Resistance Training and the Elderly: An Investigation into Psychological Wellbeing and Life Satisfaction

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ABSTRACT

This exploratory study examined the psychological benefits of high-intensity resistance training in an elderly age group. Participants in the sample (N=76) aged between 70-80, were randomly allocated to two groups (37 exercisers- 18 female and 19 male; 39 controls- 20 female and 19 male). Both groups completed five self-report questionnaires measuring psychological variables. The Purpose in Life Test (PIL), Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), Affectometer 2, Rosenbergs Self-Esteem Scale (RSES) and a Dynamometer hand-grip strength test were administered pre-test, mid-test and post-test .The independent variable in this study was a 12 week high-intensity resistance training programme especially designed for this age group and supervised by qualified instructors at a commercial gymnasium. Repeated measures ANOVA produced results that indicated a high intensity resistance training programme provided strength gains, and improved some aspects of psychological wellbeing and life satisfaction components in older adults. There are positive indications from this study that this format of planned exercise can assist in the promotion of life quality enabling adaptation to changing situations often accompanying increasing age.

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CHAPTER ONE: Introduction

A. Rationale

The population of New Zealand is aging and currently its most distinguishing characteristic is the growing size of the elderly population and its expanding proportion of the total population. Between 1901 and 1951, the number of New Zealanders aged 65 years and over increased almost six-fold from 31,000 to 177,000. Over the next 48 years it increased by 151% to reach 446,000 in year 1999 (Statistics New Zealand, 2000). Latest projections indicate that the population aged 61 years and over is expected to grow by approximately 100,000 during the current decade to reach an estimated 552,000 in 2011. By 2051, there will be over 1.14 million aged 65 years and over living in New Zealand. This projected 166% increase over the 1996 (base) population means that by 2051, one in four New Zealanders will be over the age of 65 (Statistics New Zealand, 2000).

The likelihood of incurring a disability or age related health problem increases with advancing age with 14% of women aged between 15-44 and 12% of men aged 15-44 reported a disability, in the 75 plus age group the proportion of those with a disability or age related health problem increased to 69% for women and 64% for men, with a disproportionate reliance on support agencies and health services. Disability support services (DSS) expenditure in 2001/2002 was around $1300 million, with an estimated 69% of the total funding going to individuals aged 65 and over (Ministry of Health, 2002).

Despite evidence for improved health status and falling rates of disability it appears that this will not be sufficient to offset pressures on health and disability services from the increase in numbers of disabled elderly. A study generating baseline rates of disability showed that all scenarios for change in mortality and morbidity indicated dramatic rises in the numbers of disabled older people (Kunkel and Applebaum, 1992). Thus interventions in the form of planned exercise and activity become an important component in delaying physiological and psychological declines.

The World Health Organisation (2002) summarised an international consensus on health system policies in response to global population aging. Aging population patterns in New Zealand are not removed from international trends. Firstly, the World Health Organisation (2002) advocates the prevention and reduction of excess disability and premature mortality. Secondly, the reduction of risk factors associated with major diseases and increases in factors that protect health throughout the life course. Thirdly, the development of affordable, accessible, high quality and age-friendly health and social services that addresses the needs and rights of men and women as they age.

Older adults become increasingly less able to perform functional tasks necessary to living independently as a result of frailty, decreased mobility, poor balance, a lack of confidence from past falls or the possibility of future falls, and decreased psychological health. (Ballinger and Payne (2002). Health professionals increasingly emphasise the role of physical exercise in the general health of young to middle aged adults. For these age groups, health goals focus on the prevention of chronic disease and increased life

expectancy. For older adults the goals are different. Participation in resistance weight training, aerobic and flexibility exercises with the goals of reducing functional impairment and psychological decreases that accompany elderly life are of primary importance (Cronin, 2001). Psychological benefits from exercise have received less attention from researchers than physiological benefits (Cronin, 2001).

The concept of wellbeing has become increasingly important as a measure of the quality of life. Kammann and Flett (1983) have suggested that quality of life is underpinned by life satisfaction and life enjoyment with little dependency on availability of social and medical services, economic status or health. At its most basic level, quality of life can be defined as the sum of experiences that arise from living them, sometimes referred to as "satisfaction with life as a whole", or "global sense of wellbeing" (Andrews and Witney, 1976). The use of exercise to increase the wellbeing and life satisfaction on the general psychological health of older adults has been fleetingly researched.

Previous studies have explored the physiological benefits of physical activity for the elderly with brief reference to any psychological benefits (Brown, 1992; Lee, 1991). Most would agree that some form of exercise is beneficial in that physical activity manifests in improved daily functioning, with improved muscle tone and endurance, better balance and more confidence to not only maintain daily living tasks, but to attempt new ones. Most researchers agree that strategies to maintain or improve the health and independence of the elderly is a priority, both for improving quality of life in effective

daily functioning and to reduce the burden and independence on public health systems (McPherson, 1994; Buchner, 1997).

Do physiological improvements necessarily manifest in psychological improvements? Past studies incorporating both physiological and psychological measures have presented evidence that is less than convincing. For example, Singh, Clement and Fiatarone (1997), found the neuropsychological effects of resistance training in an elderly group resulted in improved psychological wellbeing by a reduction in the depressive symptoms, improved sleep quality and assisted in the prevention of cognitive impairment. Yet other research (Brown, 1992; Emery and Blumenthal, 1991) found that physical activity did not change life satisfaction and psychological wellbeing in elderly groups.

The evidence is therefore mixed, thus a primary objective of this study was to ascertain the effect of a twelve week high intensity resistance training programme on the psychological wellbeing and life satisfaction determinants in individuals aged 70-80 as well as strength gains.

B. Definition of Terms

1. Psychological Wellbeing: a subjective term used in this study for the 70-80 year age group to mean contentment, satisfaction with all elements of life, self-actualisation (feeling of having achieved something with one's life), peace and very importantly, happiness. In this study, psychological wellbeing was measured using the following test

instruments. Profile of Mood States (POMS), Purpose in Life Test (PIL), State-Trait Anxiety Inventory, (STAI). Rosenbergs Self-Esteem Scale (RSE).

2. Life Satisfaction: In this study, a subjective open measure of human welfare. For the elderly, factors that influence life satisfaction are personality, and components such as optimism, extroversion, self-esteem and gender. Self reported health has a strong association with life satisfaction (Donovan & Halpern, 2002). For this study, life satisfaction is measured with the Affectometer 2 (Kammann and Flett, 1983).

3. Progressive Resistance Training: For this project, a programme specially designed for the 70 to 80 year old age group, divided into exercises using weight machines and dumbbells for the upper body, abdominals and lower body. The resistance of the exercises was systematically increased on the machines and free weights as the training programme progressed. A baseline for each participant was established when each individual could comfortably complete the number of sets and the number of repetitions per exercise set out in the training schedule

CHAPTER TWO: Literature review

A. Introduction

This review summarises the previous research appropriate to the psychological benefits of physical activity in an elderly population. Research on the physiological benefits relating to psychological function is included as it cannot be divorced from the psychology of wellbeing and life satisfaction in the context of this study.

Life expectancy measures calculate the average number of years a person can expect to live from a stated age (65-74 young-old; 75-84 old-old; 85+ oldest-old, Ostir & Uchida, 2000), assuming specific mortality levels remain constant. They do not take account of the quality of life during those years. An indicator of the quality of life associated with increasing longevity is independent life expectancy, which measures the average number of years that will be free from disability requiring assistance (Ministry of Health 2002). Reducing the impact of diseases and conditions that affect functional ability has become an important objective for geriatric wellness (Wood, Reyes-Alvarez, Maraj, Metoyer, and Welsch, 1999).

Higher levels of physical activity have been connected with reductions in the progression of dependency, psychological declines, disability severity levels and in the slowing of existing disabilities (Hirvensalo, Rantenan & Heikkinen, 2000). The aging process is associated with decreases in muscle strength, power and flexibility. Strength is estimated to decrease by 20 to 40% between ages 20 to 70 years (Akima, Kano, Enomoto, Ishizu,

Okada & Oishi, 2001). This process can be slowed with resistance training. High intensity, short term resistance training has been shown to increase one repetition maximum knee extension strength up to 227% in elderly mean and women (Fiatarone, Marks, Ryan, Meredith, Lipsitz & Evans, 1990).

However, increases in the incidence of cardiovascular disease, cancer and osteoporosis have not motivated most elderly to undertake some form of physical activity, despite the well documented effects of inactivity. Even a minimum of regular planned exercise has been associated with positive physical and psychological health, demonstrating a decrease in all-cause mortality and morbidity in elderly samples (Blair, Kohl, Barlow, Paffenbarger, Gibbons & Macera, 1995).

Increasing life expectancy means that quality of life and perceived health in older people becomes increasingly important. The concept of health as incorporating physical, mental and social wellbeing, not just an absence of disease or infirmity is particularly important to older people (Byles, 1999). One of the issues raised by increased longevity is that of net gain in active functional years versus total years of disability and dysfunction (Arent, Landers & Etnier, 2000). Of all age groups, the elderly have the most to gain by being active as the effects of physical activity on fitness, ability to perform personal care activities and the management of age related maladies such as arthritis all impact on the quality of life and general wellbeing. Blumenthal, Williams, Needels and Wallace (1982) found a positive relationship between exercise participation and wellbeing and mood. Other research (Dishman & Sallis, 1994) illustrated that social and psychological benefits

become important, not only for their own merit, but also because individuals will continue to participate in any physical activity that they enjoy. The net result is improved purpose or quality of life. Donovan, Halpern and Sargeant (2002) state that self-reported health has one of the strongest associations with life satisfaction.

B. Effects of Exercise on Physiological Functioning

Reviews of the literature examining the effects of exercise for older adults has illuminated instances in the past where it was thought that vigorous physical activity for older adults was not appropriate (Ebrahim & Williams 1992). This has been based on low expectations of benefit and fears of exercise related injury specifically orthopaedic injury and heart attack. More recent research however, has shown only positive benefits. For example, Stock, Requa & Garrick (2001) report that there is no other group in our society that can benefit more from regularly performed exercise than the elderly. Higher levels of physical activity and physical function have been related to the postponement of dependency, disability severity and aided in the rehabilitation of those already mobility impaired (Hirvensalo, Rantenan & Heikkenan, 2000; Rantenan, Guralnik, Foley, Masaki, Levielle, Curb & White, 1999; Vita, Terry, Hubert & Fries, 1998). Other research has suggested that exercise goals appropriate to younger adults are substituted in older age groups to encompass minimising biological changes of ageing (Fiatarone & Evans, 1993), offset disuse syndrome conditions (Bortz, 1982), contributing to control of chronic diseases (Evans, Hughes, Ferrara, Fielding, Fiatarone, Fisher & Elahi, 1991), and maximising psychological health (Singh, Clements, & Fiatarone, 1997). Other research (Edward & Larson, 1992) has provided evidence of reduced body fat levels, increases in

bone density, and lower rates of heart disease, hypertension and cancer in elderly who maintain regular exercise regimes. The American College of Sports Medicine researchers Mazzeo, Cavanagh, Evans, Fiatarone, Hagberg, McAuley & Startzell, (1998) have suggested that regular activity for older adults is associated with the maintenance and improvement of cardiovascular function, a reduction in risk factors for several diseases, increased life expectancy, improved bone and muscle strength and a reduced risk of falling. Furthermore, Boutcher (2000) concluded that fitter older adults have better cognitive function than less fit counterparts and that there may be improvements in cognitive function as a result of increasing fitness. In terms of public health, the benefits of increasing activity levels and maintaining functional abilities are enormous (Mazzeo et al, 1998). Cassell (2002) suggested that activity, including physical activity, may be the "best treatment" for ageing.

The overall picture for exercise with the elderly is encouraging and clearly points to a form of prevention that can be the first step toward a lifetime of increased physical activity and a realistic strategy for maintaining functional status and independence.

C. Balance, Flexibility and Falls

Falls are an extremely common problem in the elderly with many extrinsic and intrinsic contributing factors (Woolley, Czaja, & Drury, 1997; Lord & Ward, 1994; Smidt, 1990; Wickham, Cooper, Margetts & Barker, 1989). A deterioration of balance, decreases in flexibility that occur naturally with age, loss of muscle tissue and a liability to postural hypertension all contribute to an increased risk of falls (Shephard, 1987). The central

nervous system which is involved in maintaining balance and gait stability can be undermined by a host of disease and age related changes (Rigler, 1999). In the peripheral nervous system, changes may occur in sight and hearing. Musculoskeletal abnormalities associated with falling include muscle weakness, loss of coordination, degenerative bone and soft tissue around weight bearing joints. Cardiovascular considerations include peripheral vascular disease, oedema and congestive heart failure.

A strategy commonly adopted by elderly in fear of falls is a self imposed restriction in physical activity (Bruce, Devine & Prince, 2002). A reduction in levels of physical activity through fear of falling can often lead to accelerated declines in physiological and psychological function, in turn leading to increased disability, loss of social contacts and diminished self confidence (Miller, Rejeski & Reboussin, 2000). In response to the perceived problems of falling in older age, falls have featured regularly in health policy and research programmes. A consistent theme of the reviews in this emerging field is the neglect of psychological and social factors in the aetiology of falls (Askam, Glucksman, Owens, Swift, Tinker & Yu, 1990). Thus, given the importance of exercise in the prevention of falls and secondary disabling conditions among older adults, it is vital that exercise becomes part of a daily treatment strategy (Tinetti, Doucette & Claus, 1995).

Studies utilising low to moderate intensity training have shown a reduction in the number of falls in combination with balance training (Campbell, Crim, Young & Evans, 1994; Province, Hodley, Hombrook, Lipsitz, Miller, Mulrow, Ory, Sattin, Tinetti & Wolf,

1995). Similarly, positive effect has been shown with aerobic training in conjunction with moderate to high resistance weight training programmes (Buchner & Wagner, 1997).

Falls related to emotional status investigated in a study of Hauer, Rost, Rutsche, Optiz, Specht, Bartsh, Oster & Schlierf (2001), reported physical activity before hospital admission correlated highly with fall-related emotional variables such as fear of falling, and fall-related emotional restrictions. Training interventions significantly improved these fall-related variables, although the overall emotional status of the participants as measured by the Geriatric Depression Scale and the Philadelphia Geriatric Centre Morale Scale was not influenced by the exercise intervention. Nevertheless, the Hauer et al (2001) study did demonstrate that combined progressive high resistance training and progressive functional training improved strength, balance and functional performance without increasing the risk of training related adverse clinical events in frail geriatric patients with a history of injurious falls (mean age 82). These changes were accompanied by an improvement in subjective awareness and fewer fall related emotional and behavioural restrictions. Previous studies of falls in the elderly (McAuley, Miahlko & Rosengren, 1997) have confirmed that a strong sense of mastery or self efficacy induce psychological improvements. Falls are implicated in an increasing number of hip fractures, currently one of the most serious health care problems facing aging populations (Marks, Allegrante, MacKenzie & Lane, 2003). These researchers reported a proportion of hip-fractured elderly (approximately 20%), particularly men and those older than 75 years, die within the first 3-6 months of their injury.

Data reveals that the most likely causes of hip fractures are the impact of falls and muscle weakness, along with low physical activity levels (Marks et al, 2003). Furthermore, Farmer, Harris, Madans, Wallace, Contoni-Huntly & White (1989) found the risk of hip fracture was negatively associated with low arm muscle area, suggesting that having a low arm muscle mass might slow normal reflexive protection mechanisms, such as extension of the forearm, thereby reducing the effectiveness of inherent protective strategies again bone fractures when falling. Similarly, Cummings and Nevitt (1989) have argued that the effectiveness of protective responses which depend on arm strength, and decreases with age along with hip strength, may heighten the risk of fracturing a hip when falling.

Further research (Robbins, Rubenstein, Josephson, Schulman, Osterwell & Fine, 1989) has reported increased risk of falling associated with hip weakness, poor grip strength (Cooper, Campion & Melton, 1992), neuromuscular impairment (Slemenda, 1997), poor ankle, lower body and knee extensor strength (Lord, Ward, Williams & Anstey, 1994) and the inability to rise from a chair without using one's arms (Cummings & Nevitt, 1989). The fear falling alone may lead to the limitation of activities, isolation, depression and a cycle of increasing deconditioning weakness (Rigler, 1995). Concerns about falling in older age may be largely addressed by a physical activity programme that accents on developing muscle strength and increasing bone density (Stock et al, 2001) to counteract the inevitability of balance and fall accidents.

D. Effect of Exercise on Psychological Functioning

Despite numerous reviews that consider physiological improvements in the elderly, there are few that explore the psychological effects of exercise in this age group. Reifschneider (1998) concluded that reviews have been cited in reference to psychological benefits of physical activity but most are generalised to all age groups, not specific to an elderly age cohort. For the purpose of this review, research on cognitive function, depression, anxiety and well being will be presented.

Depression is the most common complaint in older adults (Gatz, Smyer & Lawton, 1980). The combination effects of loneliness, loss of a spouse, and age related health problems may all be precursors for a depressive episode. The elderly are particularly vulnerable to depressive grief reactions as they suffer more frequent losses than those at other periods of their life cycle. Diminished physical health, loss of spouse and friends, reduced financial, social and employment status may manifest in despondent mood, social withdrawal, loss of interest in usual activities, weight loss or gain and a state of hopelessness (Blazer, Burchett, Service & George, 1991), all point to a gloomy picture of aging that without practical intervention may result in depression and other negative psychological symptoms.

Research supporting the anti-depressant effect of exercise (North, McCullagh & Tran, 1990) has reported that using physical activity to treat or control depression is based on a more favourable risk/benefit ratio compared to pharmacological therapies and the cost of current psychotherapies. Although aerobic exercise has been used in the majority of

studies examining depression and exercise, Singh, Clements & Fiatarone (1997) utilised a resistance training programme in a randomised controlled trials of depressed elderly over the age of 60. The study revealed low to moderate walking was not better than attention control (30% reduction in depressive symptoms), but both high intensity progressive resistance training and moderate to light jogging showed to be equipotent to pharmacological therapies (60-70% effective in treatment of depression). Low intensity progressive resistance training was no more effective that a referral to a general medical practitioner (30% improvement). It would appear that the use of a resistance training programme can reduce depressive symptoms.

Intensity of training in a progressive resistance programme appears to be a moderator between effectiveness in relieving depression or depressive symptoms and minimal change (Singh et al 1997). This may be based on the physiological gains through exercise and subsequent psychological improvement. Interestingly, in Singh et al's (1997) study, the anti-depressant effect was maintained and actually increased when the resistance training programme changed from fully supervised to an unsupervised setting. Further research (McNeil, Le Blanc & Joyner, 1991), on exercise depression and the elderly, found experimenter-accompanied exercise and social contact were both equally effective in reducing both total depression and psychological symptoms against a control group and no exercise. This study determined that accompanied exercise reduces a broader range of depressive symptoms compared with just social contact alone. The implications of this are that those elderly engaged in physical activity will be generally less depressed than

those who are inactive. North et al (1990) concluded that exercise can help decrease depression, even in those who are not initially depressed.

Those elderly who repeatedly engaged in low levels of physical activity reported more depressive symptoms than those reporting high activity levels (Moore, Babyak, Wood, Napolitano, Khatri, Craighead, Hernan, Krishnan & Blumenthal, 1999). These researchers concluded that regular physical activity is associated with fewer depressive symptoms in those diagnosed with a major depressive disorder, and that enhanced physical activity may provide an effective method for the maintenance of functional ability and promote an enhanced sense of wellbeing for elderly age groups. In conclusion, exercise as a treatment for depression may have a number of benefits. A resistance training programme or other exercise is relatively inexpensive, can be utilised by large numbers of the general population, and will have less negative side effects than pharmacological solutions.

The degeneration of cognitive abilities is a major factor in physiological and psychological dependency in old age (Buchner & Wagner, 1992). Most studies researching a connection between cognitive function and self reported quality of life have involved dementia populations or those with a cardiovascular history. Spirduso (1993) reported that even in the absence of disease, age remains associated with decreases in cognitive performance. Available data, although not comprehensive, suggests that cognitive performance is related to perceived wellbeing in the general population of older adults (Duke University, 1978).

There is no concrete evidence that resistance training or any other form of exercise can prevent or even slow the onset of dementia. Small changes in attention span, mood and activity levels have come from elderly samples with dementia engaging in aerobic exercise (Friedman & Tappen, 1991; Molloy, Delaquerriere, Richardson & Crilly, 1988). Two reviews (Folkins & Sime, 1981; Hughes, 1984) assessing studies of institutionalised elderly (aged 60 and over) with psychiatric problems demonstrated that exercise improves cognitive performance. However, a third review (Morgan, 1989) found that there were no improvements in the cognitive ability of the sample after 12 weeks of light exercise. The minimal effect of exercise on dementia should not discourage sufferers. It is obvious that more research in this area needs to be conducted as the data is clearly conflicting.

Difficulty in sleeping is a common complaint amongst the elderly. Insomnia has been associated with an increased risk of accidents and falls (Vellas & Morley, 1994). A study using a clinically depressed elderly sample demonstrated that a resistance training programme significantly improved sleep quality over 10 weeks compared with a control group (Singh, Clements & Fiatarone, 1997). Another study, (King, Orren, Brassington, Bliwise & Haskell, 1997) used an elderly group free of clinically diagnosable sleep disorders and psychiatric condition. With a programme of aerobic exercise for 16 weeks, sleep quality, total sleep time and sleep onset were significantly improved. There are currently no direct comparisons between the two forms of exercise, aerobics and resistance training to determine the most effective.

The effects of exercise on anxiety have been researched with varying results. Schlicht (1994) conducted a meta-analysis on the effects of exercise on anxiety in 22 independent samples containing over 1300 participants. The exercise programmes utilised running, swimming, strength training and callisthenics. Schlicht found that the exercise interventions did not significantly reduce anxiety. Psychological outcomes may be more significant for those suffering specific physiological disorders. Elderly with chronic obstructive pulmonary disease (COPD) require specialised and carefully administered exercise programmes. Several past studies have found that exercise is associated with enhanced psychological functioning, particularly in decreased negative mood and anxiety states. It must be added that other studies have shown few psychological benefits in exercise for COPD patients (Emery, Schein, Hauck & McIntyre, 1998).

Psychological wellbeing is a vital component of the multidimensional concept, quality of life. Lawton (1991) suggests this contains four main concepts, objective environment, behavioural competence (health), perceived quality of life, and psychological wellbeing. Research indicates that participation in regular exercise promotes emotional and psychological health (Folkins & Sime, 1981), although Sward (1998) suggests that there is no adequate explanation for the process culminating in positive changes consequent to regular exercise activity. Sarvimaki & Stenbock-Hutt (2000) advocate that quality of life encompasses a sense of wellbeing, a meaning to life, and a value or self worth, with wellbeing incorporating pleasure, joy and satisfaction, where opposites are different forms of pain, suffering and dissatisfaction. Gabriel & Bowling (2004) propose that the established models of quality of life are rarely multidimensional in structure. They range

from basic, objective and subjective needs based approaches, often derived from Maslow's (1954) hierarchy of human needs, to classic models based on psychological wellbeing, happiness, morale and life satisfaction (Andrews, 1986), physical health and functioning (Bowling 2001), social expectations, and the individual's unique perceptions. Although there are numerous interpretations, for practical purposes, psychological wellbeing can be viewed as meaning in life (Zika & Chamberlain, 1987) coupled with, and equally important, being happy (Kammann & Flett, 1983).

It has been suggested (Staudinger, Freund, Linden & Maas, 1999) that the regulation of subjective wellbeing can occur through psychological resources that promote adaptation to adverse situations. Examples include Locus of Control (Rotter, 1966), a belief as to whether an individual feels their life is controlled by external factors or internally through their own behaviour; Self-Esteem (Rosenberg, 1965), a sense of worth, confidence or self-respect; Self-Efficacy (Bandura, 1977), the extent to which a person perceives they can succeed at what they want to do. Baltes, (1993) suggested that the regulatory processes influencing subjective wellbeing may compensate for age related losses as elderly individuals face increasing physiological and psychological declines, particularly diminishing interest in life, or more specifically, a purpose in life.

Purpose in Life

Meaning in life has been recognised as an essential factor in maintaining personal wellbeing. Frankl (1959) suggested that the search for a meaning in life is an important motive for every human being and that the primary force driving all human beings is the

desire to find meaning. Failure to find meaning or purpose in life results in an "existential vacuum" (Crumbaugh and Maholick,1981). If not attended to, this may lead to adverse psychological outcomes. Frankl (1959) proposed that purpose in life is specific to an individual and is sourced from the circumstances of that individual's immediate life. The individual, the life experiences and environmental challenges leading to an exisistental vacuum (no meaning) on towards purpose in life (meaning).

The search for meaning in life has proved to be especially significant in older age (Reker, Peacock & Wong, 1987). Among elderly persons, there is considerable evidence of the health benefits of physical activity, but the evidence regarding its psychological effects is inconsistent. Largely, the inconsistencies stem from methodological differences, in particular the way in which the constructs of wellbeing, life satisfaction and/or quality of life are measured. Windle & Woods (2004) proposed that any variations in well-being were associated with housing difficulties, isolation, loneliness, physical functioning, pain, support networks and mental status. An existentialist viewpoint suggests that many of life's events are out of our control, and wellbeing is derived from how well one faces up to and deals with such situations (Sixsmith, 1993). In that sense, positive wellbeing may occur when an individual has the personal resolve to feel in control and adapt their behaviour accordingly.

Kaplan & Bush (1982), in a quite difference approach, introduced the term Health Related Quality of Life (HRQL) to project quality of life aspects that are directly influenced by health status, and not by other quality of life issues seen as ancillary (living

environment, economic status). Wenger & Furberg (1990) suggested that the HRQL is necessarily those attributes valued by individuals, including resultant comfort or sense of wellbeing; the extent to which they are able to maintain reasonable physical, emotional and intellectual function, and the degree to which they are able to retain their ability to participate in valued activities with family, workplace and in the community, and therefore closely aligns itself with the directedness, life meaning, aims and objectives necessary to obtain or maintain a purpose in life (Ryff & Keyes, 1995).

For elderly responding to a qualitative study by Gabriel and Bowling (2004), the main quality of life themes that emerged were; having good social relationships, help and support, living at home, feeling safe, access to local facilities, engaging in hobbies and leisure activities, retaining a role in society, having a positive psychological outlook, and acceptance of circumstances that cannot be changed, good health and mobility, participation in society, retention of independence and control over life.

Grimby, Grimby, Frondin & Wiklund, (1992) studied the effects of physical activity on several aspects of psychological wellbeing in elderly persons. This study revealed that those who exercised more often had more positive emotional reactions to items like "I feel that life is not worth living". Wankel, (1997) suggested the psychological mechanisms that may explain how physical activity influences psychological wellbeing include opportunity for social contacts during activity, enhanced feelings of competence and self-mastery, and distraction from everyday stressors.

Heisel, (2005) found that the perception of purpose in life is positively associated with life satisfaction and psychological wellbeing. The search for purpose in life has proven to be particularly significant for the elderly (Reker, Peacock & Wong, 1987) and finding a purpose in life has also proved to be a predictor of physical wellbeing (Wood et al, 1999). Achieving a purpose in life through exercise has been demonstrated by McAuley & Rudolph, (1995) who found a positive relationship between physical activities and a meaning or purpose in life.

A review by Brown (1992) found that exercise did not change life satisfaction in elderly groups, although Brown does suggest that the exercise programmes were not of sufficient length to bring about changes in psychological wellbeing. There is no detail provided on the length of the programmes. Emery and Blumenthal (1991), in their review of seven studies investigating the effects of exercise on the psychological wellbeing in older adults, found similar results. Although their review contained two studies of institutionalised older patients with psychological disorders, the results concluded that exercise did reduce anxiety and depression (Clark, Wade, Massey & Van Dyke, 1975). The five other studies utilised samples from the general population and of those studies, two found that exercise reduced anxiety, the remaining three found no significant difference between anxiety levels of the exercise group and the control (Emery & Gatz, 1990; Blumenthal, Emery, Madden, George, Coleman, Riddle, McKee, Reasoner & Williams, 1989; Stacey, Kozma & Stones, 1985; Dustman, Ruhling, Rusell, Shearer, Bonekat, Shigeoka, Wood and Bradford, 1984; Perri & Templar, 1984). Reductions in physical health and functioning and most health problems have been linked to poor and

worsening levels of life satisfaction (Bowling, Farquhar, Grundy & Fornby, 1993). Windle & Woods (2004) reported that both of their health measures (Short Form 35 Questionnaire and the Environmental Mastery Scale) correlated positively with life satisfaction, an expected finding given that the most salient life domain for older people is health and maintenance of mobility (Wenger, Burholt & Scott, 2001). Lee (1991) in a review of four studies examining the effects of exercise on older adult women noted that participants often reported notions of enhanced wellbeing, but variations in research design, exercise programming and outcome measures made any conclusions difficult. Several factors may have influenced the outcomes of these reviews. For example, older participating adults who were healthy and active, and whose initial levels of anxiety and depression were low and life satisfaction was high, may present the study with confound effects, making the detection of psychological improvements difficult. This is supported by Neugarten & Neugarten (1989) who reported healthy elderly self-reported high levels of satisfaction with life; hence it is not always clear that exercise would have a pronounced affect. Definitive conclusions are allusive.

Chin, Paw, deJong, Schouten, van Stavenen & Kok (2002) examined the affects of 17 weeks of physical exercise and micronutrient supplementation on the psychological wellbeing of 139 dependently living participants. They concluded that psychological wellbeing in frail elderly was not responsive to 17 weeks of intervention, although they suggested that changes in wellbeing may occur after longer term intervention.

Ranzijn (2002) reports that while psychological research in the past has focused on decline and depression, there is now an increasing emphasis on successful ageing and on the characteristics of elderly who age well. Measuring the psychological characteristics that maintain wellbeing in the elderly now becomes very important because the identification of the psychological characteristics may provide direction for preventative intervention, and an insight into those characteristics that allow some elderly to age both positively and successfully (Synder & Lopez, 2002).

Having a sense of meaning or purpose in life promotes subjective health, and the results of intensive research on the effect of physical activity and human well-being are both positive and promising (Takkinen et al, 2001). This study does not attempt to differentiate between the terms quality, meaning and purpose in life as they all possess the same core values; a sense of well being and self-worth (Sarvimaki & Stenbock-Hult, 2000), pursuit and attainment of worthwhile goals (Reker & Wong, 1988), and a sense of directedness (Ryff, 1989). Significantly, purpose in life in elderly groups has been positively related to self-rated health and functioning both directly and indirectly (Takkinen et al, 2001), as a consequence of engaging in physical activity.

E. Progressive Resistance Training and the Elderly

The use of progressive resistance training as an exercise form in elderly groups is not widely utilised. It was once thought vigorous physical activity was not appropriate for older adults (Singh, 2001). The risk of orthopaedic injury and heart attack were the primary concerns. Recent research has demonstrated that the elderly can benefit from

planned exercise (Cavani et al, 2002). Muscle strength declines after age 70 can be as much as 30% (Nied & Franklin, 2002) principally from sarcopenia (loss of muscle mass). Since muscle weakness is a primary deficit in many older individuals strength training may stimulate more general activity enhancing well-being, a point not to be underestimated as many believe that muscle weakness can be attributed primarily to inactivity rather than old age per se (Fiatarone & Evans, 1993; Meredith, Frontera, O'Reilly, & Evans, 1992). In Swards (2001) study on the effects of resistance training in elderly groups, improvements found in physical self perception and quality of life were disproportionately greater than improvements in muscular strength and functional fitness. Thus, resistance training can provide physical improvements which quickly manifest in improved quality of life and psychological wellbeing. In a study to determine short and long term effects of progressive resistance training and muscle strength, psychological wellbeing, control-beliefs, cognitive speed and memory in active elderly adults, Perrig-Chiello, Perrig, Ehrsam, Staehelin & Krings (1998) reported a significant increase in the maximum dynamic strength of the training group. This training effect was associated with significant decreases in self attentiveness, know to enhance psychological wellbeing. Strength is intrinsic to daily function in the elderly and only strength training can stop or reverse sarcopenia (Singh, 2001).

Numerous considerations must be addressed when designing and executing an exercise programme with elderly groups. These may include decreased physical capabilities, maintaining training regimes and administrative challenges such as ethical and liability issues, knowledge, and general competence of those conducting the training sessions

(Spirduso & Cronin, 2001). Singh (2001) suggest it would be sensible to screen for muscle strength deficits and balance, offer a combined programme of balance training and resistance training, include hip and knee extensions, hip abductors and dorsiflexors in the exercise programme, attempt to substitute exercise for medication and compensate for other remediable factors such as visual impairment and hearing loss concurrently. Taking these considerations into account the benefits of weight training are considerable. Singh (2001) stated that appropriate progressive resistance training programmes lasting 3-12 months have shown to increase muscle strength by an average of 40-150% depending on the individual's body characteristics. Fiatarone & Evans, (1993) suggested that substantial increases in muscle mass are only achievable with progressive resistance training and could have a role in the prevention of diabetes, functional dependency and falls.

The current American College of Sports Medicine position on exercise training for the elderly recommends resistance training 2-3 days a week, performed at an intensity level of 10-15 repetitions, and that exercises include all muscle groups (ACSM, 1998).Pyka, Lindenberger, Charette & Marcus (1994) reported that resistance training results in significant muscle hypertrophy and improvements in muscle strength among older adults and the adaptation can continue over several months with sufficient training stimulus. Progressive resistance training and progressive functional training are safe and effective methods of increasing strength and functional performance. They are effective methods of increasing strength and functional performance. They are effective in reducing fall-related behavioural and emotional restrictions in frail, high risk geriatric patients with a history of injurious falls (Hoenig, Nusbaum & Brummel-Smith, 1997). Strength training

may increase balance by strengthening the muscle involved in walking. La Croix, Leveille & Hecht (1996) found that ankle weakness has been demonstrated to be associated with increased risk of falling; this research is commensurate with that of Vandervoort & McComas (1996) who suggested that age-related losses occur sooner and at a faster rate in the lower extremities than the upper extremities.

In conclusion, recent research has indicated that high intensity resistance training provides a host of beneficial outcomes for the elderly. The existing literature suggests extensive physiological benefits. The postponement of dependency, augmentation of functional performance, aiding in rehabilitation, falls prevention through improved muscular strength and improved balance can emerge from planned resistance training. The psychological benefits are not as conclusive, although previous research has shown improvements in depressive symptoms, sleep quality, anxiety and purpose in life through exercise. Having a purpose in life has been recognised as a vital factor in maintaining personal well-being when in older age and although the literature presents different interpretations, purpose in life is essentially self-worth, having goals and a sense of directedness. There is also evidence that resistance training interventions are a cost effective method of assisting in the slowing of psychological decline in the elderly.

In embracing a realistic strategy for the maintenance of functional status and independence, there is no other group in our society that can benefit more from regularly performed exercise than the elderly. This group can profit more benefit from strength training than other age groups. Increased muscle strength through regular training can provide opportunities for a life time of physical activity and functional independence.

CHAPTER THREE: Methodology

A. Participants

The participants used in this study were 76 men (n=39) and women (n=37), aged between 70 and 80 who volunteered to take part in this project. Before the start of the project, all participants were visited and the research procedures and requirements explained in detail. Written consent was obtained to participate in this study. The research protocol and ethical considerations were assessed and approved by the Massey University Human Ethics Committee (MUHEC) and by the Health and Disabilities Human Ethics Committee (HDEC, Auckland Region).

Participants were included in the study if they were aged between 70 and 80, consented to random selection into one of two groups (gym group and control), passed the medical check at the Kerikeri Medical Centre and KeriMed, be available to train three days a week (Monday, Wednesday and Friday), were able to read, understand and complete the five test questionnaires, agree to the terms of the consent forms, and have a thorough understanding of the information sheet. Participants with chronic health conditions (unmedicated cardiovascular, metabolic or orthopaedic conditions) that may have compromised the safety of the training protocol were excluded.

B. Experimental Design

This study utilised a pre-test, mid-test and post-test experimental and control group design. The experimental design examined the effect of a high intensity resistance

training programme on the psychological wellbeing and life satisfaction determinants in the elderly. The resistance training programme was twelve weeks in length. A hand grip strength test was also conducted on all participants, pre-test, mid-test and post-test to assess muscular strength.

Psychological measures used were the Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), Purpose in Life Test (PIL), Rosenberg's Self-Esteem Scale (RSE), and the Affectometer 2. Assessment of psychological wellbeing took place immediately prior to the start of the training programme, halfway through (at 6 weeks) the training programme, and immediately following the conclusion of the programme (at 12 weeks).

C. Protocol / Measures

Descriptive information regarding age, gender, blood pressure and resting heart rate was obtained for each participant.

The independent variable for this study was a 12 week progressive resistance training programme. The programme was used for each training session and consisted of a warm-up, resistance training exercises, a warm down and stretches (see Appendix C). The resistance training programme was standardised for all participants in the intervention group. The initial intensity (weight lifted) of the programme was determined when the participant could comfortably complete the required repetitions for each of the sets exercising the upper body, abdominals and lower body. As strength increased the weight

lifted was increased incrementally to a comfortable level. For example, Mrs.S gradually increased the weight on the leg press machine from week 5 (22kg) to week 7 (27kg) to week 10 (35kg).

Psychological Wellbeing

Psychological wellbeing is a component of "quality of life", and one of several variables that contribute to an individual's overall sense of wellbeing (Palmer, 2004). It encompasses the extent to which an individual is able to maintain physical, emotional and intellectual function (Wenger & Furberg, 1990). Subjective wellbeing is considered to be an important component of the "good life" (Lawton, 1983; Ryff & Keyes, 1995) with positive outcomes considered to be an indicator of successful ageing. Variables that impact on wellbeing include having difficulties, isolation, loneliness, physical functioning, pain, support networks, and marital status.

Purpose in Life Scale (PIL)

The PIL (Crumbaugh & Maholick, 1964) is a 20 item questionnaire, utilising a 7 point scale: "life to me seems"- 7 (always exciting) to 1 (completely routine).

The Purpose in Life scale was designed to measure an individual's experience of meaning and purpose in life. The 20 item scale has been shown to have good reliability (split-half and test-retest reliability, alpha = .91), Zika and Chamberlain, (1992).

High scores on the PIL would suggest that an individual has goals, directedness, feels there is meaning to life, holds beliefs that give life purpose, and possess aims and objectives for living. Low scorers lack a sense of meaning in life, possess few goals , lack

a sense of direction , see no purpose in their past and do not have a meaningful outlook on life (Ryff & Keyes, 1995). The Purpose in Life scale has been demonstrated to relate consistently to a variety of wellbeing and other psychological variables such as life-satisfaction, affect balance, depression, morale, happiness and self-esteem. The Purpose in Life test was designed to operationalise Frankl's (1959) theories of life meaning by measuring an individual's experience of meaning and purpose in life.

Rosenberg Self-Esteem Scale

The RSES (Rosenberg, 1965) is 10 item questionnaire measuring a sense of self-worth. It has a 1 (strongly agree) to 4 (strongly disagree) scale with 5 positive items ("I am able to do things as well as most other people"), and 5 negative items ("I certainly feel useless at times").

It contains a continuum of self-worth statements ranging from those that are endorsed by individuals with low self esteem to statements that are endorsed only by persons with high self esteem. High scores indicate a strong sense of self-esteem (Sarvimak, 2000). Research examining the reliability of the Rosenberg Self-Esteem Scale generally has reported the instrument to be psychometrically sound with test – retest reliability found to be .85 after a two week interval, and .82 after one week.

State-Trait Anxiety Inventory (STAI)

The STAI (Speilberger, Gorsuch & Lushene, 1970) is a 40 item questionnaire. Participants respond to the first 20 questions measuring the temporary condition of state

anxiety, and the next 20 questions measuring the long standing quality of trait anxiety. The STAI is the definitive instrument for measuring anxiety in adults. State anxiety (questions 1-20) is defined as a transitory emotional state characterised by a consciously perceived feeling of tension and apprehension. Trait anxiety (questions 21-40) refers to relatively stable individual differences in anxiety proneness (Speilberger, Gorsich & Lushene, 1969). Relatively high correlations are presented in the STAI manual between this scale and other measures of trait anxiety; the Taylor Manifest Anxiety Scale, the IPAT Anxiety Scale, and the Multiple Affect Adjective Check List. The correlations are .80, .75 and .52 respectively (Speilberger et al, 1969). The STAI has been used in various psychological settings over the past 36 years. It is still an effective psychometric instrument and its continued use underlines the STAI's importance and validity as a measure of anxiety. (ACU National School of Exercise Science, 2004).

Profile of Mood States (POMS)

The POMS (McNair, Lorr & Droppleman, 1971 & 1992), is a 65 item questionnaire. Participants rate a 1 to 5 point scale, 1 (not at all) to 5 (extremely). Profile of Mood States is a test instrument for measuring mood states of intermediate durations. The test contains seven subscales: tension - anxiety; depression - dejection; anger - hostility; vigour - activity; fatigue - inertia; confusion - bewilderment and friendliness. Rotation to oblique simple structure was used; the factors are moderately positively correlated, with the exception of the vigour factor, which is negatively correlated with the other factors. This feature makes it possible to derive a meaningful score of emotional disturbances (Weckowicz, 1979). The internal consistency of the six subscales ranges for 0.84 to 0.98,

while the test - retest stability of the Profile of Mood States ranges from 0.65 to 0.74 (Cox, Thomas, Volker & Aoyagi, 2004).

Life Satisfaction

Positive life satisfaction, a primary factor of psychological or subjective wellbeing and a component of quality of life (Garfien & Herzog, 1995) is considered to be an important element of successful aging (Baxter, Shetterly, Eby, Mason, Cortese & Hamman, 1998). Factors associated with life satisfaction include personality components such as optimism, extroversion and self esteem; gender studies have shown women report higher levels of life satisfaction and age studies indicate that the young and older are more satisfied with their lives than those middle aged. Self reported health has one of the strongest associations with life satisfaction. Its effect is larger in size than income, employment or marital status (Donovan, Halpan & Sargeant, 2002).

In previous studies, life satisfaction has received mention as a component in measuring psychological wellbeing or quality of life. In this study an attempt is made to tease it out and use it as a separate experimental variable. The Affectometer 2 (Kammann & Flett, 1983) is a brief questionnaire used to obtain a reliable and meaningful measure of a person's current level of general happiness.

Affectometer 2

The Affectometer 2 is a brief questionnaire designed to determine a reliable and meaningful measure of a person's current level of general happiness or sense of

wellbeing. Affectometer 2 (Karmmann & Flett, 1985) consists of a 40 item questionnaire in which the participant reports how often they have had certain feelings related to emotional satisfaction and life fulfilment. In the first two sections, participants respond to sentences, for example "my life is on the right track" and "my life seems stuck in a rut". In the next two sections responses are made to adjectives ("lonely" and "insignificant"). The Affectometer 2 measures quality of life as the sum of the experiences that arise from living them, sometimes referred to as "satisfaction with life as a whole" (Andrew & Withey, 1976; Campbell, Converse & Rodgers, 1976). The reliability of the net all score of the Affectometer 2 is given by an alpha coefficient of 0.95. Reliability for the subscale sentences (short form 20 = 0.87) and adjectives (short form 20 = 0.92) indicate that it is reliable enough for most purposes.

Muscular Strength

Previous research (Fike & Rousseau, 1982) has shown a relationship between hand strength and age. Data from a Mathiowetz, Kashman, Volland, Weber, Dowe & Rogers (1984) study supports a curvilinear relationship between strength and age with hand grip strength peaking between 25 to 50 years of age, and decreasing from that point onwards. Determining maximal isometric grip force (MIGF) with the use of a hand grip instrument cannot be assumed to reflect the functional status of the entire muscle system, or even to provide insight into other functionally important measurements of muscle performance. In this study, measuring the maximal isometric grip force (MIGF) provided a readily available method of training at least one quantitative measure of muscle function.

The Jamar Dynamometer is the most widely used hand grip strength instrument. It is the most widely researched and reported hand grip strength measurement device available (Ashton & Myers, 2004). The participant in a seated position contracts the Dynamometer handgrip with maximal effort. The reading in kilograms is recorded and the process repeated for a second time. In determining maximal isometric grip force (MIGF), the Jamar Dynamometer provides a simple, quick, well-established method to quantify one aspect of muscle function (Fess, 1995). For the participants in this study, measurements were taken in accordance with the instructions for this instrument, pre-test, mid-test and post-test. The Jamar dynamometer is a variable hand span instrument with five different positions for measurement. Maximal grip strength most commonly occurs in the second or third position, the current study utilised the second position (3.8cm), and did not account for hand dominance. The small percentage of left handed participants (less than 5%) scores were combined with scores from right-handed participants.

D. Procedures

Recruitment and Orientation

Participant recruitment was initiated through advertisements placed on the noticeboards of the two Kerikeri supermarkets, through 1000 flyers placed in a regional newspaper, the Northern News, through an article about the proposed study kindly written by the Editor of the local community newspaper, the Kerikeri Chronicle, and with the assistance of the Kerikeri Medical Centre who distributed a contact card to interested clients. Potential participants contacted the researcher by telephone.

The researcher scheduled appointment times to visit each of the respondents in their homes and present the information sheet, providing a detailed summary of the proposed project. Upon agreeing to participate, the researcher informed the respondent of their rights under the study, as required by the Massey University Human Ethics Committee (MUHEC), and the consent form to participate was signed. At this point, the participant was asked to complete a brief health check list and informed that a medical check by the designated medical physician would be required before the start of the project. The participant was also required to sign a medical consent form giving permission to the assigned staff at Kerikeri Medical Centre and KeriMed to access their medical records on computer file. The health checklist and the medical consent form were presented to the designated medical physicians prior to the participant's medical check.

A total of 83 individuals responded to the recruitment drive. Three of the participants were advised by their physician not to attempt gym training and were excluded. The remaining 80 names were randomly assigned to one of two groups, the intervention group (gym group) and the control group. The control group was offered the opportunity to participate in the same training programme after the completion of the primary intervention protocol. The control was asked not to begin any exercise activity for the duration of the 12-week programme.

Following the start of the project, 3 participants in the intervention group could not continue, and 1 participant in the control group had to withdraw. The remaining 76 participants (gym group n=37, control group n=39) completed the 12 week programme.

Tests and Exercise Protocol

From weeks 1 through 12 of the project, the intervention group attended the ASB Gymfit Kerikeri gymnasium 3 days a week; Monday, Wednesday and Friday. On each of those days, three time options were made available: 7am to 8:30am; 11am to 1:30pm; and 2pm to 3:30pm. There was no instruction or obligation for participants to maintain the same training time on different days. Each training session was approximately 45 minutes in duration.

The handgrip strength test to measure maximum isometric grip force (MIGF) was administered to all participants immediately prior to the very first training session, repeated again at 6 weeks and at the conclusion of the project at 12 weeks, following the same order and format on each occasion.

Resistance Exercise Training

All participants' attendance was monitored and recorded. The training sessions began with a 10-minute warm up on the treadmill, rower or exercycle. Participants began the resistance-training schedule. All training exercises with free weights were done in support or seated position to ensure participant safety.

Training progression was based on the following:

a. Participant was able to perform the complete set of repetitions comfortably.
b. The weight increase was always only to the next increment, both for machines with calibrated weight stacks and dumbbells.

Resistance Training Programme (Example in Appendix C)

The participants were shown precisely how to perform each exercise in the correct form, with particular emphasis on safety and correct range of movement. The exercises were performed in the order set out on the training sheet. Each participant received their own copy of the training programme accessed at each session from gym reception.

E. Data Analysis

The sample for the study totalled 76, of whom 37 completed both the gym programme and questionnaires. Descriptive data was analysed and a one way repeated measures analysis of variance (ANOVA) used to examine the differences among participation groups with regard to the psychological variables assessed in the questionnaires. T tests were used to examine changes in psychological and physical parameters from baseline (Time 1) to the conclusion of the project at 12 weeks (Time 3). Post-hoc pairwise comparisons determined significant mean differences between the control and experimental groups at Time 1 and Time 3. By subtracting the differences at these two time points, a true effect size at Time 3 was achieved. Scores on the POMS, STAI, AFFECTOMETER and RSES were recoded using SPSS for Windows (version 12), and descriptive statistics obtained. The reliability of each scale was determined, including the subscales contained in POMS, STAI, AFFECTOMETER and RSES.

CHAPTER FOUR: Results

A. Descriptive Characteristics

The primary aim of this project was to determine the effect of a 12 week high-intensity resistance training programme on psychological wellbeing and life-satisfaction in older individuals aged between 70-80 years. The age means and standard deviations for the experimental group (N =37) were 73.42 (SD = 3.13) and for the control group (N = 39), 74.58 (SD = 3.35). The mean age and standard deviation of the total sample was 74.09 years (SD = 3.18). The gender composition of each group was female (N = 18), 47.36% for the experimental group and (N = 20), 51.28% for the control. For the males it was (N = 19), 52.63% for the experimental group and (N = 19), 48.71% for the control.

Four individuals dropped out of the study due to health reasons, leaving a final sample of 76. No unusual pain or discomfort was reported by any of the participants over the 12-week training period.

B. Scale Descriptive and Reliability Data

The means, standard deviations and alpha reliability coefficients for all scales are presented in table 1 and table 2. Reliability was about .70 for most scales except for POMS subscales Anger-Hostility and Confusion-Bewilderment. Generally over the three time points the measures remained consistently high. The exception to this were the time 1 and time 3 alpha coefficients of the POMS subscales Anger-Hostility, at .55 and .55 respectively. Similarly, The subscale Confusion –Bewilderment alpha coefficients were .65 at time 1 and .36 at time 3.

Table 1: Scale Descriptives and Reliability Data

Scale		Time 1			Time 2			Time 3		
		M	SD	Alpha	M	SD	Alpha	M	SD	Alpha
PIL	expt	113.94	15.62	.90	113.67	18.49	.98	121.89	10.11	.87
	control	107.30	13.94	.91	100.02	24.21	.97	101.12	13.63	.94
STATE -	expt	30.05	9.58	.90	31.32	9.33	.92	27.97	6.13	.87
ANXIETY	control	40.92	8.94	.93	40.41	10.23	.95	42.41	8.25	.92
TRAIT -	expt	32.32	9.96	.93	34.50	10.19	.93	30.88	7.44	.88
ANXIETY	control	41.10	10.08	.95	43.92	11.51	.96	40.02	7.83	.93
AFFPOS	expt	76.29	13.79	.94	73.97	12.58	.92	81.81	10.23	.93
	control	67.82	14.64	.97	68.35	16.69	.97	66.92	11.10	.95
AFFNEG	expt	36.66	10.58	.93	36.58	9.70	.92	33.58	8.73	.91
	control	35.43	6.73	.91	44.28	11.94	.95	33.02	6.73	.92
RSES	expt	20.32	4.12	.78	17.18	4.40	.85	16.29	3.73	.79
	control	20.51	4.28	.87	19.79	5.46	.92	19.53	3.91	.87
STRENGTH	expt	31.21	11.11		35.17	11.91		34.87	11.61	
	control	28.78	9.16		28.30	9.00		28.37	8.70	

Table 2: Scale Descriptives and Reliability Data for POMS subscales

Subscale		Time 1			Time 2			Time 3		
		M	SD	Alpha	M	SD	Alpha	M	SD	Alpha
Tension	expt	12.48	4.60	.84	12.43	4.11	.84	11.54	3.85	.83
Anxiety	control	13.10	2.81	.68	17.94	5.17	.88	14.57	2.81	.72
Depression -	expt	20.13	6.49	.89	20.38	5.74	.89	18.80	5.37	.86
Dejection	control	20.22	4.23	.80	28.11	9.19	.95	20.75	3.82	.76
Anger -	expt	16.54	5.09	.79	16.45	6.81	.92	15.54	3.61	.74
Hostility	control	14.82	2.19	.55	20.69	6.42	.90	16.05	2.52	.57
Vigour -	expt	27.94	5.17	.83	27.62	5.84	.89	29.97	4.38	.79
Activity	control	21.46	4.96	.91	25.74	5.08	.89	20.66	3.25	.74
Fatigue -	expt	12.51	3.99	.83	12.24	3.98	.82	11.81	3.65	.81
Inertia	control	10.94	2.19	.69	13.84	3.58	.86	11.10	2.37	.69
Confusion -	expt	13.16	2.83	.70	12.64	2.78	.78	12.72	2.19	.73
Bewilderment	control	14.20	2.44	.65	17.12	3.12	.83	14.25	1.64	.36
Friendliness	expt	27.75	4.53	.84	26.62	4.38	.83	28.64	4.04	.78
	control	24.07	3.76	.77	25.74	4.30	.86	23.00	3.14	.67

C. Analysis

Repeated measures ANOVA analysis using SPSS for Windows (version 12) was used to determine interactions and main effects for each of the measures across three time points. The means and standard deviations for both the experimental and control groups is presented on all measures (see table 1). Interpretation of the data was by the Greenhouse-Geisser Epsilon as this is a conservative measure particularly suited when violations of assumptions occur. T-tests were used to evaluate mean differences between significant variables at Time 1 (see table 5). The confidence level was set at 95% (p=0.05). The effect of a high intensity resistance-training programme between two groups on the following variables was evaluated with a one way repeated measures ANOVA being appropriate.

The results for the one-way ANOVA at Time 1 suggest that there were differences on the following variables; Strength, Affectometer (negative mood), Profile of Mood subscales Tension-Anxiety, Depression-Dejection, Confusion-Bewilderment. To deal with any differences at Time 1, the effect size for Time 1 and Time 3 respectively between conditions was calculated to correct for this disparity. In other words, the difference between the effect sizes was an indication of the true difference between the groups. The one-way repeated measures ANOVA was conducted on all measures.

Table 3. Independent Samples *t* test at Time 1

Measure	*t*	*df*	*p*
PIL	1.95	74	0.05
STATE ANXIETY	5.12	74	0.00
TRAIT ANXIETY	3.79	72	0.00
AFFPOS	2.59	74	0.01
AFFNEG	0.60	73	0.54
RSES	0.19	74	0.84
POMS tension-anxiety	0.68	74	0.49
POMS depression-dejection	0.05	72	0.95
POMS anger-hostility	1.92	74	0.05
POMS vigor-activity	5.57	74	0.00
POMS fatigue-inertia	2.12	74	0.03
POMS confusion-bewilderment	1.72	74	0.08
POMS friendliness	3.85	74	0.00
STRENGTH	1.04	74	0.30

Figure 1.

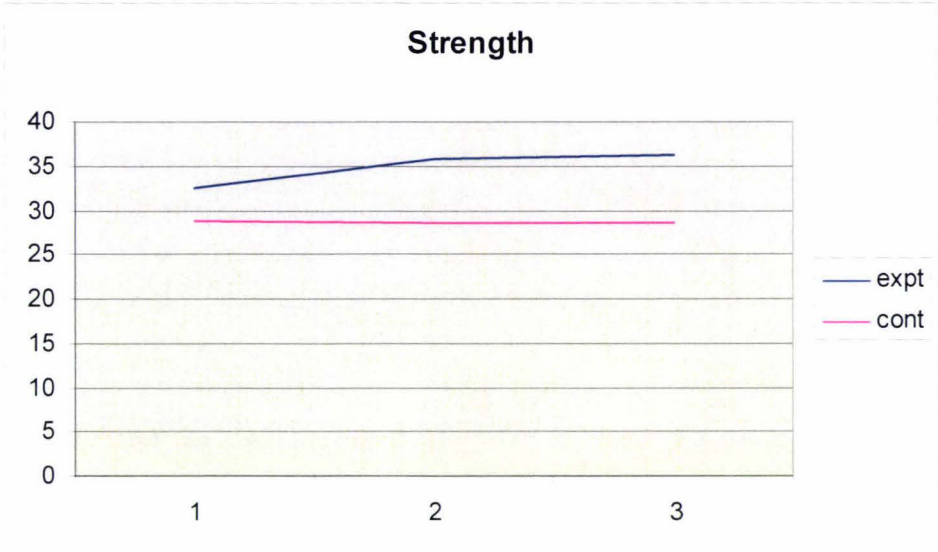

Figure 1. Mean scores for Strength over Times 1, 2 and 3.

For the strength measures over time, the F (1.98) = 6.09, p = 0.00 was significant. For comparisons at Time1 between the two conditions see table 5. Differences at Time 2 were significant, *t* (74) 2.84, p = 0.00, and again at Time 3, *t* (74) 2.76, p = 0.00. Mean differences at Time 2 of 8.28 and at Time 3 of 7.70 indicate significant improvement in strength gains for the gym condition. Pairwise comparisons between Time 1 and Time 2 showed significant effect with a mean difference of 4.42 and *t* (36) 3.33, p = 0.00, and from Time 1 to Time 3 with a mean difference of 3.72 and *t* (36) 3.80, p = 0.00. As there was a difference at Time 1, effect sizes at Time 1 and Time 3 were calculated and subtracted one from another to show the true effect size at Time 3 of 0.40, a medium effect size on this variable. The experimental group increased in strength from Time 1 (M = 31.21, SD = 11.11) to Time 3 (M = 34.87, SD = 11.61).

Figure 2 .

Figure 2. Mean scores for the Purpose in Life Test over Times 1, 2 and 3.

The Purpose in Life variable, using Greenhouse-Geisser Epsilon, F (1.51) = 3.84, p = 0.03. Post-hoc comparisons were performed at Time 1 by independent T- test (see table 5). T-test results at Time 2, *t* (74) = 2.75, p= 0.00, and again at Time 3, *t* (74) = 7.50, p = 0.00. Because there was a difference at Time 1, the mean effect size at Time 1 between the experimental group and the control and Time 3 was determined to be 1.27, a large effect size for this variable. There was a mean difference at Time 2 of 13.62 between the two conditions and at Time 3 of 20.77 significantly indicating the positive benefits of exercise on life purpose in the exercise condition for this age group.

The experimental group significantly increased in purpose in life from Time 1 (M = 113.94, SD = 15.62) to Time 3 (M = 121.89, SD = 10.11).

Figure 3.

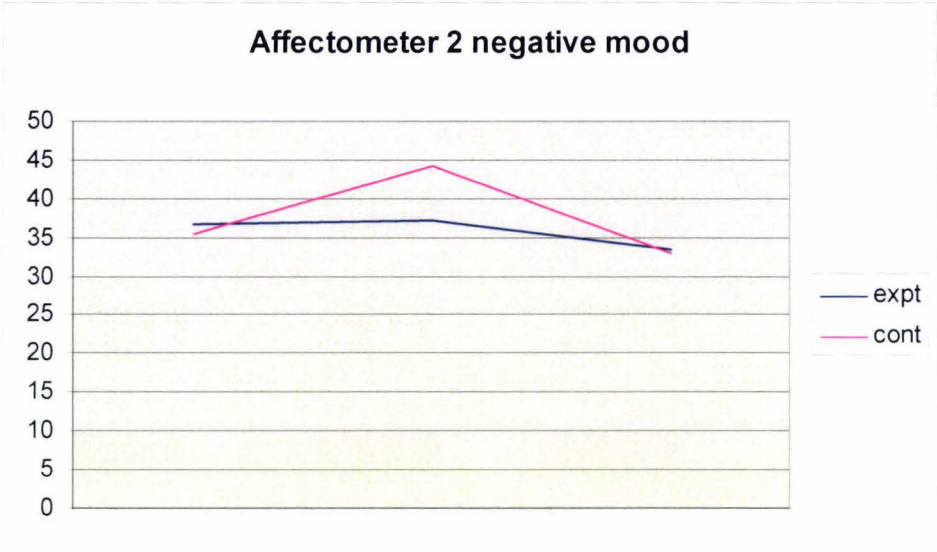

Figure 3. Mean scores for the Affectometer 2 negative mood subscales over Times 1, 2 and 3.

Significantly, Affectometer 2 Negative Mood results were F (1.71) = 5.41, p = 0.01. Time 1 comparisons were performed by independent T-test (see table 5). At Time 2, comparisons were significant, *t* (74) 2.81, p = 0.00. Participants in the control condition showed a significant increase in negative mood from Time 1 to Time 2 with a mean difference of 8.45 and *t* (39) = 3.63, p = 0.00, and a significant decrease from Time 2 to Time 3, with a mean difference of 11.26 and *t* (38) = 6.39, p = 0.00. The confidence interval for the population mean difference was between 13.14 and 3.75 for Time 1 to Time 2, and 7.69 to 14.82 for Time 2 to Time 3. Because there was a difference at Time 1 between the experimental group and the control the effect size at Time 1 and at Time 3 were calculated and subtracted to show a significant and true effect size of -0.07. The experimental group decreased in negative mood from Time 1 (M = 36.66, SD = 10.58) to

Time 3 (M = 33.58, SD = 8.73). The control condition also experienced a slight drop in negative mood from Time 1 (M = 33.58, SD = 8.73) to Time 3 (M = 33.02, SD = 6.73).

Figure 4.

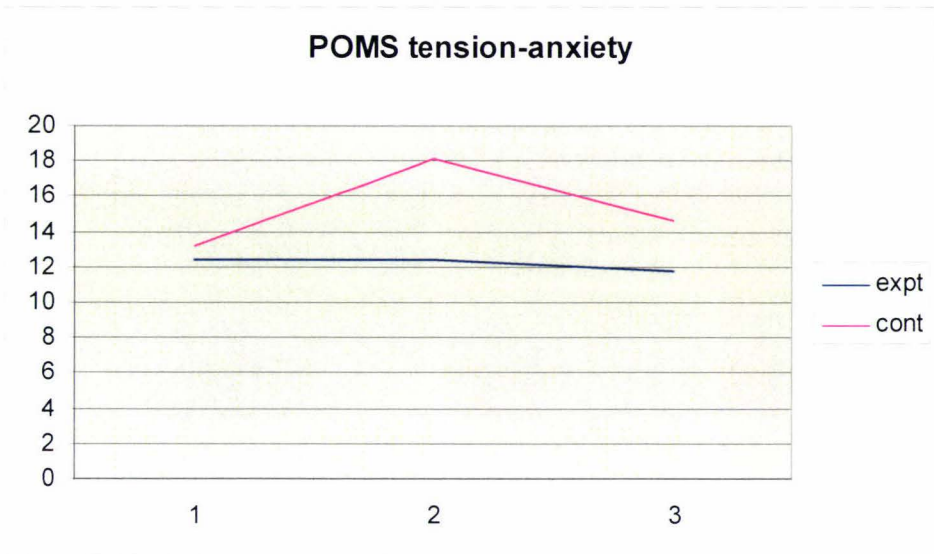

Figure 4. Mean scores for POMS subscale tension-anxiety over Times 1, 2 and 3.

The results for POMS tension-anxiety were significant, F (1.86) 6.26, p = 0.00. Differences at Time 1 between the two conditions can be seen on table 5. Differences at Time 2 were significant, *t* (74) 5.14, p = 0.00, and again at Time 3, *t* (73) 3.90, p = 0.00. . At Time 3 the mean difference was 3.03. The confidence interval showed that the population means differences were likely to be found between 6.90 and 2.73, 1.86 and 4.87, and 2.89 and 0.05 for times 1 to 2, times 2 to 3 and times 1 to 3 respectively. Because there were differences at Time 1, the effect size at Time 1 and Time 3 were computed. The difference at Time 3 minus the difference at Time 1 showed that the difference at Time 3 was significant at 0.81, a large effect size for the experimental group

on this variable. In the experimental condition there was a reduction in tension-anxiety from Time 1 (M = 12.48, SD = 4.60) to Time 3 (M = 11.58, SD = 3.85). The control group increased in tension-anxiety from Time 1 (M = 13.10, SD = 2.81) to Time 3 (M = 14.57, SD = 2.87).

Figure 5.

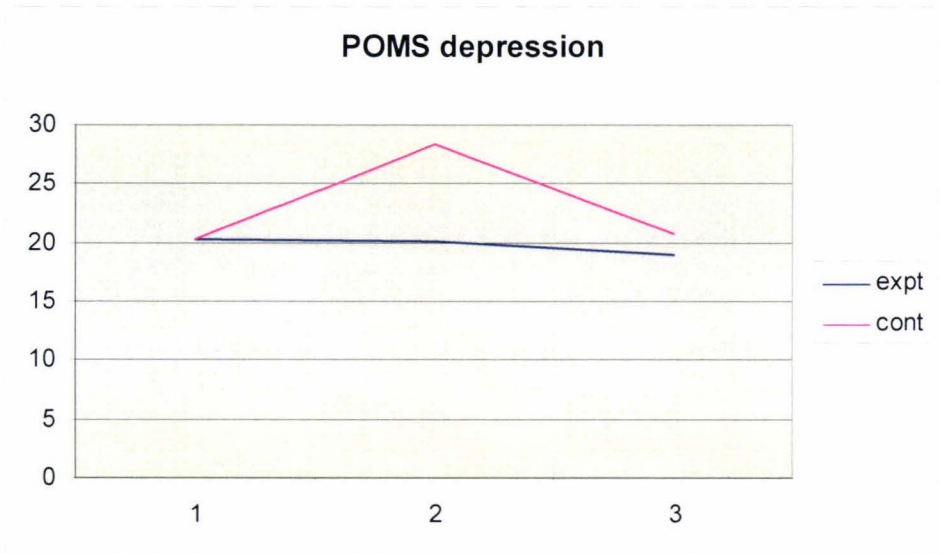

Figure 5. Mean scores for POMS subscale depression-dejection over Times 1, 2 and 3.

The results were significant for POMS Depression-Dejection, F (1.66) 9.04, p = 0.00. Differences at time 1 between the two conditions can be viewed in table 5. Differences at Time 2 were significant, *t* (73) 4.25, p= 0.00. Differences at Time 3 were not significant, *t* (73) 1.84, p = 0.06. The mean difference between the two conditions at time 2 was 7.57, with a mean difference of 1.96 at time 3 supporting the t-test result. Pairwise comparisons carried out on the control condition showed significant increase in

depression scores for Times 1 to 2 (mean difference 7.73 with t (36) 4.72, p = 0.00) and a significant decrease for Times 2 to 3 (mean difference 7.26 with t (36) 5.21, p = 0.00). The confidence interval for the population mean difference was between 11.70 and 4.67 for Times 1 to 2 and between 4.32 and 9.83 for Times 2 to 3. The effect size at Time 3 was 0.40, a medium effect for this variable. The control condition showed a small increase in depression-dejection from Time 1 (M = 20.22, SD = 4.23) to Time 3 (M = 20.75, SD = 3.82). The experimental group decreased in depression-dejection from Time 1 (M = 20.13, SD = 6.49) to Time 3 (M = 18.80, SD = 5.37).

Figure 6.

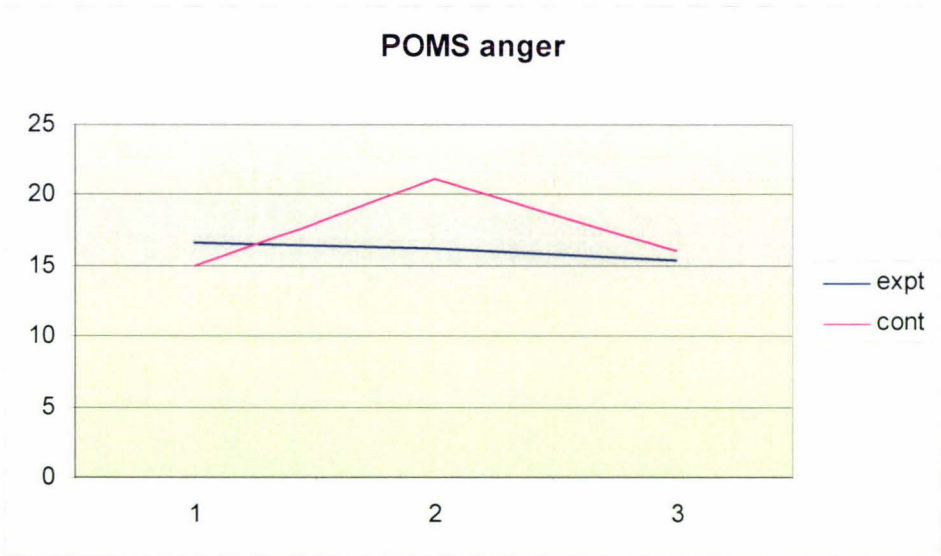

Figure 6. Mean scores for POMS subscale anger-hostility over Times 1, 2 and 3.

For anger-hostility measures over time, F (1.55) 7.39, p = 0.00. Differences at Time 1 between the two conditions can be seen on table 5. Differences at Time 2 were significant, t (74) 2.78, p = 0.00. Mean differences at Time 2 were 4.24, reflecting an

increase in anger-hostility for the control condition. At time 3 the mean difference was 0.51, showing a significant decrease from Time 2 for the control. Pairwise comparisons were carried out between the time points in the control condition. For Times 1 to 2 there was a significant increase in anger-hostility scores, the mean difference was 5.87 with *t* (38) 5.10, p = 0.00 and population mean differences likely to be found between 8.20 and 3.54. For times 2 to 3 there was a significant decrease in anger-hostility scores, the mean difference was 4.64 with *t* (38) 4.97, p = 0.00 and population mean differences likely to be found between 2.75 and 6.52. There were differences at Time 1 so the effect size at Time 1 and Time 3 were calculated and subtracted to show a true effect size of -0.19. The interaction shows the control group got angrier as there was an increase in anger-hostility from Time 1 (M = 14.82, SD = 2.19) to Time 3 (M = 16.05, SD = 2.52). The experimental group showed a decrease in anger-hostility from Time 1 (M = 16.54, SD = 5.09) to Time 3 (M = 15.54, SD = 3.61).

Figure 7.

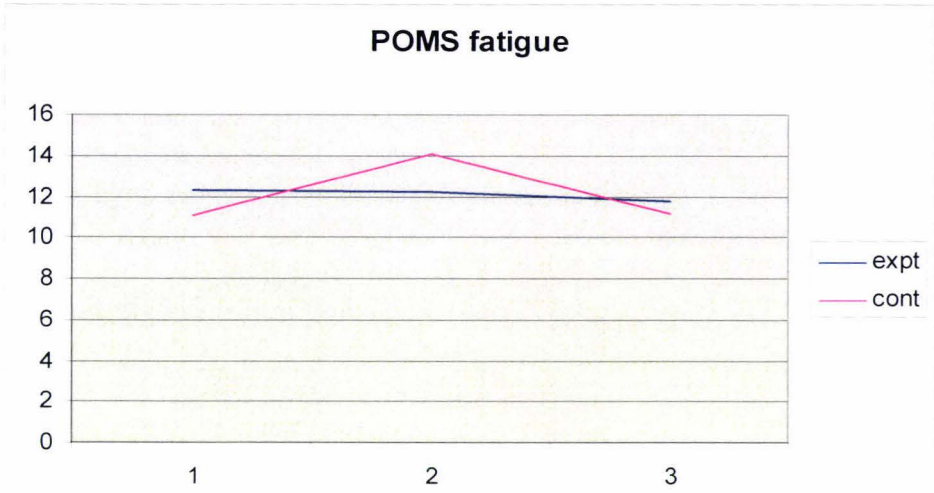

Figure 7. Mean scores for POMS subscale fatigue-inertia over Times 1, 2 and 3.

Greenhouse-Geisser Epsilon produced F (1.90) 4.11, p = 0.02 on POMS Fatigue-Inertia. Differences at Time 1 can be seen on table 5. Differences at time 2 were not significant, *t* (74) 1.89, p = 0.06. A similar result occurred at Time 3, *t* (74) 1.00, p = 0.31. Mean differences at Time 2 (1.60) and at Time 3 (0.71) reflect minimal effect. Because of differences at Time 1, the effect size at Time 1 and Time 3 .were calculated. Thus the difference at Time 1 minus the difference at Time 3 showed a true and significant effect size of -0.26 for this variable. Overall, the control condition increased in fatigue from Time 1 (M = 10.94, SD = 2.19) to time 3 (M = 11.10, SD = 2.37). The experimental group decreased in fatigue from Time 1 (M = 12.51, SD = 3.99) to Time 3 (M = 11.81, SD = 3.65).

Figure 8.

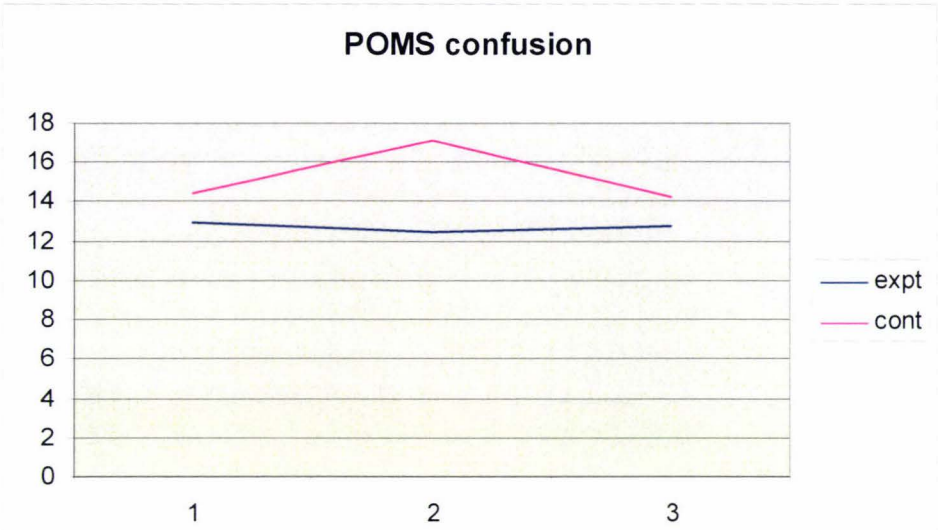

Figure 8. Mean scores for POMS subscale confusion-bewilderment over Times 1, 2 and 3.

The results were significant on POMS Confusion-Bewilderment, F (1.88) 9.33, p = 0.00. Any differences at Time 1 were evaluated by independent T-test and can be seen on table 5. Differences at Time 2 were significant, *t* (74) 6.59, p = 0.00. As there were difference at Time 1, the effect size for Time 1 and Time 3 were calculated. The difference at Time 1 minus the difference at Time 3 showed a true effect size of 0.40, a medium and significant effect size for this variable. Those in the control condition experienced almost no change in confusion-bewilderment from Time 1 (M = 14.20, SD = 2.94) to Time 3 (M = 14.25, SD = 1.64). The experimental condition showed decrease in confusion-bewilderment from Time 1 (M = 13.16, SD = 2.83) to Time 3 (M = 12.72, SD = 2.19).

Figure 9.

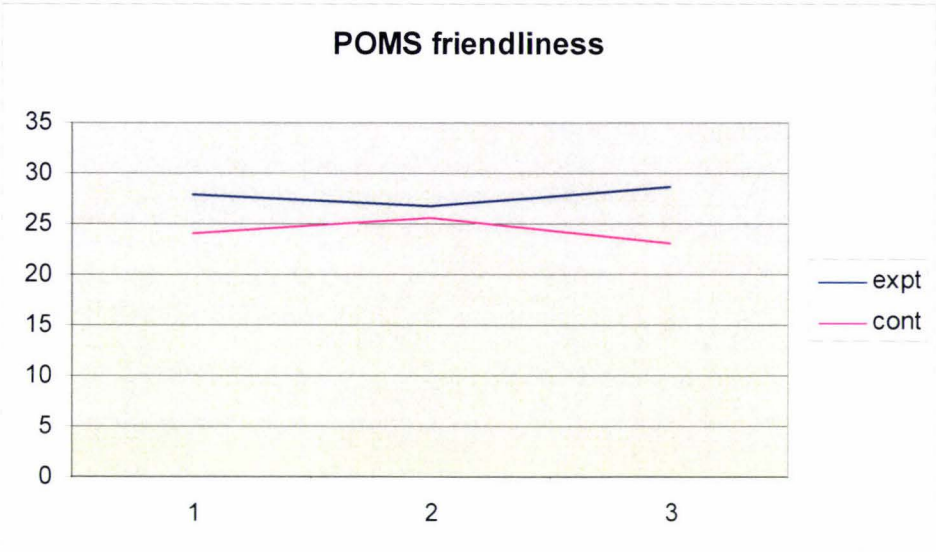

Figure 9. Mean scores for POMS subscale friendliness over Times 1, 2 and 3.

Over the 12 week programme, results for POMS Friendliness were significant, F (1.91) 4.92, p = 0.01. Differences at Time 1 can be seen on table 5. Time 2 differences were not significant, *t* (74) 0.88, p = 0.38. Because there were substantial differences at Time 1 between the two conditions, the effect sizes at Time 1 and at Time 3 were calculated. Thus the difference at Time 1 minus the difference at Time 3 showed a true and significant effect size of 0.68, somewhere between a medium and large effect size for this variable. Overall, the control condition experienced a decrease in friendliness from Time 1 (M = 24.07, SD = 3.76) to time 3 (M = 23.00, SD = 3.14). The experimental group however, became more friendly from Time 1 (M = 27.75, SD = 4.53) to Time 3 (M = 28.64, SD = 4.04).

Figure 10.

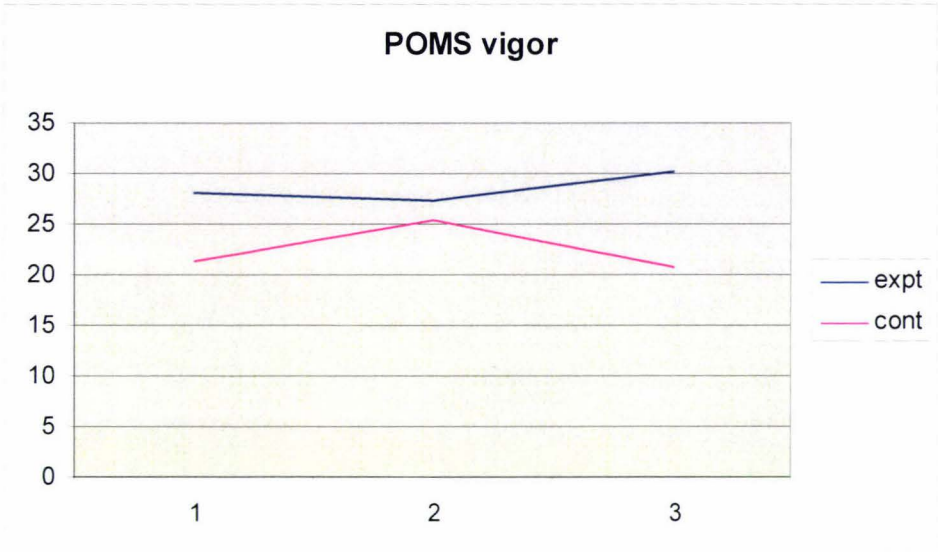

Figure 10. Mean scores for POMS subscale vigor-activity over Times 1, 2 and 3.

Significant results were produced on POMS Vigor-Activity, F (1.94) 9.48, p = 0.00. Differences between conditions at Time 1 can be viewed on table 5. Differences at Time 2 were not significant, *t* (74) 0.88, p = 0.13. At Time 3, differences by T-test were significant, *t* (74) 10.54, p = 0.00. Mean differences at Time 2 between the two conditions were 1.88, while the Time 3 mean difference was 9.31. Pairwise comparisons showed significant differences on this variable for Times 1 to 2 in the control condition, (mean difference 4.28 with *t* (38) 3.48, p = 0.00, and for Time 2 to Time 3, (mean difference 5.08 with *t* (38) 5.08, p = 0.00). The confidence interval showed that the population means difference was likely to be found between 6.77 and 1.79 for Times 1 to 2 and between 3.05 and 7.09 for Times 2 to 3. Because of a difference at Time 1 between the two conditions effect size calculations were performed at Time 1 and Time 3. The difference at Time 1 minus the difference at Time 3 showed a true effect size of 1.14, a

large and significant effect for this variable. Overall, the control group showed a decease in vigor from time 1 (M = 21.46, SD = 4.96) to Time 3 (M = 20.66, SD = 3.25). The experimental condition showed an increase in vigor from Time 1 (M = 27.94, SD = 5.17) to Time 3 (M = 29.97, SD = 4.38).

The State Anxiety component F (1.67) 0.97, p = 0.38 and the Trait Anxiety component F (1.54) 0.03, p = 0.93 of the State-Trait Anxiety Inventory were not significant. The positive mood component of the Affectometer 2 test was not significant, F (1.67) 1.80, P = 0.17. Rosenbergs Self-Esteem Scale was not significant, F (1.73) 1.96, p = 0.15.

CHAPTER FIVE: Discussion

The purpose of this study was to determine the effect of a 12-week high intensity resistance-training programme on psychological wellbeing and life satisfaction in an elderly group aged 70-80. The findings of this study suggest that regular participation in a resistance-training programme may be beneficial to older adults in terms of their physical and psychological functioning on some of the variables measured. The pattern of results is encouraging, especially as strength changes were accompanied by enhanced purpose in life, friendliness and reductions in negative mood, anxiety, depression, anger, fatigue and confusion. The results are discussed with this in mind.

A. Strength

The training programme employed in this study was specifically designed for this sample and did lead to strength gains. The strength gains were similar to those reported in previous research (Frontera, Merdith, O'Reilly, Knuttgen & Evans, 1988; Welle, Totterman & Thornton, 1994; Chilibeck, Sale & Webber, 1995; Nieman, 1999).

Participants in the gym condition showed increases in strength from Time 1, with maintenance of those gains from Time 2 to Time 3. This pattern of immediate strength gains followed by a leveling off is paralleled by a Morey, Pieper, Sullivan, Crowley, Cowper and Robbins (1996) study, which found a pattern of strength gains during the first 4 months, but no further gains from month 4 to 24. One should remember that this programme was of only twelve weeks duration and given the effect size (0.40) the results are very encouraging.

In the current study, initial strength gains up to week 6 for the gym group may have occurred, firstly as a result of the unfamiliar stratagem of weight training accompanied by embarking on a new activity, secondly, the discovery that, despite initial fears of not being able to accomplish the actual exercises, participants found that with correct instruction they could easily master the task. Possibly the most important element here was the new experience, that a specific exercise programme designed for this age group and applied correctly on untrained muscles initiated a significant response. Also, the program was individualized and fully monitored for each person.

Although the participants showed no increases from Time 2 to Time 3, they were able to maintain strength gains. The reasons for this warrant further discussion. First, the time period of 6 weeks representing Time 1 to Time 2, is generally regarded as being of sufficient time to achieve the goals of a new programme but the training stimulus would need to increase for further improvements (Cavani, Mier, Musto and Tummers, 2002), in other words, reinvigorate the program. The current study did not include a review at 6 weeks and no major changes were introduced, although minor modifications were made throughout the project as standardizing the training programme was seen as important from a research perspective. It was possible that diminished interest resulted, and this affected the gym participant's ability to further increase in strength gains. Certainly strength gains can continue but other exercises may be necessary, for example, new and varied programmes, different techniques, possibly diet, and increased intensity are all required. In the current study, initial strength gains may have been realised by the mid point of the project (6 weeks). Cavani et al (2002) suggested further research is required

to determine whether resistance training beyond 6 weeks provokes any further improvements. The results from this study suggest that gains are possible. Without any changes to the programme the following 6 weeks may have been a maintenance stage, retaining the gains made in the first 6 weeks and very importantly preventing any declines in strength. Morey's et al (1996) study demonstrated this with no strength gains after the first 4 months of a 24-month training programme. Overall the results are very encouraging.

B. Purpose in Life Test

The results of the Purpose in Life Test suggest that regular participation in a resistance-training programme can provide positive psychological benefits for older adults. These results support research by Takkinen et al, (2001) and Grimsby, Grimsby, Frandin and Wiklund, (1992) regarding positive relationships between physical activity and emotional reactions (including meaning or purpose in life). Even though the training programme was of relatively short duration (12 weeks) there were significant differences between Time 1 and Time 3 on this variable for the intervention group with a large effect size (1.27) and between the intervention group and the control, suggesting that changes to life purpose through exercise can occur within this time frame.

The gym group showed no change from week 1 to week 6, an expected result given that of the entire sample only three had ever undertaken regular exercise in a commercial gymnasium. Their adaptation to the gym culture, gym staff, exercise requirements, the apprehension and anxiety at meeting and training with others they are not familiar with

may have accounted for this trend. Another explanation for the lack of effect over the first six weeks may be that some aspects of quality of life, vitality and depression represent more stable personality traits resistant to modification and the measures used are not sufficiently sensitive to determine change even if it did occur.

From weeks 6 to 12, significant improvement may have reflected increased physical strength, confidence, familiarity with the gym machinery and the benefits of social contact. Increases in physiological health (strength, flexibility and mobility) may have impacted on activities of daily living giving rise to a more purposeful existence.

The control group scores on this variable decreased from Time 1 to Time 2 with little improvement to Time 3. The initial decline may centre in the selection to the control condition and subsequently led to some disappointment. As the 12 week training programme concluded for the intervention group, this group's anticipation at starting the gym programme may have elevated the Purpose in Life scores, a feature that concurs with Courneya's (1995) research relating to exercise readiness in older adults. This study found the cognitions of those preparing to exercise were positive, but not as positive as those actually engaged in exercise activity.

At the conclusion of this study, the intervention group displayed an elevating trend indicating an increase in the elements that form purpose in life. This trend may have continued had the training programme been of longer duration. Research on subjective wellbeing (Zika and Chamberlain, 1987) has indicated that meaning in life as measured

by the Purpose in Life Test has consistent and direct effects on reports of wellbeing. Going to the gym perhaps gave the participants some purpose. The personal attention was well received, made them feel good about themselves and therefore produced higher PIL scores. Anecdotal comments received in the closing stages of this project support resistance training as a vehicle for change in purpose in life.

C. Affectometer 2 Test (negative mood)

To remain consistent with the current literature (Arent et al, 2000), this study accepts the terms affect (positive and negative) and mood as meaning the same thing. At Time 1 both the gym group and the control conditions were similar. By Time 2 the intervention group had exhibited little change, but this may not have been unexpected as several researchers have found resistance training associated with infrequent changes in mood (North, McCullagh, & Tran, 1990), and associated with no change in mood (Landers & Petruzzello, 1994). This effect may be due to the more resistant trait component of mood. Previous research has contended that the intensity of exercise can modify mood effects (Brown, 1992) with Arent et al, (2000) finding the greatest improvements in mood were associated with the lowest intensity of exercise, in direct contrast to the current study which employed a high intensity exercise programme.

The control group had increased significantly in negative mood at Time 2. The assignment to the control condition and the resultant disappointment at not being in the gym group may have elevated the negative mood score. In this study, the control exhibited decreased positive affect on the positive mood component and increased

negative affect on the negative mood component from Time 1 to Time 2. This effect however was almost completely reversed from time 2 to time 3. This effect was unexpected, given the sharp rise in negative affect time 1 to time 2, but may be attributable to the anticipation of participating in the gym programme. There is an increased prevalence of mood disturbances in later life, specifically, increased negative affect and decreased positive affect (Fillingim & Blumenthal, 1993). Those in the gym condition decreased in negative mood from time 1 to time 3. This result is interesting as this group did not report significantly in the positive mood component of the same test and is in contrast to the results of a meta-analytic review by Arent et al, (2000), which found equivalent improvements in both negative and positive affect. Nevertheless this group showed an increasing trend in decreasing negative mood at Time 3 consistent with work done by Moore and Blumenthal, 1998), whose overall conclusions supported the role of exercise in reducing negative affect, in other words they were more positive. Whether decreased negative mood relates to increased positive mood needs further investigation. Other studies that have shown decreases in negative mood through exercise; Glisky (1998) reported decreases in negative mood affect significantly greater than a non-intervention control, and Arent, Landers and Etnier (2000) noted that resistance training and cardiovascular exercise improved negative affect in older adults.

D. POMS subscale: Tension-Anxiety

In the current study, the effects of the resistance-training programme on tension-anxiety subscale were significant. Specifically this subscale taps into responses of anticipated stressful situations and unpleasant emotion brought on by misfortune (McNair et al,

1992). Differences between both conditions at Time 1 were not significant. In the gym condition little change was evidenced from Time 1 through Time 2 to Time 3, where a slight decrease in tension-anxiety occurred. This is a positive result on two counts. First there was a decrease over time on this variable and second, the large effect size (0.81) between the two conditions supports the effect of the resistance training on anxiety, a finding corroborated by Landers & Petruzzello (1994). There is however, little conclusive evidence that associates exercise and decreases in anxiety states. Schlicht, (1994,) in a meta-analysis found that several forms of physical activity including weight training did not significantly reduce anxiety, yet Sward's (1998) findings were conceptually in agreement with previous studies that report strength training and/or aerobic exercise improves measures of depression, anxiety and energy levels.

The control condition exhibited a sharp rise in tension-anxiety Time 1 to Time 2 and then an equally sharp decline to Time 3 to finish with a higher level of tension-anxiety than at the start. The significant increase in tension-anxiety in the control condition Time 1 to Time 2 may well correlate with a similar pattern for the control group in POMS depression. Anxiety disorders, social phobia and generalized anxiety disorders have been identified as risk factors of depression (Fava, Rankin, Wright, Alpart Nierenberg and Pava, 2000). Also, feelings of tension anxiety may have developed through exclusion to the gym condition and their random assignment to this group In the current study, participants in the control condition experienced elevated tension-anxiety, yet all remained in the project.

E. POMS subscale: Depression-Dejection

There was virtually no difference between the two conditions at Time 1 for depression-dejection. The experimental group showed a decline in depression-dejection from Time 1 to Time 3. The above findings (effect size 0.40) suggest that regular participation in a resistance-training programme may be beneficial to older adults in dealing with the effects of depression-dejection. This result supports work by Singh et al, (1997) that suggests high intensity progressive resistance training is equipotent to pharmacological therapies, and Moore et al, (1999) whose results indicate regular physical activity is associated with fewer depressive symptoms in older populations diagnosed with major depressive disorder. Anecdotal information from participants suggested that improvements in physical and psychological function were taking place. Cronin (2001) found that not only does the amount of physical activity relate to better physical function, maintenance of mobility and capacity to participate in daily tasks; it is also related to higher levels of physical functioning. Previous research (Agency for Health Care Policy and Research, 1993) indicates that depression is associated with significant impairment in functioning, specifically a decline in the ability to perform activities of daily living. There may be another explanation for the positive effect of resistance training on this variable that has possibly less to do with the actual training regimen but rather with the effect of social interaction and the provision of a distraction or diversion from unpleasant cognitions, emotions and behaviours. This has been observed in a study by Kovach-Anta (1998), who suggested that while exercising, the focus is put on the activity at hand and not on other factors that may be influencing an individual throughout the day.

The control group exhibited a substantial increase in depression-dejection from Time 1 to Time 2 exhibiting a similar trend to the anxiety subscale. This result is upheld by Heun and Hein (2004) who have suggested that anxiety disorders have been identified as risk factors of depression. Emotive responses generated by exclusion to the resistance-training programme may be responsible. This corroborates research by Courneya (1995), who suggests that individuals not exercising and stuck at a low activity level, had cognitions not as positive as those engaged in regular activity. From Time 2 to Time 3 this group decreased in depression-dejection, but remained at higher levels on this variable at the end of 12 weeks than at the start. The decrease from Time 2 may have occurred because of the closer proximity to the start of their gym programme and the positive emotional responses present when looking forward to something new. The participants suffering depressive symptoms from Time 1 may have responded to their plight by seeking medical or therapeutic assistance, thus bringing about a decline in depressive levels. This interpretation needs to be treated cautiously, it may be that the POMS instrument has just captured a very small segment of depressive histories and the lineal trend downwards indicating decreases in depression-dejection could easily reverse.

F. POMS subscale: Anger-Hostility

The results of this POMS subscale suggest that high intensity resistance training is effective in moderating anger emotion. The experimental group at Time 1 decreased in anger-hostility to Time 3, yet the control increased in anger from Time 1 to Time 2 substantially, and decreased to time 3 .The experimental condition showed a decrease over time perhaps indicating a subtle moderating effect of the resistance training

programme. This finding should be treated with caution. Lane and Terry (2000) indicated that anger experienced with a negative mood state like depression is qualitatively different to anger experienced with positive mood states such as vigor. Although the current study employed a high intensity resistance training programme (and as such, vigorous) it is difficult to determine whether the reported anger was positive or negative. Anger-hostility and the POMS subscales depression, tension-anxiety, fatigue and confusion scores all exhibit similar trends in this study for both groups. There is the likelihood of an association between these variables, although this would require further research. Previous research by Mondin, Morgan, Piering, Stegner, Stotesbery, Trine, and Wu (1996) demonstrated increases in mood disturbance as a consequence of exercise deprivation, but more importantly that the increases were collectively on POMS subscales tension-anxiety, depression, confusion and vigor supporting a similar trend in the current study.

Having a positive purpose or meaning in life for older adults can moderate an emotive construct like anger (Missinne & Willeke-Kay,1985). The ability of older adults to search for and recognize meaning in life can help improve their acceptance of and adaptation toward negative experiences that accompany aging (Missinne & Willeke-Kay, 1985). The Purpose in Life Test administered in this study showed a significant increase from Time1 to Time 3 for the experimental group, and this positive adaptation to the physical activity may have been manifest in producing a reduction in anger for this condition. The control group response on this variable follows a similar trend to the other POMS subscales measured in this study. Interestingly, this group was angrier at the

end of the 12 week programme than at the start, a response that may have been the product of being in the control condition.

G. POMS subscale: Fatigue-Inertia

The scores for this subscale suggest that resistance training reduces the level of fatigue, an expected result given the nature of the intervention. From Time 1 to Time 3 there was only a very slight reduction in fatigue over time. This slight reduction may have been balanced out by an increase in fatigue, at least initially as participants were challenged by an exercise regime most of them had never experienced before. Although resistance training is generally anaerobic, Larsson (1982) found that comparisons of participants engaged in both aerobic exercise and resistance training increased their maximum oxygen consumption equally. Further research (Kash, Boyer, VanCamp, Verity, and Wallace, 1990) showed the maximal oxygen consumption of exercisers was almost twice that of non-exercisers in an elderly sample, this may explain the differences in levels of fatigue between the experimental group and the control in the current study. Another interpretation of this effect may be that the sample engaged in resistance training was reasonably fit and active before the commencement of the programme, thus minimizing the physical fitness effects. This, however, must be approached with caution as the anecdotal information testifies to numerous verbal and recorded instances of physiological improvements wholly attributable to the resistance training. The small effect in the experimental group may further be explained by an Evans and Campbell study (1993) that found gym training elderly decreased their physical activity outside the gym to compensate for increased activity inside the gym.

The control exhibited elevated fatigue from Time 1 to Time 2 in a similar lineal trend as other POMS subscales.

H. POMS subscale: Vigor-Activity

This subscale captures the positive constructs of vigor and activity. The trends in the data on this variable contrast with those of the subscale fatigue, a negative construct. Even with large differences between the two groups at Time 1 the experimental group finished the 12 week programme and showed a significant increase in vigor-activity with a large effect size (1.14). The experimental group at Time 1 increased in vigor-activity to time 3 indicating positive effects of resistance training on the levels of vigor and activity. This is a very positive finding and of substantial benefit to this age group.

Very few studies have researched vigor and activity as a component of improved physical and psychological health. The current study indicates that regular physical activity in the form of planned exercise provides some psychological health benefits for older adults, as increases in strength were accompanied by elevated levels of activity and vigor. Conn, Minor, and Burks (2003) found no significant result for vigor in their study on sedentary older women's experience with exercise and Lane & Jarrett (2005) actually found decreases in vigor in elderly sportsmen. It could be that the exercise made them tired. More exposure to exercise over the long term might have shown greater vigor. Nevertheless, the results from the current study show a positive correlation between physical exercise and increases in vigor and activity, this finding supported by Mondin et

al, (1996), who found that a planned withdrawal from regular exercise decreased vigor and activity levels in a sample of habitual exercisers.

The control exhibited similar trends over time as other POMS subscales tension-anxiety, depression, anger, fatigue and confusion with a small overall decrease in vigor-activity by Time 3. This effect was not unexpected, as this group had been given specific instruction not to embark on any new exercise regime for the duration of the 12 week programme. This may support research by Courneya (1995), who found more positive cognitions amongst exercise preparers than in those merely contemplating exercise.

I. POMS subscale: Confusion-Bewilderment

This subscale produced a medium overall effect size although there were differences at Time 1. The experimental group reported being less confused at Time 1 than the control and this trend continued over time providing evidence of the positive benefits of resistance training on this variable. Furthermore they responded positively from Time 1 to Time 3, showing a decrease in confusion over the 12 week training period. With a significant effect size (0.40) this is a positive result for this group, thus it appears that exercise is a useful adjunct in reducing the effects of confusion, although amongst the elderly confusion is most often associated with the symptomlogy of delirium or dementia (Espino, Jules-Bradley, Johnston, and Mouton, 1998).

The control showed similar lineal trends as other subscales in the POMS inventory. The increase in confusion to Time 2 and decrease to Time 3 for this group cannot immediately be explained.

Confusion is associated with a number of other age related declines and may threaten independent living situations. Associated with strength gains after resistance training are improvements in physiological and psychological functioning. A major benefit has been the maintenance of physical function and health status in order to postpone dependency (Cronin, 2001).

J. POMS subscale: Friendliness

The results on this subscale indicate that resistance training increases friendliness over time. The experimental group increased slightly from Time 1 to Time 3. The control decreased in friendliness to time 3. Although there were differences at time 1 between groups indicating that the experimental group may have been friendlier at the beginning of the project, there was a medium to large effect size.

The participants in the experimental condition in the current study formed themselves into training groups over the 12-week period, not only to assist and support each other in a new environment but also for the purposes of social interaction. This supports research by McNeil et al, (1991), who found that much of the positive effect of exercise on emotive states is due not only to improved fitness but also to the social aspect of the exercise conditions.

The participants in the control condition generally decreased in friendliness over time to conclude at Time 3 less friendly than at Time 1. A possible explanation centres on participants frustration and discontent at being consigned to a control condition and less opportunity to meet new people.

State-Trait Anxiety Inventory, Rosenberg Self-Esteem Scale and the Positive Mood Component of the Affectometer 2

The other test instruments employed in this study to measure psychological wellbeing and life satisfaction were State-Trait Anxiety Inventory, Rosenberg Self-Esteem Scale and the positive mood component of the Affectometer 2. In the context of this study these tests were not statistically significant in what they determined to measure. The length of the training programme at 12 weeks may not have been of sufficient duration to bring about any significant change in the more resistant and entrenched emotive states that some of these instruments such as the Trait anxiety component of the STAI were specifically designed to access.

Suggested Future Research Directions

Current findings indicate a positive outcome for the elderly and their involvement in exercise. Future research would overcome some of the limitations of the current study and perhaps incorporate larger sample sizes and interventions that compare participants and groups who differ in ethnicity and gender. Additional investigation into the relationship between exercise and balance for falls prevention in the elderly would be a worthy pursuit. The measuring of psychological well-being would benefit from further research with more attention being paid to how a sense of well-being, purpose in life and value are measured and to what extent these constructs relate to an elderly persons own perception of what a "good life" really is.

While there are many exercise formats available, and although both aerobic and strength conditioning are highly recommended, only strength training can stop or reverse sarcopenia (age related loss of muscle mass) (Stock et al, 2001). Future research is needed to authenticate resistance-training regimes for the elderly as viable alternatives to pharmacological solutions.

Work is needed to determine whether a resistance training programme of the intensity used in this study would invoke further improvements beyond 12 weeks, not only for additional strength gains but very importantly for the maintenance of those gains The inclusion of functional fitness measures such as activities of daily living scale and progressive measurements of muscle mass and bone density would be useful as these seem to form critical components of well-being constructs. A future direction for research

investigating exercise and elderly groups may be the inclusion of activity of daily living measures and a confidence measurement scale.

CONCLUSION

The resistance-training programme employed in this study is an effective and low cost approach to improving the physical and psychological health of older adults. The major findings show significant improvement on most of the measures over the 12-week period in the experimental group compared to the control as well as increases from Time 1 to Time 3 for the same group. This study has addressed another possible option for extending the useable lifespan of the elderly generally overlooked by health professionals monitoring the wellbeing of this age group. Perhaps this exploratory investigation has paved the way for further research into a shift from diagnosis and cure to maintenance of independent living as this section of the population continues to occupy the most significant increases in the general populace.

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APPENDIX A

Information sheet

RESEARCHER INTRODUCTION

- Researcher: Kevin Maxwell Barker, Access Road, Kerikeri.

  Phone [redacted]

  Full-time Massey University student completing a Master of Arts in Psychology.

- Supervisor: Dr. Richard Fletcher, School of Psychology, Massey University Albany Campus. Phone (09) 414 0800 ext 9077, Email R.B.Fletcher@massey.ac.nz.

PROJECT INTRODUCTION

You are invited to participate in this study. I require 80 participants. All 80 will undergo a medical check at the Kerikeri Medical Centre and KeriMed. All participants will be randomly allocated to a gym group or a control group. In other words, everyone has an equal chance of being selected for either group.

- Gym Group: This group, 40 in number will train three times a week for twelve weeks in a programme designed specifically for 70-80 year olds. The training days will be Monday, Wednesday and Friday. On any one of those days there will be three sessions; a morning session (7am -8.30am), a midday session (11am-1pm), and an afternoon session (2pm-3.30pm). The gym programme will be supervised by gym staff and will take approximately 30-40 minutes to complete in a supportive and friendly environment.

- Control Group: This group is 40 in number and will not exercise for the 12-week period but will be given the opportunity to do the same gym programme after the 12-week period has concluded. This group is a very important feature of this study. I will offer the same rights, training and supervision as the experimental group. Those contemplating a resistance training programme or any planned exercise during the 12 week project will be asked to delay their training until the study is completed.

RECRUITMENT

I will running an article about the study in the Kerikeri Chronicle with my contact numbers. In addition, 1000 flyers will be distributed in the Northern News. There will be advertisements placed on the notice boards of the two supermarkets.

Being selected:

1. You will need to be aged between 70-80.
2. You will need to pass the medical check.
3. You will need to available three times a week (Monday, Wednesday and Friday).
4. Agree to the terms in the consent forms, be able to fill in the questionnaires and have a thorough understanding of this information sheet.

COSTS

- There will no cost to anyone participating in this study.
- There will no charge for going to the gym and training on the assigned days.
- There will be no cost for the medical check.

YOUR RIGHTS UNDER THIS STUDY (FOR ALL PARTICIPANTS)

You are under no obligation to accept this invitation. If you decide to participate, you have the right to....

- Decline to answer any particular question.
- Withdraw from the study
- Ask any questions about the study at any time during participation.
- Provide information on the understanding that your name will not be used unless you give express permission.
- Be given access to a summary of the findings when it is concluded.
- When a test questionnaire is given, completed and returned, this action implies consent, however you have the right to decline to answer any question.

APPENDIX B

Research questionnaires

PURPOSE IN LIFE TEST

Crumbaugh & Maholik (1964)

For each of the following statements, fill in the dot that would be most true for you. Note that the numbers always extend from one extreme feeling to its opposite kind of feeling. "Nuetral" implies no judgement either way. Try and use this rating as little as possible.

1. I am usually:

1						7
0	0	0	0	0	0	0
completely bored			neutral			enthusiastic exuberant

2. Life seems to me:

7						1
0	0	0	0	0	0	0
always exciting			neutral			completely routine

3. In life, I have:

1						7
0	0	0	0	0	0	0
no goals or aims at all			neutral			very clear goals and aims

4. My personal existence is:

1						7
0	0	0	0	0	0	0
utterly meaningless without purpose			neutral			very purposeful and meaningful

5. Every day is:

7						
0	0	0	0	0	0	0
constantly new and different			neutral			exactly the same

6. If I could choose,
I would:

1						7
0	0	0	0	0	0	0
prefer never to have been born			neutral			like nine lives just like this one

7. After retiring, I would:

7						1
0	0	0	0	0	0	0
do some of the exciting things I have always wanted to do			neutral			loaf completely for the rest of my life

8. In achieving life goals
I have:

1						7
0	0	0	0	0	0	0
made no progress whatever			neutral			progressed to complete fulfilment

9. My life is:

1						7
0	0	0	0	0	0	0
empty, filled only with despair			neutral			running over with exciting good things

10. If I should die today,
I would feel that my
life has been:

7						1
0	0	0	0	0	0	0
very worthwhile			neutral			completely worthless

11. In thinking of my life, I:

1						7
0	0	0	0	0	0	0
often wonder why I exist			neutral			always see a reason for my being here

12. As I view the world in relation to my life, the world:

1						7
0	0	0	0	0	0	0
completely confuses me			neutral			fits meaningfully with my life

13. I am a:

1						7
0	0	0	0	0	0	0
very irresponsible person			neutral			very responsible person

14. Concerning people's freedom to make their own choices, I believe people are:

7						1
0	0	0	0	0	0	0
absolutely free to make all life choices			neutral			completely bound by limitations of heredity and environment

15. With regard to death, I am:

7						1
0	0	0	0	0	0	0
prepared and unafraid			neutral			unprepared and frightened

16. With regard to suicide, I have:

1						7
0	0	0	0	0	0	0
thought of it seriously as a way out.			neutral			never given it a second thought

17. I regard my ability to a meaning, purpose or mission In life as:

7						1
0	0	0	0	0	0	0
very great			neutral			practically none

18. My life is:

7						1
0	0	0	0	0	0	0
in my hands and I am in control of it			neutral			out of my hands and controlled by external factors

19. Facing my daily tasks is:

7						1
0	0	0	0	0	0	0
a source of pleasure and satisfaction			neutral			a painful and boring experience

20. I have discovered:

1						
0	0	0	0	0	0	0
no mission or purpose in life			neutral			clear-cut goals and a satisfying life purpose

PROFILE OF MOOD STATES

McNair, Lorre & Droppleman (1971)

Directions: Below is a list of words that describe feelings people have. Please read each one carefully and fill in the dot to the right of the statement that best describes how you have been feeling during the past week, including today.

	Not at all	A little	Moderately	Quite a bit	Extremely
1. Friendly	0	0	0	0	0
2. Tense	0	0	0	0	0
3. Angry	0	0	0	0	0
4. Worn out	0	0	0	0	0
5. Unhappy	0	0	0	0	0
6. Clear headed	0	0	0	0	0
7. Lively	0	0	0	0	0
8. Confused	0	0	0	0	0
9. Sorry for things done	0	0	0	0	0
10. Shaky	0	0	0	0	0
11. Listless	0	0	0	0	0
12. Peeved	0	0	0	0	0
13. Considerate	0	0	0	0	0
14. Sad	0	0	0	0	0
15. Active	0	0	0	0	0
16. On edge	0	0	0	0	0
17. Grouchy	0	0	0	0	0
18. Blue	0	0	0	0	0
19. Energetic	0	0	0	0	0
20. Panic	0	0	0	0	0
21. Hopeless	0	0	0	0	0
22. Relaxed	0	0	0	0	0

	Not at all	A little	Moderately	Quite a bit	Extremely
23. Unworthy	0	0	0	0	0
24. Spiteful	0	0	0	0	0
25. Sympathetic	0	0	0	0	0
26. Uneasy	0	0	0	0	0
27. Restless	0	0	0	0	0
28. Unable to concentrate	0	0	0	0	0
29. Fatigued	0	0	0	0	0
30. Helpful	0	0	0	0	0
31. Annoyed	0	0	0	0	0
32. Discouraged	0	0	0	0	0
33. Resentful	0	0	0	0	0
34. Nervous	0	0	0	0	0
35. Lonely	0	0	0	0	0
36. Miserable	0	0	0	0	0
37. Muddled	0	0	0	0	0
38. Cheerful	0	0	0	0	0
39. Bitter	0	0	0	0	0
40. Exhausted	0	0	0	0	0
41. Anxious	0	0	0	0	0
42. Ready to fight	0	0	0	0	0
43. Good natured	0	0	0	0	0
44. Gloomy	0	0	0	0	0
45. Desperate	0	0	0	0	0
46. Sluggish	0	0	0	0	0
47. Rebellious	0	0	0	0	0
48. Helpless	0	0	0	0	0
49. Weary	0	0	0	0	0

	Not at all	A little	Moderately	Quite a bit	Extremely
50. Bewildered	0	0	0	0	0
51. Alert	0	0	0	0	0
52. Deceived	0	0	0	0	0
53. Furious	0	0	0	0	0
54. Efficient	0	0	0	0	0
55. Trusting	0	0	0	0	0
56. Full of pep	0	0	0	0	0
57. Bad tempered	0	0	0	0	0
58. Worthless	0	0	0	0	0
59. Forgetful	0	0	0	0	0
60. Carefree	0	0	0	0	0
61. Terrified	0	0	0	0	0
62. Guilty	0	0	0	0	0
63. Vigorous	0	0	0	0	0
64. Uncertain about things	0	0	0	0	0
65. Bushed	0	0	0	0	0

STATE-TRAIT ANXIETY QUESTIONNAIRE

Speilberger (1968, 1977)

STAI Form Y-1

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and fill in the dot to the right of the statement to indicate how you feel right now, right at this moment. There are no right or wrong answers. DO NOT spend too much time on any one statement, but give an answer which seems to describe your feelings best.

	Not at all	Somewhat	Moderately so	Very much
1. I feel calm	0	0	0	0
2. I feel secure	0	0	0	0
3. I am tense	0	0	0	0
4. I feel strained	0	0	0	0
5. I feel at ease	0	0	0	0
6. I feel upset	0	0	0	0
7. I am presently worrying over possible misfortune	0	0	0	0
8. I feel satisfied	0	0	0	0
9. I feel frightened	0	0	0	0
10. I feel comfortable	0	0	0	0
11. I feel self confident	0	0	0	0
12. I feel nervous	0	0	0	0
13. I am jittery	0	0	0	0
14. I feel indecisive	0	0	0	0
15. I am relaxed	0	0	0	0
16. I am content	0	0	0	0
17. I am worried	0	0	0	0
18. I feel steady	0	0	0	0
19. I feel confused	0	0	0	0
20. I feel pleasant	0	0	0	0

STAI Form Y-2

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and fill in the dot to the right of the statement to indicate how you generally feel. There are no right or wrong answers. DO NOT spend too much time on any one statement, but give the answer which seems to describe how you generally feel.

	Almost never	Sometimes	Often	Almost always
21. I feel pleasant	0	0	0	0
22. I feel nervous and restless	0	0	0	0
23. I feel satisfied with myself	0	0	0	0
24. I wish I could be as happy as others seem to be.	0	0	0	0
25. I feel like a failure	0	0	0	0
26. I feel rested	0	0	0	0
27. I am calm and collected	0	0	0	0
28. I feel that difficulties are piling up and I cannot overcome them	0	0	0	0
29. I worry too much over something that really doesn't matter	0	0	0	0
30. I am happy	0	0	0	0
31. I have disturbing thoughts	0	0	0	0
32. I lack self-confidence	0	0	0	0
33. I feel secure	0	0	0	0

	Almost never	Sometimes	Often	Almost always
34. I make decisions easily	0	0	0	0
35 I feel inadequate	0	0	0	0
36. I am content	0	0	0	0
37. Some unimportant things run through my mind and bother me	0	0	0	0
38. I take disappointments so keenly that I can't put them out of my mind	0	0	0	0
39 I am a steady person	0	0	0	0
40. I get in a state of tension as I think over my recent concerns and interests	0	0	0	0

AFFECTOMETER 2

A Rapid Inventory of Subjective Wellbeing

Karmmann & Flett (1985)

Directions: Affectometer 2 is a questionnaire for reporting *how often* you have certain general feelings which are related to your emotional satisfaction and life fulfilment.

There is no point in filing out this questionnaire unless you describe your own honest feelings as best you can.

The items are either sentences or adjectives which best describe different feelings about yourself and your life. For each item please check how often you had that feeling over the past *two weeks.*

You have 5 choices for *how often* you have felt each feeling.

These are: Not at all
Occasionally
Some of the time
Often
All of the time

Fill in the dot under one of the 5 choices which shows how often the item applies to you. You may wish that you could choose a phrase which is in between one of the choices given, but if you choose the one which comes *closest* to your experiences the results will be very accurate. You do not need to spend a long time on the item.

Form A-1

	Not at all	Occasionally	Some of the time	Often	All of the time
1. My life is on the right track	0	0	0	0	0
2. I seem to be left alone when I don't want to be	0	0	0	0	0
3. I feel I can do whatever I want to	0	0	0	0	0
4. I think clearly and creatively	0	0	0	0	0
5. I feel like a failure	0	0	0	0	0
6. I like myself	0	0	0	0	0
7. Nothing seems very much fun anymore	0	0	0	0	0
8. I can't be bothered doing anything	0	0	0	0	0
9. I feel close to people around me	0	0	0	0	0
10. I feel as though the best years of my life are over	0	0	0	0	0

Form A-2

	Not at all	Occasionally	Some of the time	Often	All of the time
1. My future looks good	0	0	0	0	0
2. I have lost interest in other people and don't care about them	0	0	0	0	0
3. I have energy to spare	0	0	0	0	0
4. I smile and laugh a lot	0	0	0	0	0
5. I wish I could change some parts of my life	0	0	0	0	0
6. My thoughts go around in useless circles	0	0	0	0	0
7. I can handle any problem that comes up	0	0	0	0	0
8. My life seems stuck in a rut	0	0	0	0	0
9. I feel loved and trusted	0	0	0	0	0
10. I feel there must be something wrong with me	0	0	0	0	0

Form B-1

	Not at all	Occasionally	Some of the time	Often	All of the time
1. Satisfied	0	0	0	0	0
2. Lonely	0	0	0	0	0
3. Free and easy	0	0	0	0	0
4. Clear-headed	0	0	0	0	0
5. Helpless	0	0	0	0	0
6. Impatient	0	0	0	0	0
7. Useful	0	0	0	0	0
8. Depressed	0	0	0	0	0
9. Loving	0	0	0	0	0
10. Hopeless	0	0	0	0	0

Form B-2

1. Optimistic	0	0	0	0	0
2. Withdrawn	0	0	0	0	0
3. Enthusiastic	0	0	0	0	0
4. Good-natured	0	0	0	0	0
5. Discontented	0	0	0	0	0
6. Confused	0	0	0	0	0
7. Confident	0	0	0	0	0
8. Tense	0	0	0	0	0
9. Understood	0	0	0	0	0
10. Insignificant	0	0	0	0	0

SELF-ESTEEM SCALE

Rosenberg (1979)

Directions: For each question use the scale below as a guide and fill in the dot that matches the statement you most closely identify with.

	Strongly agree	Agree	Disagree	Strongly disagree
1. On the whole I am satisfied with myself	0	0	0	0
2. At times I think I am no good at all	0	0	0	0
3 I feel that I have a number	0	0	0	0
4. I am able to do things as most other people	0	0	0	0
5. I feel I do not have much to be proud of	0	0	0	0
6. I certainly feel useless at times	0	0	0	0
7. I feel that I'm a person of worth, at least on a equal plane with others	0	0	0	0
8. I wish I could have more respect for myself	0	0	0	0
9. All in all, I am inclined to feel I am a failure	0	0	0	0
10. I take a positive attitude towards myself	0	0	0	0

APPENDIX C

Exercise Prescription

Training programme for 70-80 yr olds

Treadmill or rower or bike for 5 minutes		Sets	Reps	Weight
1. Incline Dumbbell Press	(upper body)	2	10	
2. Shoulder Press	(upper body)	2	10	
3. Leg Press	(lower body)	2	15	
4. Leg Extensions	(lower body)	2	10	
5. Assisted chin-up Machine	(upper body)	2	8	
6. Pulley upright rows	(upper body)	2	8	
7. Swiss Ball Crunches	(abs)	2	10	
8. Swiss Ball Lunges	(lower body)	2	10	
9. Pulley Curls	(upper body)	2	10	
10.Pulley Pushdowns	(upper body)	2	10	
11.Crunches on Bench	(abs)	1	15	

12.Treadmill or rower for 5 minutes

13. Stretches as specified.

APPENDIX D

Participant consent form

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I agree to participate in this study under the conditions set out in the Information Sheet.

Signature.....Date.....

Full name (printed).....

Version no. akx/04/08/229

6th September 2004

APPENDIX E

Health checklist

Name.....Age.....Sex.....

Location.....Date.....

Height.....Weight.....Heart Rate.....

Systolic BP.....Diastolic BP.....

Please list any medications you are currently using

.....

.....

.....

Please answer the following questions

1. Do you suffer from or have you ever been treated for diabetes?	YES	NO
2. Have you ever had a stroke?	YES	NO
3. Do you have or have you ever been treated for heart disease?	YES	NO
4. Do you suffer from joint, limb or movement disorders?	YES	NO
5. Do you suffer from or have you ever been treated for a mental illness?	YES	NO
6. Do you suffer from or have you ever suffered from a neuromuscular disorder?	YES	NO
7. Do you suffer from or have you ever been treated for seizures, fits, convulsions or epilepsy?	YES	NO
8. Do you get chest pain or tightness during exertion?	YES	NO

9. Do you get short of breath on…?

Climbing stairs?

Walking?

Getting dressed?

None of the above

10. Could you walk 800 metres without problems? YES NO

11. Do you play ant sport? YES NO

Approved and Authorised by:

Full name (printed).....

Signature.....Date.....

Registration No. .....

APPENDIX F

Medical consent form

I..... (Full name-printed) give permission for the assigned staff of the Kerikeri Medical Centre and KeriMed to access my records. I understand that all the confidentialities associated with the doctor-client relationship will be observed.

Signature.....Date.....

APPENDIX G

I NEED YOU FOR A STUDY

Conducted by Kevin Barker, Graduate Psychology Student

Supervised by Dr. Richard Fletcher, Massey University

I want to recruit 80 people for my study, aged between 70-80. This group will be randomly selected to one of two conditions, a gym group and a control group. For the gym group we offer a fully supervised weight-training programme at ASB Gymfit Kerikeri, three days a week for 12 weeks! Although the control group will not exercise for this period, we offer the same programme after the project has finished.

Come, join up for some fun and enjoyable times at absolutely no cost to you!.

Participants must...

- Be between the ages of 70-80.
- Undergo a medical check.
- Be available Monday, Wednesday and Friday for approximately 30-40 minutes per gym session for 12 weeks.

CONTACT KEVIN BARKER

[redacted]