY.

We would like to ask you what you do at the moment to keep yourself fit and healthy.

Please say whether you currently do, any of the following things to keep yourself healthy :

Please answer each question.

Please tick one box per question.

DO YOU :	YES	NO
Take exercise ?	☐	☐
Eat healthy meals ?	☐	☐
See somebody everyday ?	☐	☐
Smoke ?	☐	☐
Avoid drinking alcohol every-day ?	☐	☐
Have regular health checks SUCH AS :		
Cancer screening, smear tests, or breast checks ?	☐	☐
OR :		
A complete medical examination from a doctor ?	☐	☐
OTHER THINGS ? (please specify)	_____	

How often do you leave your house ?

Please tick one box only.

DAILY	☐	MONTHLY	☐
WEEKLY	☐	NEVER	☐

Do you climb stairs everyday ?

Please tick one box only.

YES ☐

NO ☐

Please say how much time in **the last week** you have spent doing the following sorts of housework :

Please tick one box per question.

	No time at all	Less than 1 hour	less than 2 hours	Less than 3 hours	3 hours or more
Light house-work (e.g dusting, bed making and washing)	☐	☐	☐	☐	☐
Heavy house-work (e.g ironing, yard brushing, vacuuming)	☐	☐	☐	☐	☐

Did you feel that your body was working hard, doing any of this house-work ?

Please tick one box only.

YES ☐ **If YES**, please say which housework made your body work hard _____

NO ☐ DOES NOT APPLY ☐

Please can you say how much time **in the last week**, you have spent carrying out everyday activities, such as walking the dog, travelling to visit people, shopping, and collecting the pension :

Please tick one box only.

No time at all	Less than 1 hour	Less than 2 hours	Less than 3 hours	3 hours or more
☐	☐	☐	☐	☐

Did you feel that your body was working hard doing any of these everyday activities ?

Please tick one box only.

YES ☐ If YES, please say which activities made your body work hard _____

NO ☐

DOES NOT APPLY ☐

In **the last week** how much time would you say you have spent doing the following sorts of gardening :

Please tick one box per question.

	No time at all	Less than 1 hour	Less than 2 hours	Less than 3 hours	3 hours or more
Light gardening (e.g pruning, watering planting and weeding)	☐	☐	☐	☐	☐
Heavy gardening (e.g hoeing, digging and lawn mowing)	☐	☐	☐	☐	☐

Did you feel that your body was working hard, doing any of this gardening ?

Please tick one box only.

YES ☐ If YES , please say which sort of gardening made your body work hard _____

NO ☐

DOES NOT APPLY ☐

How much time in **the last week** have you spent doing the following leisure / recreational activities :

PLEASE ANSWER EACH QUESTION.

Please tick one box per question.

	No time at all	Less than 1 hour	Less than 2 hours	Less than 3 hours	3 hou or mo
Bowls ?	☐	☐	☐	☐	☐
Badminton ?	☐	☐	☐	☐	☐
Dancing ?	☐	☐	☐	☐	☐
Walking ?	☐	☐	☐	☐	☐
Swimming ?	☐	☐	☐	☐	☐
Cycling ?	☐	☐	☐	☐	☐
Keep fit/aerobics ?	☐	☐	☐	☐	☐
Golf ?	☐	☐	☐	☐	☐
Tennis ?	☐	☐	☐	☐	☐
Team sports ? (hockey, rugby,etc..)	☐	☐	☐	☐	☐
Jogging / running ?	☐	☐	☐	☐	☐

Other sports activities ? (please specify). _____

Did you feel that your body was working hard, doing any of these leisure / recreational activities ?

Please tick one box only.

YES ☐ If YES, please say which ones made your body work hard _____

NO ☐

DOES NOT APPLY ☐

When people talk about vigorous exercise, they often mean different things. We would like you to think about vigorous exercise as something which makes you feel that your body is working really hard.

In **the last week** have you taken part in vigorous exercise like this for 20 minutes at any one time ?

Please tick one box only.

YES ☐

NO ☐

If YES, how much time in the last week did you spend on vigorous exercise like this ?

Please tick one box only.

Less than 1 hour	Less than 2 hours	Less than 3 hours	3 hours or more
☐	☐	☐	☐

Which of the following things would you say are " exercise " ?

You may tick more than one box.

Team sports (hockey, rugby etc.) ☐	House-work ☐	Jogging ☐
Dancing ☐	Snooker ☐	Golf ☐
Aerobics ☐	Roller skating ☐	Playing bowls ☐
Shopping ☐	Gardening ☐	Fishing ☐
Walking ☐	Playing darts ☐	

Do you think you get enough exercise at present to keep you fit ?

Please tick one box only.

YES ☐ NO ☐ DON'T KNOW ☐

All sorts of things stop us from getting more exercise. Please answer each of the following, saying whether you agree, disagree, or strongly agree / disagree with each of them.

Please answer each question.

Please tick one box per question.

A).

	Strongly disagree	Disagree	Agree	Strongly agree	
I am not the sporty type	☐	☐	☐	☐	C
I have not got the time	☐	☐	☐	☐	C
I am too shy	☐	☐	☐	☐	A. REMEMBER it is your opinion that we are interested in.
There is no-one to exercise with	☐	☐	☐	☐	C
I am too old	☐	☐	☐	☐	A or C

Please say whether you agree, disagree, or strongly agree/disagree with the following :

Please answer each question.

Please tick one box per question.

B).

	Strongly disagree	Disagree	Agree	Strongly agree	
There aren't any exercise facilities in the area	☐	☐	☐	☐	C
My health is not good enough	☐	☐	☐	☐	C
I need to rest and relax in my spare time	☐	☐	☐	☐	B. REMEMBER: it is your opinion that we are interested in.
I might get injured or damage my health	☐	☐	☐	☐	C
I don't enjoy exercise.	☐	☐	☐	☐	A.

please say whether you agree, disagree, or strongly agree / disagree with the following :

Please answer each question.

Please tick one box per question.

C).

	Strongly disagree	Disagree	Agree	Strongly agree
I haven't got the right sports equipment	☐	☐	☐	☐
I would never keep up any exercise	☐	☐	☐	☐
I am too fat	☐	☐	☐	☐
I can't afford it	☐	☐	☐	☐
I'm not very good at sport	☐	☐	☐	☐

C

C.

C A

REMEMBER : it is your opinion that we are interested in.

C

C

Please tick from the list below, **the things** which **stop YOU** from taking more exercise at the moment :

You may tick more than one box.

Lack of time ?	☐	Transport is difficult ?	☐
Lack of interest ?	☐	Not knowing about local exercise facilities ?	☐
Lack of money ?	☐	Being unfit ?	☐
No-one to exercise with ?	☐	Not having enough energy ?	☐
Having painful joints e.g. knees, hips, feet?	☐	Being in ill-health ?	☐
No local exercise facilities for retired people ?	☐		

NONE OF THE ABOVE THINGS ☐

Would you like to get more exercise than you do at present ?

Please tick one box only.

YES ☐ NO ☐

SECTION FIVE : BACKGROUND INFORMATION.

We would now like to ask you a few background questions about yourself.

Which of the following best describes your current marital position ?

Please tick one box only.

MARRIED ☐ SEPERATED ☐ SINGLE ☐

DIVORCED ☐ WIDOWED ☐

Do you live alone ?

Please tick one box only.

YES ☐ NO ☐

Are you in regular contact with relatives and friends ?

Please tick one box only.

YES ☐ NO ☐

Do you belong to an ethnic minority group ?

Please tick one box only.

YES ☐ NO ☐

IF YES, which ethnic group ? _____

How old are you ? _____

At what age did you leave full-time education ?

_____

What is the highest educational qualification that you have obtained ?

_____

What was your final work category before retiring ?

_____

In terms of living accommodation, do you :

Please tick one box only.

Own your own house/ flat/bungalow ? ☐

Rent from a private landlord ? ☐

Rent from the local council ? ☐

OTHER (please specify) _____

Have you attended a Look After Yourself/Heart (LAY/H) course ?

Please tick one box only.

YES ☐ NO ☐

You have now completed the questionnaire

PLEASE :
Read through the questionnaire, and check that you have answered all the questions.

AND THEN PLEASE :
Put the questionnaire in the stamped addressed envelope and return it to us, as soon as possible.

THANK YOU VERY MUCH FOR YOUR TIME AND CO-OPERATION.

If you would like to receive a final report on the survey, please tick the box below : ☐

☐

APPENDIX D

EXERCISE ACTIVITY MONITORING DIARY SHEET.

Date and time of day	Exercise done	Time spent on activity	How hard you worked (1-10)*	Comments

* 1 = not at all strenuous; 5 = moderately strenuous; 10 = exercising extremely hard

APPENDIX E

Table E1 Correlations (Pearsons r) between significant predictors of domestic activity.

	Domestic activity	Age	Beliefs	NHP mobility	NHP energy	NHP pain
Age	-.19	1.0	-.10	.16	.07	.12
Beliefs	.11	-.10	1.0	-.03	-.03	-.00
Mobility	-.29	.16	-.03	1.0	.62	.71
Energy	-.23	.07	-.03	.62	1.0	.48
Pain	-.12	.00	-.00	.71	.48	1.0

Table E2 Correlations (Pearsons r) between significant predictors of sporting activity.

	Sport	Age	Attitudes	NHP mobility	Exercise experience
Sport	1.0	-.22	-.36	-.28	.17
Age	-.22	1.0	.22	.16	.06
Attitudes	-.36	.22	1.0	.30	-.14
Mobility	-.28	.16	.30	1.0	.07
Experience	.17	.06	-.14	.07	1.0