Factors that Influence Physical Activity in Prostate Cancer Patients

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Signed…… Date……..

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Abstract

This exploratory study determines the physical activity intentions and behaviours in men (n=81) with prostate cancer who are currently receiving androgen deprivation therapy, and identifies factors that influence these behaviours. The quality of life of men with prostate cancer was also measured. The Theory of Planned Behaviour is utilised as a predictor of participant's intention to be physically active. Men (58-92 years of age) who were registered as receiving androgen deprivation therapy for prostate cancer through the Auckland District Health Board were invited to be involved in this study. Frequency testing indicated that the majority of men were regularly physically active, but that only a small proportion of participants (11%) engaged in resistance or strength training activities. Hierarchical multiple linear regression analyses indicated that the components of the Theory of Planned Behaviour accurately predicted intention to exercise. Of the three components of the Theory of Planned Behaviour, attitude is the most important variable in terms of intention to exercise, relative to subjective norm and perceived behavioural control. In terms of actual activity, the components of the Theory of Planned Behaviour partly predict activity, with perceived behavioural control being the greatest determinant for one participating in activity. Two-tailed independent samples *t*-tests were performed to compare the norms of the current quality of life data, with existing New Zealand and Australian normative data sets. Results indicated that the means of all three data sets are very similar in the psychological, social and environmental domains, but are close to being statistically different in the physical domain, indicating that men with prostate cancer who are receiving androgen deprivation therapy have a lower physical quality of life than age-matched healthy samples.

Introduction

Little is known regarding cancer survivors' readiness to make lifestyle changes nor their interest in physical activity. Although many cancer survivors already practice behaviours associated with a healthy life-style, there still are many who choose not to or cannot (Demark-Wahnefried, Peterson, McBride, Lipkus & Clipp, 2000). Research suggests that early stage prostate carcinoma patients are among a group of cancer patients who are ideal targets for life-style change interventions because their level of interest is high. Moreover, despite the diagnosis of cancer, the majority of these individuals appear to believe that they are in good to excellent health (Demark-Wahnefried et al., 2000).

Cancer Prevalence – Worldwide

Cancer is currently ranked the second leading cause of death worldwide. In 2005 there were 12 million new cases reported globally and 7.6 million cancer-related deaths recorded. The number of new cancer mortalities reported per year are expected to continue to increase rapidly, and at least 11.4 million people are expected to die worldwide of cancer by 2015 (Hall, 2008). In 2002 newly collected data showed a decrease in the United States cancer death rate. However, the number of cases is expected to increase because of the growth and an aging of the population (Dollinger, Rosenbaum, Tempero & Mulvihill, 2002).

Cancer Prevalence – New Zealand

In 2005 (the most recent year for which statistics are available) cancer remained the leading cause of death in New Zealand, accounting for 29.4 percent of all deaths (Ministry of Health, 2009). Cancer was the leading cause of death among both males (31.0 percent of all deaths) and females (27.7 percent of all deaths) (Ministry of Health, 2009). These rates had increased by 1.5 percent and 6.8 percent, respectively, from 2004 to 2005 (Ministry of Health, 2009).

In New Zealand there were 18,610 new registrations of cancer in 2005 (9647 for males, and 8963 for females), and 7971 deaths from cancer (4184 for males, and 3787 for females). Registrations had decreased by 3.2 percent from 2004, but increased by 17.3 percent from 1995. Deaths from cancer had also decreased from 2004, but at a lower rate (2.1 percent). Compared with 1995, cancer deaths had increased by 7.4 percent (Ministry of Health, 2009).

Data suggest that the ageing New Zealand population largely drove the increase in the number of new cancer registrations. However, changes in the clinical definition of cancer have also influenced changes in the overall number of cancer registrations since 1995. Some of these changes would have had the effect of reducing the number of registrations, while others would have had the effect of increasing the number of new registrations (Ministry of Health, 2009).

Site Specific Cancer Registrations

For males, prostate cancer was the most commonly registered cancer in 2005, accounting for 25.6 percent of male registrations. Among all cancer registrations in 2005 for both men and women, the most common was cancer of the colorectum and anus (2716 new cases), followed closely by cancer of the breast (2479) and cancer of the prostate (2471). The five leading sites, cancer of the colorectum and anus, breast cancer, prostate cancer, malignant melanoma of the skin (2017) and cancer of the trachea, bronchus and lung (1659), together accounted for 61 percent of all registered cancers in 2005 (Ministry of Health, 2009).

Site Specific Cancer Deaths

The main causes of cancer-related deaths for males were cancer of the trachea, bronchus and lung (864), cancer of the colorectum and anus (608), and prostate cancer (564) (Cancer: New Registrations and Deaths, 2005).

For both genders, cancer of the trachea, bronchus and lung (1451 deaths) was the leading cause of death from cancer in New Zealand in 2005, followed by cancer of the colorectum and anus (1222). Together with cancer of the breast (653) and prostate cancer (564), they accounted for 48.8 percent of all deaths from cancer in 2005 (Ministry of Health, 2009). Figure one displays the frequency of registrations and deaths of specific cancers as reported in 2005.

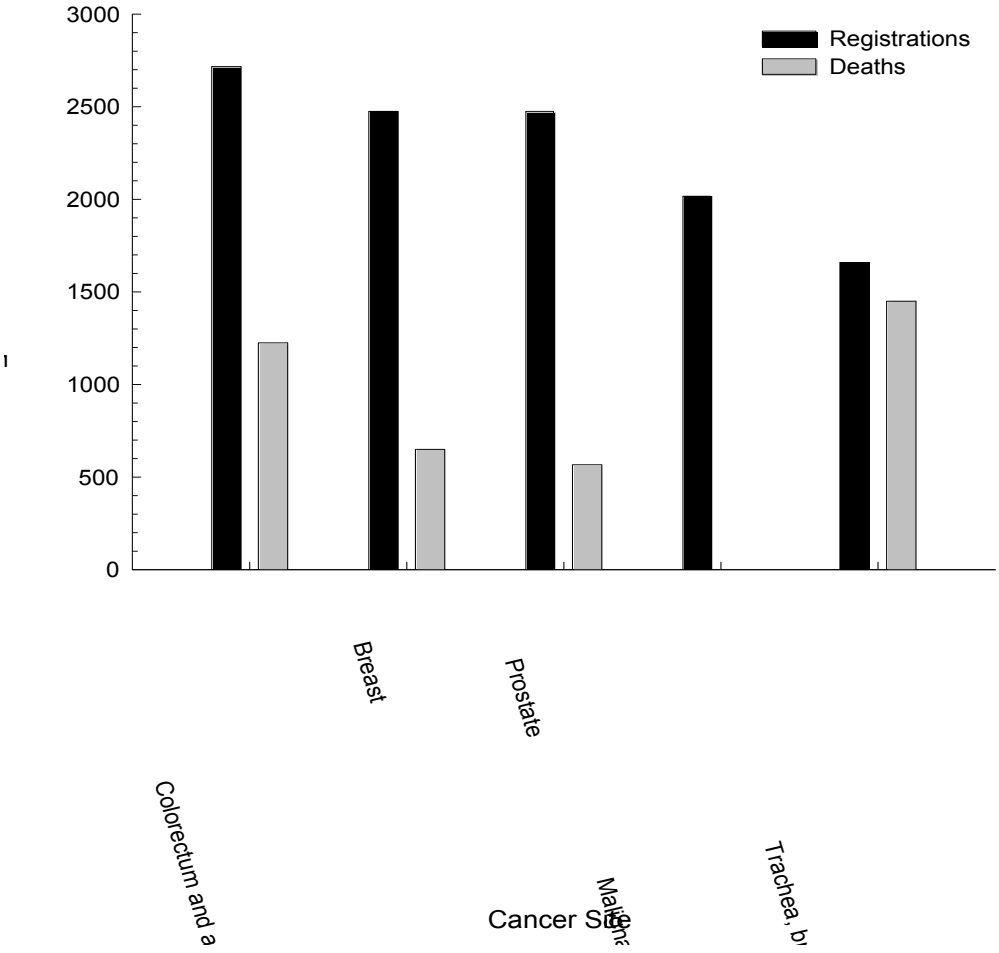

Figure 1: *Site specific highest incidence of new cancer registrations and deaths in New Zealand in 2005.*

Considering the high prevalence of prostate cancer in men, it is compelling that there has not been a substantial movement towards making society aware of these statistics (Schulman, Kirby & Fitzpatrick, 2003). Compared with breast cancer, and melanoma of the skin, there is minimal community and population education and promotion to being aware of the signs and symptoms associated with prostate cancer, and the importance of check-ups with general practitioners. However, prostate cancer remains the highest registered cancer in males, and the fourth highest cause of cancer-related death in males in New Zealand

Cancer Registrations and Deaths by Ethnicity

Ethnic data indicate that there were 1377 new cancer registrations for Maori in 2005 (598 male and 779 female registrations). Within the Maori population, there were 760 deaths from cancer (369 males, and 391 females). Among the Pacific population of New Zealand, there were 575 cancer registrations (267 males and 308 females), and 244 deaths (115 males and 129 females) from cancer (Ministry of Health, 2009).

Age-Standardised Cancer Rates in New Zealand

Age-standardised rates are a valid way of comparing groups that have different age structures (e.g., one group may be older on average than the other) as well as comparing data from the same group where the age structure is changing over time. Age-standardisation shows how comparative differences and trends over time reflect disease patterns rather than differences in population age profiles (Ministry of Health, 2006). Age-standardised rates show the number of events (e.g., cancer registrations or deaths) per 100,000 of the population in each age group for each year. They adjust for differences in age distribution of the populations being compared. They are calculated by the direct standardisation method, which multiplies the age-specific rates by a standard population. The standard population used in the Cancer: New Registrations and Deaths (2005) is the World Health Organisation world population.

Although the number of cancer registrations had risen, especially for males, over the period 1995 to 2005, *age-standardised rates* decreased significantly for males.

Among males aged 65 to 74 years and 75 years and older, the age-specific rates had also fallen significantly since 1995. Age-specific rates show the proportion of new cases or deaths in a given group. They are calculated by dividing the number of new cases or deaths by the corresponding number of people in the age group, then multiplying the result by a constant (in this case 100,000) (Ministry of Health, 2009). Age-specific rates for the male age group 45-64 years and each of the female age groups 45 years and older did not changed significantly over this period (Ministry of Health, 2009).

The age-standardised rate for cancer registrations among males was 376.3 per 100,000 males in 2005, less than the 2004 rate of 404.1 and significantly less than the 1995 rate of 431.9. The female registration rate was 312.7 per 100,000 females in 2005, a decrease from the 2004 rate of 323.1 in 2004 and the 1995 rate of 325.6 (Ministry of Health, 2009).

Projection of Cancer Registrations and Deaths

For males, the age standardised 'all adult cancer' mortality rate is projected to fall to 198 per 100,000 in 2012, a 20% decline from 1997. Despite these accelerated declines in the risk of dying from cancer, the annual number of cancer deaths is forecast to increase each year over the forecasting period, reflecting the impact of population growth and, increasingly, an aging population. Among males, 4554 cancer related deaths are projected for 2012, an increase of 17% over the 1997 mortality rate. Total cancer deaths are projected to increase from 7447 deaths in 1997 to 8963 deaths in 2012, a 20% increase over the 15 year forecasting period (Ministry of Health, 2002).

Age Specific Cancer Rates in New Zealand

Cancer is a disease that tends to emerge later in life (Ministry of Health, 2009). In 2005, 95.4 percent of deaths from cancer occurred at 45 years of age and over, with 70.9 percent of deaths occurring at 65 years and over. Of the 9647 male registrations in 2005, 31 percent were in the 75 years and over age group, 30 percent in the 65 to 74 years age group and 33 percent in the 45 to 64 years age group. Of the 4184 male deaths from

cancer recorded in 2005, 46 percent were in the 75 years and over age group, 27 percent in the 65-74 age group and 23 percent in the 45 to 64 years age group (Ministry of Health, 2009). In the 25 to 44 year age group there were 1499 registrations for cancer (549 males and 950 females), accounting for 8.1 percent of all cancer registrations in 2005. There were 302 deaths from cancer in this age group (123 males and 179 females), accounting for 3.8 percent of all cancer deaths in 2005. For children and youth (people aged under 25), there were 266 registrations for cancer in 2005 (134 males and 132 females), 1.4 percent of all cancer registrations, and 65 deaths (33 males and 32 females), accounting for 0.8 percent of all cancer deaths (Ministry of Health, 2009) (See Figure 2).

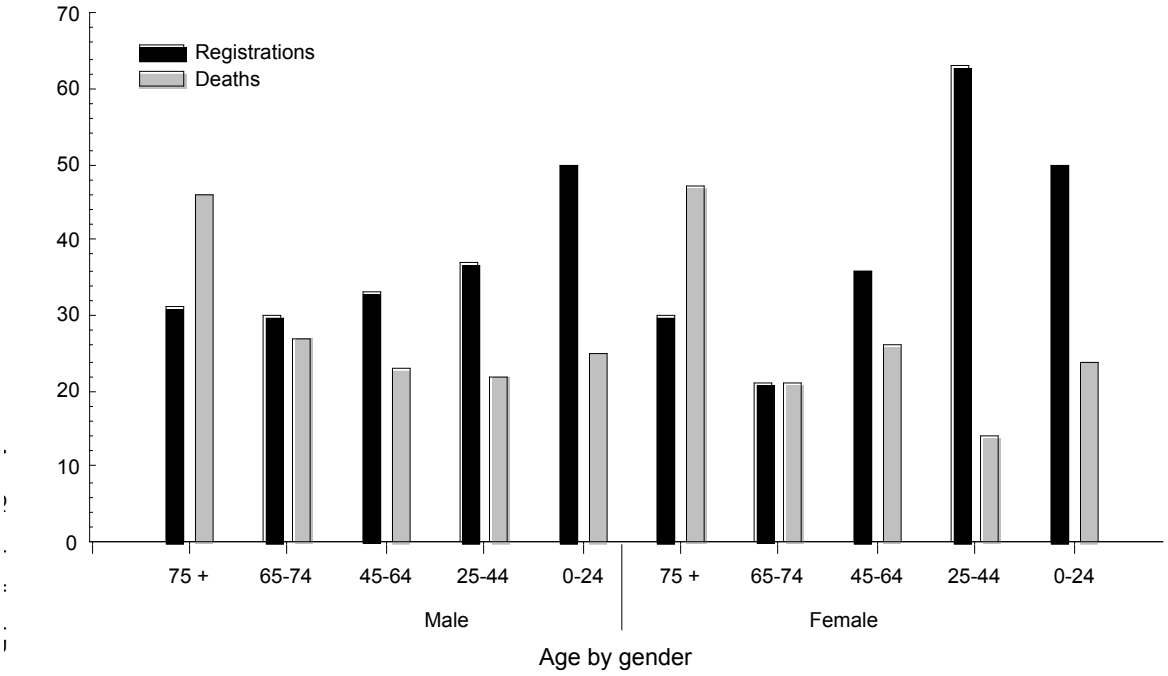

Figure 2: *Age standardised cancer registrations and deaths in New Zealand in 2005.*

Prostate Cancer

The sixth most common cancer in the world, prostate cancer is ranked as the fourth most common cancer among males worldwide (Parkin, Pisani & Ferlay, 1999, cited in Wallace & Powel, 2002). In the United States of America prostate cancer is the

most common male cancer, representing 15% of all cases of cancer in men (Harrington & Badger, 2009). The lifetime probability of developing prostate cancer is about 16%. According to the American Cancer Society, five-year survival rates for all stages of prostate cancer have increased during the past 20 years from 67% to a current relative five-year survival rate of 98%, and most men diagnosed and treated for prostate cancer survive for many years (Harrington & Badger, 2009). Although survey polls indicate that cancer is among the worst fears of Americans, advances in the areas of early detection and treatment have resulted in a recent decline in cancer-related mortality (Demark-Wahnefried, et al., 2000). Nearly all men will develop prostate cancer if they live long enough, although it may never cause symptoms or be diagnosed (Bostwick, Crawford, Higano & Roach, 2005).

Around 2000 to 3000 men are diagnosed with prostate cancer in New Zealand each year (Cancer Society of New Zealand, 2001). According to the New Zealand Ministry of Health (2009), an estimated 33 percent of men over 50 years of age had a Prostate Specific Antigen (PSA) test in 2007, and 54 percent of men over 50 years of age have had a test at some stage over the three-year period from 2005 to 2007. The age groups most likely to have a PSA test were those between 65 and 74 years. Approximately forty percent of men in this age group have had a test over a one-year period and approximately sixty percent of men in this age group have had a test over a three-year period (MOH, 2009). The PSA test is a blood test that measures the level of prostate specific antigen in the blood. Prostate specific antigen is a glycoprotein that is manufactured almost exclusively by the prostate gland. Prostate specific antigen is produced for the ejaculate where it liquefies the semen in the seminal coagulum and allows sperm to swim freely (Prostate Specific Antigen Research, n.d.). In the presence of prostate cancer, PSA may rise, but it may also be elevated in other non-malignancies (Wallace & Powel, 2002).

The Biology of Prostate Cancer

The prostate gland is made up of compressed tissue and an intricate series of channels and canals called ducts and ductules, which are lined by fluid-producing cells. These cells empty their secretions into the ducts and ductules and the prostate squeezes those fluids into the urethra to mix with sperm during ejaculation (Bostwick et al., 2005). The prostate gland is located between the bladder and the rectum and wraps around the urethra (See Figure 3).

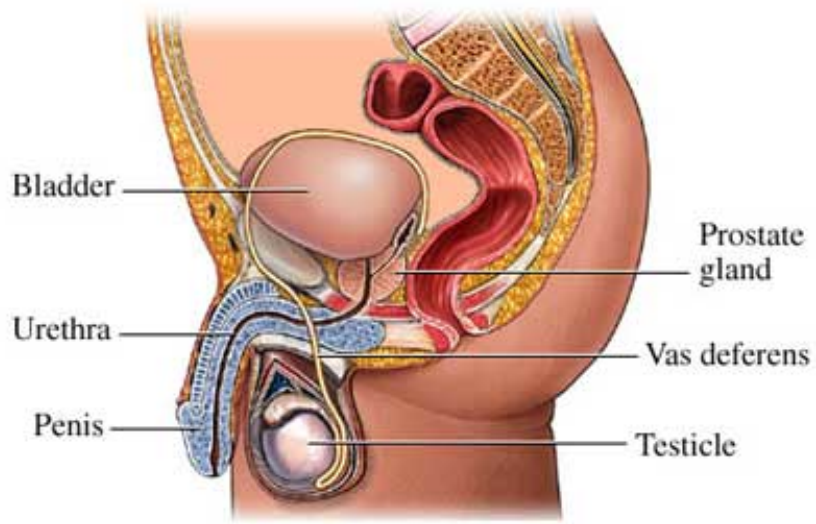

Figure 3: *Illustration of the biology of the prostate gland (Sourced from the University of Liverpool website).*

Prostate cancer is defined as a malignant tumour within the prostate gland (Garnick, 1994). As with any cancer, if it is advanced or left untreated in the early stages it can eventually spread through the blood and lymph fluid to other organs. Compared to other cancers, prostate cancer tends to be slow growing, and as many as 90% of all prostate cancers remain dormant and clinically unimportant for decades.

The prostate gland undergoes many changes during the course of a male's life. At birth, the prostate is about the size of a pea. It grows only slightly until puberty, when it begins to enlarge rapidly, attaining normal adult size and shape, about that of a walnut,

when a man reaches his early 20s. The gland generally remains stable until men reach their mid 40s, when, in most men, the prostate begins to enlarge again through a process of cell multiplication.

Very early prostate cancers, which are contained within the prostate gland, are called localised cancers. Localised cancers do not usually produce symptoms, may not develop into a serious cancer, and may not require treatment. Prostate cancers that grow within the prostate gland and spread to the surrounding tissues are called invasive prostate cancer (Cancer Society of New Zealand, 2001).

Near the prostate, there is a collection of small lymph glands that are part of the lymphatic system, one of the body's natural defenses against infection. Lymph glands filter out bacteria and other harmful agents. A network of very thin lymph vessels connects the major lymph glands in the abdomen, pelvis, groin, neck and armpits. Cancer that develops in the prostate may spread (or metastasize) via the lymphatic system or bloodstream to other parts of the body, such as the bones (Cancer Society of New Zealand, 2001). Prostate cancer tends to spread to lymph nodes, bones (especially ribs and bones around the hip and lower back), liver and lungs. Cancer cells that spread to other parts of the body will grow, causing symptoms such as bone pain, one of the most common complaints (Prostate Cancer Foundation, 2009).

The speed at which prostate cancer grows varies from man to man. In some men the cancer grows very slowly, in others more rapidly. A cancer is often very hard to find when it is located only within the prostate. This is because it may not cause symptoms and may be too small for a doctor to feel during a routine rectal exam (PCF, 2009). It is important to note that some men with prostate cancer do not experience symptoms or are unaware of the significance of some of the symptoms they may be experiencing (Cancer Society of New Zealand, 2001).

The Aetiology of Prostate Cancer

The causes of prostate cancer are not known, however, environmental factors such as exposure to cadmium and zinc, and infectious agents transmitted through sexual activity have been linked to prostate cancer (Wallace & Powel, 2002). The Western diet and lifestyle is also associated with an increased risk of prostate cancer (Wallace & Powel, 2002) as it is characterised by a highly caloric diet, rich in fat, refined carbohydrates and animal protein, combined with low physical activity, resulting in an overall energy imbalance (World Health Organization, 2003). Factors such as age, race, familial factors, and genetic predisposition are also hypothesised to play a role in the development of prostate cancer (Wallace & Powel, 2002; Cancer Society of New Zealand, 2001). There is also some evidence to support the idea that a diet high in animal fat increases the chance of developing prostate cancer (Cancer Society of New Zealand, 2001). Studies have shown that prostate cancer is almost as common in Japanese men as it is in American men, but very few Japanese men living in Japan die from this disease. Japanese men who live in the United States, however, develop and die from prostate cancer at the same rate as American men (Dollinger, Rosenbaum, Tempero & Mulvihill, 2002). Most researchers believe that a high-fat diet with excess caloric consumption may be at least partially responsible for these differences. Interestingly, North America has the highest incidence of prostate cancer in the world, in contrast to China where men are at little risk, 92.39 vs. 1.08 per 100,000, respectively (Parkin, Pisani & Ferlay, 1999 cited in Wallace & Powel, 2002), suggesting that either genetic or lifestyle factor may be a determinant in a man developing the disease. A diet high in fruits, vegetables, fibre, and soy products is believed to be associated with a reduced risk. At present, scientists are investigating the roles of Vitamin E, lycopene, selenium, and other nutrients in preventing or reducing the severity of prostate cancer (Dollinger, Rosenbaum, Tempero & Mulvihill, 2002).

Some men are at greater risk of developing prostate cancer than others, and genetic factors play an important role in this (Dollinger, Rosenbaum, Tempero & Mulvihill, 2002). If a man has a close relative such as a brother or a father who has

prostate cancer, he is much more likely to develop the disease. With one close relative having prostate cancer, a man is three times more likely than the general male population to develop prostate cancer. If there are two close relatives with prostate cancer, the risk increases to seven times (Dollinger, Rosenbaum, Tempero & Mulvihill, 2002). Men who have these genetic factors tend to develop the disease earlier in their lives and have a more aggressive form of the disease.

Prostate Cancer, Ethnic Trends and Socio-Economic Status

In New Zealand, prostate cancer exhibits considerable differences among ethnic groups in relation to incidence and mortality (Sneyd, 2008). Prostate cancer has a lower incidence in Maori compared with non-Maori and non-Pacific people, however, mortality rates for prostate cancer are higher in Maori and Pacific people than in non-Maori and non-Pacific people (Dachs, Currie, McKenzie, Jefferys, Cox, Foliaki, LaMarchand & Robinson, 2008).

The international data for incidence and mortality rates for prostate cancer also vary according to ethnic group (Sneyd, 2008). Prostate cancer incidence and mortality rates among Black American men are higher than any other racial groups in the US and about twice those in White American men. Black American men are also more likely to present with advanced prostate cancer (Sneyd, 2008). Results relating to socioeconomic status (SES) differ. Prior to PSA testing being widely available, Liu, Cozen, Bernstein, Ross & Deapen (2001) found no variations in prostate cancer incidence rates according to SES classification for men in any racial/ethnic group who were diagnosed with prostate cancer, however, statistically significant trends of increasing prostate cancer incidence with progressively higher levels of SES were found for all men except Asians (p = .01 for white men, p = <. 001 for black men, p = .02 for Hispanic men, p = .11 for Asian men, and p = .01 for all men combined) who were diagnosed with prostate cancer post-1988, after the PSA test was widely available. Liu et al., (2001) report that the higher prostate cancer incidence rates with increasing SES after PSA testing became available suggest that PSA screening was used differently by men in different SES groups, regardless of

their race or ethnicity. It was also found that men in the higher SES groups were diagnosed more frequently with localized disease than were men in the lower SES groups. Likewise, men of high SES were diagnosed less frequently with distant disease (prostate cancer that had metastasized) than were men of low SES. These trends further support the likelihood that access to PSA testing has contributed to the changing relationship between SES and prostate cancer incidence in recent years (Liu et al., 2001). The data support a familiar social phenomenon that individuals with greater resources are more likely to benefit from improvements in the detection of disease, in treatments of disease, or in knowledge about disease risks than individuals with limited resources, who are disadvantages with respect to access, quality, and utilization of medical services (Adler, Boyce, Chesney, Cohen, Folkman & Kahn, 1994; Bennett, Ferreira, Davis, Kaplan, Weinberger, Kuzel, Seday & Sartor, 1998). Despite having higher prostate cancer incidence rates, men of higher SES have a better prostate cancer survival than men of lower SES (Harvei & Kravdal, 1997; Dayal, Polissar & Dahlberg, 1985), almost certainly due in large part to the early detection provided by PSA testing (Liu et al., 2001).

In New Zealand, survival for 20 combined cancer sites was shown to be highest in non-Maori and non-Pacific people, followed by Pacific people, and then by Maori, for whom survival is lowest (Dachs et al., 2008). For prostate cancer, five-year survival was 61% in Maori, 87% in the Pacific population, and 86% in the non-Maori and non-Pacific population. Some, but not all, of this disparity was explained by recorded stage at diagnosis (Dachs et al., 2008).

The Role of Testosterone in Prostate Cancer

Although the causes of prostate cancer remain unknown, it is known that male hormones, especially testosterone, stimulate the growth of cancer cells in the prostate. The relationship between testosterone levels in the body and prostate cancer is controversial. It is known that testosterone provides nourishment for prostate cancer cells and helps them grow and develop. However, the incidence of prostate cancer increases

with age, while testosterone levels begin to decline with age. Therefore a paradox exists regarding the role of testosterone in prostate cancer (Bostwick et al., 2005). More research is needed to examine the potential roles of androgens such as testosterone and dihyrdotestosterone, leptin (a hormone related to fat concentration in the body), and the female hormone, estrogen, in the development of prostate cancer (Bostwick et al., 2005).

Androgen Deprivation Therapy

The prostate cancer rate is declining due to PSA screening, but also due to Androgen Deprivation Therapy (Oliver, May & Gunnell, 2001). Androgen Deprivation Therapy (ADT) has been demonstrated to improve overall survival in both localised and metastatic prostate cancer (Culos-Reed, Robinson, Lau, O'Connor & Keats, 2007). Androgen Deprivation Therapy, also called androgen suppression therapy or hormone therapy, uses drugs or surgery to suppress or block the male hormones (i.e., androgens), particularly testosterone and dihydrotestosterone, that determine male secondary sex characteristics and stimulate prostate cell growth (American Cancer Society, 2009). When prostate cells, both healthy and cancerous, are deprived of androgens, they no longer proliferate and eventually die (American Cancer Society, 2009). Androgen Deprivation Therapy is not a cure for prostate cancer, but it can help control symptoms and disease progression (Dollinger, Rosenbaum, Tempero & Mulvihill (2002).

Although each of the successful treatment options for men with prostate cancer (surgery, radiation therapy, watchful waiting, or hormonal therapy) is accompanied by Quality of Life (QoL) implications, it is the side effect profile associated with ADT that is of particular interest. The use of ADT in the treatment of men with prostate cancer has risen sharply in the last decade, partially based on evidence supporting specific indications for its use in men with high-risk features who are undergoing radiotherapy (Saigal, Gore, Krupski, Hanley, Schonlau & Litwin, 2007). Currently, in the United States of America, about one third of men in treatment for prostate cancer are receiving ADT, and it is estimated that more than 50% of all men with prostate cancer will receive ADT as an intervention. Androgen deprivation therapy is particularly difficult, as

significant, deleterious side effects occur because of the reduction of testosterone to castrate levels (Harrington & Badger, 2009).

Quality of Life and Side-Effects Associated with Androgen Deprivation Therapy

Reductions in testosterone levels associated with ADT may cause many undesirable side-effects, including direct effects on body composition. Specifically, a loss of muscle and bone mass, an increase in fat mass, unfavourable lipid profile, depression, and compromised physical and physiological functioning (Cassileth, Soloway & Vogelzang, 1992; Cleary, Morrissey & Oster, 1995; Diamond, Higano, Smith, Guise & Singer, 2004; Galvao, Nosaka, Taaffe, Spry, Kristjanson, McGuigan, Suzuki, Yamaya & Newton, 2006; Holzbeierlein, McLaughlin & Thrasher, 2004; Stege, 2000; Thorsen, Courneya, Stevinson & Fossa, 2008). Other common side effects of androgen suppression drugs are:

- Psychological disturbances, including emotional distress and mental fatigue
- Sexual disturbances, including sexual dysfunction and loss of sexual drive
- Physical and somatic affects such as swelling of the breasts (gynecomastia) nausea and vomiting, hair loss and anemia
- Other significant impairments to quality of life, particularly in men who had no symptoms beforehand, and whose cancer has not metastized.

In addition, there is growing evidence that ADT is a risk factor for diabetes and heart disease, and it is associated with increased cardiovascular morbidity in men with prostate cancer and may lower overall survival in men with low risk disease (Keating, O'Malley & Smith, 2006; Saigal, et al., 2007).

Continuous ADT is associated with significant morbidity, which may compromise a patient's QoL (Eaton & Lepore, 2002), potentially inducing fatigue, osteoporosis, muscle atrophy, strength loss, depression, and a loss of sexual functioning (Culos-Reed, Robinson, Lau, O'Connor & Keats, 2007). Importantly, a number of these side effects associated with ADT are closely related to an increased risk of developing other chronic conditions (Galvao et al., 2006).

It has previously been demonstrated that a side-effect of men receiving ADT is comprised skeletal integrity, as assessed by lower bone mineral density and higher levels of biochemical markers of bone turnover (i.e., bone formation and bone resorption markers) (Dacal, Sereika & Greenspan, 2006). This may explain why prostate cancer patients on ADT have up to four times higher the falls-related fracture rates than age-matched controls (Lopez, Pena, Hernandez, Val, Martin & Riancho 2005; Oefelein, Ricchiuti, Conrad & Resnick, 2002; Shahinian, Kuo, Freeman & Goodwin, 2005). This is a concern as these falls-related fractures may become much more of a threat to life than the prostate cancer itself. Such falls are also economically expensive, with Accident Compensation Corporation (ACC) statistics indicating that in New Zealand within the last year, men over the age of 65 made 2837 new claims for falls-related injuries with a further 646 cases still ongoing from the previous year(s). These new and ongoing cases cost a total of $17.8M and $8.3M, respectively or an average of $6300 and $13,000 for each case (ACC, 2009).

Existing treatments to alleviate the harmful effects of ADT have been predominantly pharmaceutical; however, these treatments are expensive, and their effects do not translate into improved physical and functional capacity (Galvao et al., 2006). Support for the role of a prescribed exercise regime as a tool in combating some of the ADT treatment side effects, and enhancing overall QoL is receiving increased attention (Culos-Reed, Robinson, Lau, O'Connor & Keats, 2007).

Physical Activity and Androgen Deprivation Therapy

In a study of the effects of ADT on increased cardiovascular morbidity in men with prostate cancer, Saigal et al., (2007) found that ADT is associated with a significantly increased cardiovascular morbidity, and may lower overall survival in men with low risk disease. These results mark particular relevance to decisions regarding the use of ADT in men with prostate cancer in settings in which the benefit has not been clearly established. For men with metastatic disease, focused efforts to reduce cardiac risk factors through diet, exercise, or the use of lipid-lowering agents may mitigate some

of the risks of ADT (Saigal, et al., 2007). The dramatic rise in the use of ADT in men with prostate cancer in the United States of America is documented in data compiled by Cooperberg, Grossfeld, Lubeck & Carroll (2003) from a national prostate cancer registry. In that cohort, the proportion of prostate cancer patients treated with external beam radiotherapy who also received ADT rose from 10% in 1989 to 75% in 2001. During the same period, the proportion of men receiving ADT in conjunction with brachytherapy (an internal radioactive therapy) rose from 7% to 25%. In 2001, 8% of men undergoing radical prostatectomy received ADT, although evidence does not support its use in that context (Cooperberg, Grossfeld, Lubeck & Carroll, 2003). Although not curative, ADT was the primary treatment strategy in nearly half of the men diagnosed with high-risk localized disease in 2001. Androgen Deprivation Therapy is the mainstay of therapy for men with metastatic prostate cancer. As survival rates have improved for these men, the skeletal effects of hormonal deprivation have come to the fore. Although data suggest that cardiovascular disease is the most common reason for death among men with prostate cancer who do not die of the disease itself, the effect of ADT on cardiovascular morbidity and mortality in men with prostate cancer remains poorly described. Furthermore, although male sex is a risk factor for coronary artery disease, evidence is accumulating that testosterone may actually have a cardio-protective influence in men with prostate cancer, and in men in general (Saigal et al., 2007).

Quality of Life and Prostate Cancer

Quality of life of men has gained increased attention as a significant factor in the management of cancer and cancer-related problems. The personal nature of QoL and the great variability inherent in individual values makes defining the concept difficult. However, the World Health Organization Quality of Life Group (1993) propose a definition of quality of life that is a broad-ranging multi-dimensional concept that consists of physical health, psychological state, social relationships, and relationships to salient features, in the environment. According to this group quality of life is defined as 'an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns' (WHO, 1995). Health-Related Quality of Life (HRQoL) is a multi-

dimensional construct that typically includes four broad categories: physical, functional, social and emotional well-being (Cella & Tulsky, 1993). Cella (1995) states that HRQoL refers to the extent to which one's usual or expected physical, social and emotional well-being are affected by a medical condition or its treatment.

Decision making regarding prostate cancer treatment, living with the disease, managing the symptoms, and experiencing side-effects of treatment all impact on QoL of men with prostate cancer (Wallace & Powel, 2002).

There has been less attention to QoL in the prostate cancer population when compared to literature in patients with other malignancies. When QoL is studied, most of the literature related to men with prostate cancer focuses upon the effect of disease-specific, physical complications: treatment-induced incontinence, impotence, and urinary and bowel problems. This focus is maintained in literature related to the effect of ADT upon QoL (Harrington & Badger, 2009).

In a recent review of the QoL literature in prostate cancer survivors, prostate cancer and its treatment was shown to affect both disease specific (i.e., urinary, sexual, and bowel function) as well as general QoL (i.e., energy/vitality, performance in physical and social roles) (Eton & Lepore, 2002). Multiple studies (e.g., Culos-Reed et al., 2007; Dacal et al., 2006) have shown that ADT significantly impairs QoL, therefore an important consideration for prostate cancer patients receiving ADT is HRQoL.

Dacal, Sereika & Greenspan (2006) conducted a cross-sectional study examining the effect of ADT on HRQoL in prostate cancer patients receiving short (<6 months) or long-term (≥6 months) ADT, and healthy controls. Results indicate that men receiving ADT had significantly lower levels of total testosterone (chemically bound and unavailable) and free testosterone (bioavailable and unbound), a leaner body mass, as well as greater body fat and comorbidity index (all $p<.01$) than men not receiving ADT (i.e., men with prostate cancer and healthy controls) (Dacal, Sereika & Greenspan, 2006). Participants receiving ADT reported significantly poorer QoL ($p<.001$) in the areas of

physical function, general health, and physical health than men not receiving ADT. There were no significant differences in HRQoL between participants receiving short or long-term ADT, presumably because testosterone levels were low in both groups (Dacal, Sereika & Greenspan, 2006).

The findings of the study carried out by Decal, Sereika & Greenspan (2006) are consistent with other studies, including that by Fowler, Collins, Corkery, Elliot & Barry (2002), who found that patients undergoing radical prostatectomy followed by ADT reported greater negative effects of cancer and cancer treatment on their lives, resulting in lower QoL scores, than patients undergoing radical prostatectomy alone. Particularly, large effects were observed in measures of concern regarding body image, worries about cancer and dying, and the overall reports of the extent to which cancer and its treatment had affected their lives (Fowler, Collins, Corkery, Elliot & Barry, 2002).

Because participation in physical activity can have a positive influence on the health and QoL of cancer survivors, it is important to encourage the adoption and maintenance of regular physical activity (Perkins, Baum, Carmack Taylor & Basen-Enquist, 2009).

General Benefits of Physical Activity

The Centres for Disease Control and Prevention (CDC) recommend at least 30 minutes of moderate intensity physical activity on five or more day per week (2001; 2005). According to the WHO (2002), 60-85% of adults from both developed and developing countries lead a sedentary lifestyle, making physical inactivity both common and widespread. As a consequence physical inactivity is considered a global health priority (WHO, 2004).

In New Zealand, physical inactivity is associated with 9.5% of all deaths and is estimated to account for over 2600 deaths per year (Ministry of Health, 2004), making it a significant health risk factor and cause of premature death for New Zealanders. Physical inactivity is third only to smoking and diet as a modifiable risk factor for poor

health and it has been estimated that a 10 percent increase in participation in physical activity in New Zealand would correspond to 600 fewer deaths per year (Tobias and Roberts, 2001).

Physical activity is a fundamental means of improving the physical and mental health of individuals (World Health Organization, 2004). The evidence that leisure time activity during adult life is related to better health is well established. It has been acknowledged that unhealthy diets and physical inactivity contribute substantially to the global burden of disease and are among the leading causes of major noncommunicable diseases including coronary heart disease, strokes, disability in people with chronic obstructive respiratory disease, blood pressure, incidence of some cancers, type II diabetes, obesity, depression, and a number of other illnesses (New Zealand Ministry of Health, 2003; Garcia, Broda, Frenn & Coviak, 1995; World Health Organization, 2004). Regular exercise, apart from improving physiological and psychological functions, can also improve HRQoL (Lee, Chang, Liou & Chang, 2006).

Benefits of Physical Activity for People with Cancer

Existing knowledge informs us that as well as providing benefits for healthy individuals, physical activity has many physical, social, and psychological benefits for a variety of cancer survivor groups (Galvao & Newton, 2005; Steivinson, Lawlor & Fox, 2004; Conn, Hafdahl, Porock, McDaniel & Nielsen, 2006). Benefits may include increased quality of life, greater acceptance of the cancer, and the capacity to better tolerate the side effects of the cancer and treatment options. Physical exercise is essential to maintaining human health and is now recognised but the American College of Sports Medicine and the American Heart Association as medicine for both the prevention and management of chronic disease, injury, and other illnesses (Newton & Galvao, 2008).

Regular and vigorous exercise has been scientifically established as providing strong preventative medicine against cancer with the potential to reduce incidence by 40% (Newton & Galvao, 2008). The effect is strongest for breast and colorectal cancer. However, evidence is accumulating for the protective influence on prostate cancer,

although predominantly for more advanced disease in older men. Research into the possible role of exercise in cancer survivors is relatively recent compared with research examining exercise and cancer prevention (Courneya, 2003).

Cancer and Physical Activity

There is now compelling evidence from large prospective studies that regular exercise post-diagnosis will actually increase survivorship by 50%-60% with the strongest evidence currently for breast and colorectal cancers (Newton & Galvao, 2008). Research has shown that cancer survivors participating in exercise demonstrate improved cardiovascular fitness and muscle strength, improved physical functioning, improved body image, decreased body fat, reduced fatigue, and improved quality of life (Perkins, Baum, Carmack Taylor & Basen-Enquist, 2009). Exercise prescription can also have very positive benefits for improving surgical outcomes, reducing symptom experience, managing side-effects of radiation and chemotherapy, improving psychological health and maintaining physical function (Newton & Galvao, 2008).

Several clinical trials have assessed the effect of physical activity on quality of life and other psychosocial outcomes in cancer survivors. The exercise programs in these trials were primarily three days per week of moderate to vigorous activity that was progressively increased in duration to approximately 45-minute sessions during a period of 3 or 4 months. These studies have shown that such exercise programs can reduce anxiety and depression, improve mood, boost self-esteem, and reduce symptoms of fatigue (Brown, Byers, Doyle, Courneya, Demark-Wahnefried, Kushi et al., 2003).

An increasing number of studies have examined the therapeutic value of exercise during primary cancer treatment. Most of these have examined women with early-stage breast cancer receiving chemotherapy and persons with various cancers immediately after bone marrow transplantation. Results suggest that exercise is not only safe and feasible but can also enhance physical and functional well-being and improve overall QoL (Brown et al., 2003). In relation to physical activity during recovery and long-term survival after cancer treatment, exercise has been shown to improve cardiovascular

fitness, muscle strength, body composition, fatigue, anxiety, depression, self-esteem, happiness, and several components of QoL (physical, functional, and emotional) in cancer survivors (Brown et al., 2003; Lowe, Watanabe & Courneya, 2009). Brown et al., (2003) state:

"although no studies have examined the effects of exercise on cancer recurrence or overall survival after cancer treatment, several cohort studies are ongoing that will provide data on this issue during the next several years… in the meantime, it is increasingly clear that increased exercise is related to the primary prevention of some cancers and other chronic conditions, such as cardiovascular disease and diabetes" (p. 272).

For those individuals with advanced cancer, nutrition and physical activity are important factors in establishing and maintaining a sense of well-being and enhancing QoL. Physical activity is desirable for persons with advanced cancer, as it may increase appetite, thus reducing constipation, and counteracting cancer-related, and treatment-related fatigue, and maintaining weight, but the research on exercise in cancer survivors with advanced disease is limited (Brown et al., 2003).

Prostate Cancer and Physical Activity

In relation to physical activity and men with prostate cancer, results have not been consistent. Although some longitudinal studies have shown a protective association of physical activity with prostate cancer risk, others have found neither an association nor a positive association (Crespo, Garcia-Palmieri, Smit, Lee, McGee, Muti, Figueroa Valle, Marrero, Freudenheim & Sorlie, 2008). Epidemiological studies, however, report that regular physical activity can reduce the risk for prostate cancer (Barnard, Leung, Aronson, Cohen, & Golding, 2007).

In regards to participating in physical activity while undergoing treatment for prostate cancer, it has been demonstrated that men with prostate cancer who are treated with long-term androgen suppressive medications are at a high risk for osteoporosis and

might therefore benefit from resistance training in order to increase bone strength (Brown et al., 2003; Galvao et al., 2006). Additional positive outcomes of exercise training can include improved lean body mass and balance, resulting in a reduced risk for falls and subsequent fractures (Brown et al., 2003).

Galvao et al., (2006) carried out a study to examine the effect of progressive resistance training on muscle function, functional performance, balance, body composition, and muscle thickness in men receiving ADT for prostate cancer. Ten men, aged 59-82 receiving ADT for localised prostate cancer, undertook progressive resistance training for 20 weeks, at 6- to 12- repetition maximum (RM) for 12 upper and lower body exercises in a university exercise rehabilitation centre (Galvao et al., 2006). Outcome measures included muscle strength and muscle endurance for the upper and lower body, functional performance, balance, and body composition. Blood samples were assessed for PSA, testosterone, growth hormone, cortisol and haemoglobin. Substantial improvements were seen in muscle strength and endurance, and whole-body lean mass was preserved with no change in fat mass over the 20-week intervention. There were no significant changes in PSA, testosterone, growth hormone, cortisol, or haemoglobin. Results from this study indicate that progressive resistance exercise has beneficial effects on muscle strength, functional performance and balance in older men receiving ADT for prostate cancer, and should be considered to preserve body composition and reduce treatment side effects (Galvao et al, 2006). Notable benefits following a 24-week resistance training programme for men undergoing treatment for prostate cancer were also found by Segal, Reid, Courneya, Sigal, Kenny, Prud'homme, Malone, Wells, Scott & Slovinec D'Angelo (2009) indicating long-term improvements to QoL, strength, triglycerides, and body fat measures.

Taken as a whole, the results indicate that physical activity is likely to be beneficial for most cancer survivors. Furthermore, recommendations on the type, frequency, duration, and intensity of exercise should be individualised to the survivor's age, previous fitness activities, type of cancer, stage of treatment, type of therapy, and comorbid conditions (Brown et al., 2003).

Physical Activity Patterns in Prostate Cancer Patients

A study carried out by Demark-Wahnefried et al., (2000) regarding current health and health-related beliefs and behaviours, reported that an overwhelming majority (87%) of prostate carcinoma respondents reported their health as good to excellent, with better health being reported by those who were younger versus those who were older ($p < .001$), reflecting trends in the general population. A majority of respondents (58%) reported that they routinely exercised. Among patients who routinely exercised, mean scores indicated frequencies of approximately four times per week at moderate intensity for roughly 40 minutes per session. For the majority of exercisers, this was a behaviour that had been practiced for greater than six months. Among those not routinely exercising, approximately 30% planned to pursue an exercise program within the next 30 days, but the majority had no such plan. When related to self-efficacy, mean scores suggested "slight" to "moderate" levels of confidence in adopting a routine exercise program. Self-efficacy scores were also highly correlated with stage of readiness (Spearman rank correlation = 0.44; $p < .001$). This study also examined patients' interest in health-related programs. Eighty one percent of prostate cancer patients indicated interest in health promotion programs. No differences in interest levels were detected as a function of time since diagnosis, however, older individuals were significantly less likely to express high interest when compared with those who were younger ($p < .001$.). High levels of interest were reported by 50-60% of all respondents across content areas of diet and exercise. Marked differences in preference for the method of program delivery were observed, with the majority of respondents indicating that they would be "very" or "extremely" interested in receiving mailed literature; far fewer expressed interest in videotapes or telephone counselling programs. Program preference did not appear to be a function of time since diagnosis, but interest levels in various modes of delivery were universally lower among older patients. Although slightly less than 50% of the respondents indicated that "anytime after diagnosis" would be good to offer such programs, the dominant response was for programs to be initiated "at diagnosis or soon after", with prostate cancer patients significantly more apt to report this response. Recruits in this study practiced routine physical activity at roughly twice the frequency reported by the population at large. The investigators state that this may be explained by the influence of

the cancer diagnosis in modifying health-relate behaviours, to differences in the population of patients ascertained within the major academic referral centre, or to respondent bias. Nevertheless, a considerable proportion (40%) of individuals were sedentary, with self-efficacy scores that showed slight to moderate levels of confidence in undertaking this behaviour.

The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB; Ajzen, 1985, 1991) provides a popular model of behavioural intention that accounts for attitude, social context, and perceptions of self-efficacy. As such, the model accounts for both informational and motivational influences on behaviour. The TPB was developed from, and is an extension of, the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975). The TPB has emerged as one of the most influential and popular conceptual frameworks for the study of human action (Ajzen, 2002) and has been applied by many studies investigating the relations among beliefs, attitudes, behavioural intentions and actual behaviours. Vast spectrums of social and personal behaviours have been targeted, including healthy eating, physical activity, and alcohol consumption. The TPB has been shown to have good predictive validity (Heerwegh & Loosveldt, 2009).

According to the TPB, human behaviour is guided by three kinds of fundamental beliefs:

1) Beliefs about the likely consequences or other attributes of the behaviour (*behavioural beliefs*),
2) Beliefs about the normative expectations of other people (*normative beliefs*), and,
3) Beliefs about the presence of factors that may facilitate or hinder performance of the behaviour (*control beliefs*) (Ajzen, 2002).

Components of The Theory of Planned Behaviour

In their respective aggregates, behavioural beliefs produce a favourable or unfavourable *attitude toward the behaviour*. While a person may have many beliefs as to the outcome (i.e., cost-benefit, win-lose) of a particular behaviour, it is the most salient of

those beliefs at a particular time that determines attitude (Conner & Sparks, 1996). Normative beliefs result in perceived social pressure or *subjective norm*. This represents an individual's perception of others' preferences as to what they should do, and how important these people and their views are to that individual (Conner & Sparks, 1996). Control beliefs give rise to *perceived behavioural control*, the perceived ease or difficulty of performing the behaviour, including a person's belief that they have the necessary resources to perform a specific behaviour (Ajzen, 1991). Individuals may believe that certain factors are influential whether or not they can perform the behaviour, and these perceptions or efficacy may be located internally (personal factors), or externally (situational factors) (Conner & Sparks, 1996). Perceived Behavioural Control (PBC) has a direct influence not only on behavioural intention, but also on the behaviour itself. In this way, there may be a situation where intentions remain at a specified level, but as PBC increases, so does confidence in performing the behaviour, which increases the likelihood of the behaviour occurring successfully (Ajzen, 1991). In combination, attitude toward the behaviour, subjective norm, and PBC predict behavioural *intention*. Finally, given a sufficient degree of *actual* control over the behaviour, people are expected to carry out their intentions when the opportunity arises (Ajzen, 2002).

In its simplest form, the TPB can be represented by the following equality:

$$BI= (W_1)AB[(b)+(c)] + (W_2)SN[(n)+(m)] + (W_3)PBC[(c)+(p)], \quad \text{Eq.1}$$

where:
BI=behavioural intention, *AB*= attitude toward behaviour, (*b*)= the strength of each belief, (*e*)= the evaluation of the outcome or attribute, *SN*= social norm, (*n*)= the strength of each normative belief, (*m*)= the motivation to comply with the referent, *PBC*= perceived behavioural control, (*c*) = the strength of each control belief, (*p*)= the perceived power of the control factor, and *W*= empirically derived weights.

Figure 4 shows a schematic representation of the TPB: Each term of Eq.1 will now be described in greater detail.

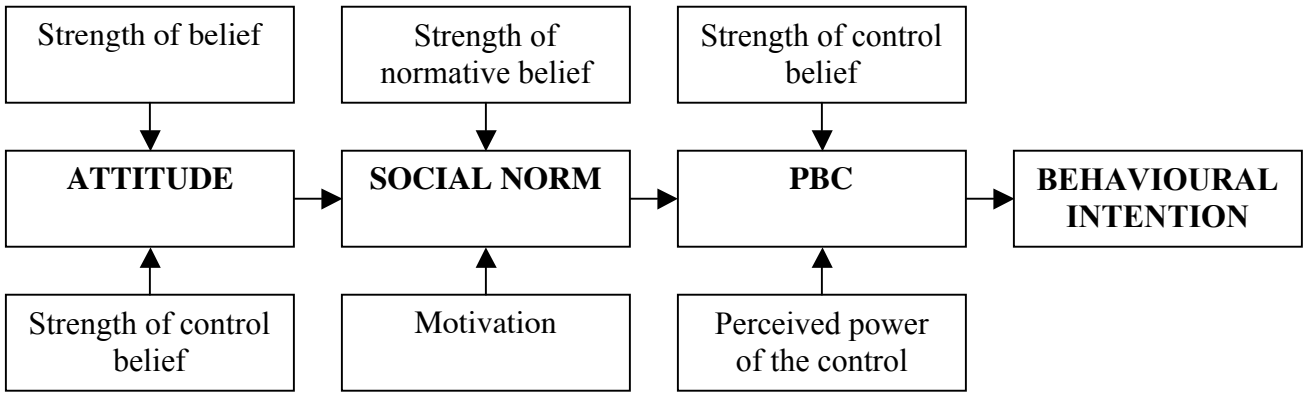

Figure 4*: A schematic representation of the TPB.*

Attitudes

Although no universally agreed definition of attitude exists, Kenyon (1968) defines attitudes as 'a latent or nonobservable, complex, but relatively stable behavioural disposition reflecting both direction and intensity of feeling *toward a particular object*' (p. 111). The structure of attitudes can be delimited to a certain extent (Olson & Zanna, 1993 in Biddle & Mutrie, 2001). A three-component model of attitude (Hovland & Rosenberg, 1960) suggests that in addition to attitudes having a belief (cognitive) component, they also have affective (emotional) and behavioural (action) components (see Figure 4) (Biddle & Mutrie, 2001).

Attitude, like personality, motivation and other psychological constructs, is hypothetical and not open to direct observation (Biddle & Mutrie, 2001). The data used to measure attitudes can be either verbal or non-verbal in each of the cognitive, affective and behavioural categories of the three-component model (Biddle & Mutrie, 2001). These are illustrated in Figure 5, contextualised to physical activity.

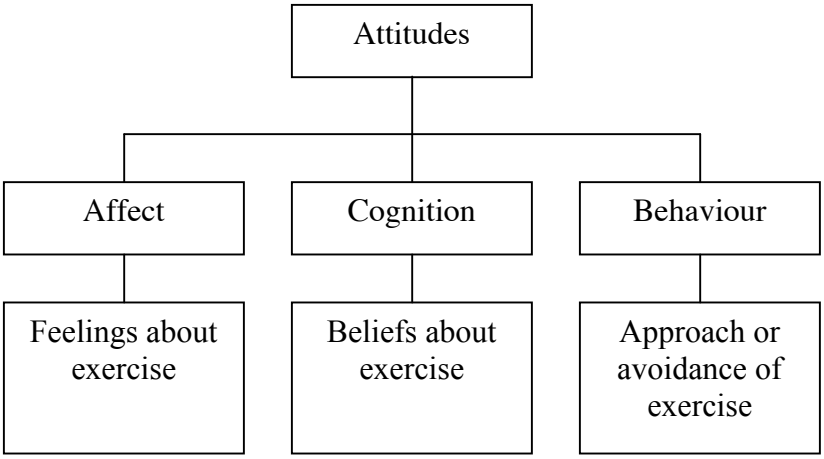

Figure 5: *The three-component view of attitude applied to physical activity*.

Perceived Behavioural Control and Self-Efficacy

Self-efficacy is a concept that was introduced by Bandura (1977, 1986) in Social Cognitive Theory, and is a concept that is built into many models of health behaviour, sometimes more explicitly than others (Ajzen, 1991). Self-efficacy is having the belief that one has the ability to perform certain behaviours, and that the behaviours will have a specific outcome. Self-efficacy has had, and continues to have, a significant place in health behaviour research. There is increasing evidence that self-efficacy has a significant effect on behavioural intention and performing the behaviour itself (Conner & Sparks, 1996; Ajzen, 2002). Importantly, self-efficacy is not only a significant factor in performing one-off behaviours, but has been found to be an important variable in sustained behavioural change (Conner & Sparks, 1996). Additionally, control beliefs and feelings of self-efficacy are particularly important in predicting adherence behaviours (Griva, Myers & Newman, 2000).

Ajzen (1987, 1991; Ajzen & Madden, 1986) combined the notions of perceived control and self-efficacy in the concept of PBC. However, it has been argued that the two variables are theoretically distinguishable (Terry & O'Leary, 1995). On one hand,

individuals can appraise the extent to which they have control over whether they are physically active, while on the other hand they can appraise physical activity in terms of their capability to perform it (Terry & O'Leary, 1995). This distinction has the most clarity when control is conceptualised in the traditional sense, namely, as a reflection of the person's appraisal of the extent to which other people or events will interfere with the performance of the behaviour. Ajzen's (1987,1991; Ajzen & Madden, 1986) use of the term 'control' is somewhat different from more orthodox conceptualisations of control. Ajzen considers that a behaviour may not be under a person's volitional control because of the effects of both internal and external constraints. From Ajzen's point of view, it could, therefore, be argued that it is reasonable to consider the roles of perceived control (as an assessment of internal constraints) and self-efficacy (as an assessment of the presence of internal constraints) as components of the same concept (Terry & O'Leary, 1995; Biddle & Mutrie, 2001; Ajzen, 2002).

However, as noted by Triandis (1977, 1980), it cannot be assumed that there will be a correspondence between the person's perception of the extent to which external barriers may impede the performance of the behaviour, and his or her judgement that the behaviour will be easy to perform, as a person may perceive few external barriers to performing the behaviour, yet lack confidence in his or her ability to do so (Terry & O'Leary, 1995).

The Theory of Planned Behaviour and its Influence on Levels of Physical Activity

In social and exercise psychology in particular, the TPB has been used extensively in the belief that specific measures of attitude, in conjunction with social influences, will predict behavioural intention and subsequent behaviour (Biddle & Mutrie, 2001). The TPB is appropriate for use in the study of exercise, particularly as exercise is a behaviour that has many barriers, thus is only partly under volitional control (Biddle, 2001). The application of the TPB in exercise research is increasing, though is not without its challengers (e.g., self-determination theory; Deci & Ryan, 1980; 1985; 1991).

Empirical Evidence for the Theory of Planned Behaviour

Perceived behavioural control has been found to influence both behavioural intentions and actual behaviour (Terry & O'Leary, 1995). For instance, in a study investigating intention, perceived control, and weight loss, Schifter & Ajzen (1985) reported that, even after the effects of attitudes and norms were controlled, perceived behavioural control emerged as a significant predictor of intention to lose weight. Perceived behavioural control also emerged as a distinctive predictor (after the effects of intentions were controlled) of actual weight loss, while the proposed interaction between perceived control and intentions was marginally significant (Terry & O'Leary, 1995).

Various studies continue to provide support for the TPB. In a review of the relevant literature, Ajzen (1991) documented the fact that 16 separate studies testing the perceived behavioural control-intention link were significant (even after control of the effects of attitudes and subjective norms) (Terry & O'Leary, 1995). The review also revealed evidence to suggest that perceptions of behavioural control are influential in the prediction of actual behaviour. After controlling for the effects of behavioural intentions, ten out of the twelve studies reviewed found evidence linking PBC to actual behaviour. In further support for the TPB, Madden, Ellen & Ajzen (1992) found that perceived behavioural control predicted behavioural intentions across ten different behaviours. There was also some evidence linking perceived behavioural control to actual behaviour. As predicted by the TPB, the strength of this effect varied as a function of the controllability of the behaviour (Terry & O'Leary, 1995).

Wankel & Mummery (1993) conducted a large population survey, 'The Campbell Survey of Wellbeing', involving over 4000 Canadian's, which was the first population-based assessment of attitudes using the framework of the TPB. In predicting physical activity intention, Wankel & Mummery (1993) found that across four different age groups and gender groups, variability in intentions accounted for by attitudes, social norm and PBC ranged from 25 to 35 percent. For the total sample, 31 percent of the variability in intentions was explained by the three TPB components. In an alternative study, Godin

(1993) claimed that about 30 percent of the variance in intention is explained by the attitude and subjective norm components and that anything between 4 and 20 percent extra variance is accounted for by PBC.

A meta-analysis by Biddle & Mutrie (2001) found that PBC was strongly correlated, after correcting for sampling and measurement error, with sport and exercise behaviour (r=0.50) and intention (r=0.60). In addition, PBC correlated with intentions even when attitudes and subjective norm were statistically controlled. These results suggest that the TPB is a superior model for the study of physical activity behaviours, a conclusion that is consistent with other research (Biddle & Mutrie, 2001; Hausenblas et al, 1997).

The Theory of Planned Behaviour, Prostate Cancer and Physical Activity

To date, there is limited information concerning the determinants of exercise during cancer treatment. Different determinants are likely to emerge for cancer patients as compared to the general population based on unique medical variables (e.g., cancer site, stage, treatment) and treatment side-effects. Courneya & Friedenreich (1999) observed the need for a validated theoretical model to guide research of exercise determinants in this population, as such an approach would provide a theoretical bases for designing interventions that would promote exercise during cancer treatment. Godin and Kok (1996) summarized 18 studies that applied the TPB to exercise in other populations. The overall conclusion of this review was that intention and PBC explained approximately 36% of the variance in exercise behaviour. Intention was a significant determinant of exercise in all studies whereas PBC explained additional variance in exercise in about half of the studies. Attitude, subjective norm and PBC explained about 42% of the variance in intention to exercise with attitude and PBC being the strongest and most consistent determinants.

The Theory of Planned Behaviour and the Current Study

The TPB was selected as the theoretical basis of this study because it is the most commonly used theory in the cancer physical activity intention and behaviour literature and because of its high levels of reliability, widely acknowledged validity, and solid theoretical foundation. Studies utilizing the TPB with cancer survivors have reported high levels of reliability for physical activity intention and the attitude, subjective norms and PBC sub-scales, with Cronbach's Alpha of 0.70-0.94. Compared to other theories such as the transtheoretical model and social cognitive theory, the TPB appears to be a better predictor of physical activity intention and behaviour in prostate cancer and non-prostate cancer survivors (Basen-Engquist et al., 2006).

The Current Study

This is an exploratory study that seeks to determine how androgen deprivation therapy, a common therapy used by prostate cancer patients, may influence the physical activity intentions and behaviours of prostate cancer survivors in the greater Auckland region.

The current study has four main objectives:

(1) To identify the physical activity intentions and behaviours of prostate cancer survivors receiving ADT;
(2) To compare how well the constructs of the TPB - attitude, subjective norm and perceived behavioural control - predict physical activity intention and behaviour;
(3) To compare QoL data to nation norms, and;
(4) To develop working relations with the cancer survivors and their referring clinicians, so to recruit sufficient numbers of the ADT survivors to a randomised control trial, comparing the effects of resistance training and aerobic exercise.

Methods

This is an exploratory study utilising surveys to investigate the exercise behaviours, barriers and motivators to being physically active, and the quality of life, of men with prostate cancer who are receiving ADT.

The Rapid Assessment of Physical Activity (RAPA) Scale, the WHOQoL-BREF, accompanied by the autonomy facet of the WHOQoL-OLD, and a self-developed TPB scale will be utilised in the study. Many of the questions included in the self-developed TPB scale were chosen from Shen, McCaughtry & Martin's TPB and Self-Determination Theory survey (2008). The RAPA will be used for measurement of frequency and intensity of current physical activity, and the WHOQoL-BREF will examine quality of life of participants. The TPB items will afford the identification of specific barriers and motivators to participants being physically activity, and estimate the degree to which each component of the TPB - attitude, behaviour, and subjective norm - determine the intention to undertake physical activity and, furthermore, the relationship between intention and actual behaviour will be elucidated.

Participants

Ethical approval for this study was obtained through the Northern Regional Ethics Committee and The Auckland University of Technology Ethics Committee (AUTEC). Additional ethical approval to use Auckland District Health Board (ADHB) information, specifically obtaining patient information, was granted through the ADHB Ethics Board.

Participants were recruited through the Auckland District Health Board (ADHB), and a Prostate Cancer Foundation (PCF) support group. The mean age of participants was 78.4 (SD = 8.21) years.

Instruments

A questionnaire incorporating three established inventories was used: 1) The RAPA; 2) The WHOQoL-BREF, with the addition of the autonomy facet of the WHOQoL-OLD, and 3) A self-developed Theory of Planned Behaviour Scale (See Appendix A). All inventories were self-report, pen-and paper questionnaires. Each will be discussed in turn.

The RAPA and WHOQoL scales used in this study have been developed and validated by previous researchers (Topolski et al, 2006; WHOQoL Group, 1998; WHO, 1997). The combination of these scales was used to provide a comprehensive data collection in the sample. Although inter-item consistency has already been established in these scales, these were confirmed in the sample using Cronbach's alpha for the four dimensions of the WHOQoL-BREF.

The Rapid Assessment of Physical Activity Scale

The RAPA (University of Washington Health Promotion Research Centre, 2006) was developed to provide an easily administered and interpreted means of assessing levels of physical activity among adults older than 50 years (Topolski, LoGerfo, Patrick, Williams, Walwick & Patrick, 2006). The RAPA is a nine-item questionnaire with 'yes' or 'no' binary response options, and consists of questions covering a range of levels of physical activity, from sedentary to regular to vigorous physical activity, as well as strength training and flexibility. Items for the RAPA are based on Centres for Disease Control and Prevention (CDC) guidelines of 30 minutes or more of moderate physical activity on every or most days of the week, and included additional questions to assess strength and flexibility, because of the association of these activities with preventing falls (Topolski et al., 2006). It is important that a clinical physical activity measure includes these areas, as they are significantly related to fall reduction and maintenance of independence among older adults (Topolski et al., 2006). The instructions for completing the questionnaire provide a brief description of three levels of physical activity (light, moderate, and vigorous) with graphic and text depictions of the types of activities that

fall into each category. By summing responses to the nine items, the RAPA classifies participants into one of five activity groups:

1) Sedentary - "I rarely or never do any physical activities;"
2) Under-active - "I do some light or moderate physical activities, but not every week;"
3) Under-active regular – light activities - "I do some light physical activity every week;"
4) Under-active regular - "I do moderate physical activities every week, but less than 30 minutes a day or five days a week" or "I do vigorous physical activities every week, but less than 20 minutes a day or three days a week," and;
5) Active - " I do 30 minutes or more of moderate physical activities, five or more days a week."

If participants indicate multiple activity levels, the highest reported level is categorised as the actual activity level. Responses to the strength training and flexibility items are scored separately, with strength training = 1 and flexibility = 2. (Topolski et al., 2006). If both strength training and flexibility are practiced, a score of 3 is issues for this subsection.

The WHOQoL-BREF and WHOQoL-OLD Autonomy Facet

As ADT is associated with a decline in QoL, the WHOQoL- BREF with an additional section comprising of the Autonomy facet of the WHOQoL-OLD, will be utilised to estimate QoL. The WHOQoL-BREF instrument comprises 26 items, and measures four broad domains: physical health, psychological health, social relationships, and environmental factors. The WHOQoL-BREF is a shortened version of the original WHOQoL-100 instrument, and is more convenient for use in large research studies and clinical trials (WHO, 2009). The WHOQoL-OLD, a 24-item QoL measure, was developed by the WHOQoL Group as an add-on module to their QoL measures (WHOQoL-100 and WHOQoL-BREF), specifically for use with older adults (Peel,

Bartlett & Marshall, 2007). WHOQoL-OLD items address the following six facets: sensory abilities, autonomy, past, present and future activities, social participation, death and dying, and intimacy (Peel, Bartlett & Marshall, 2007). Each of the facets has four items, rated on a five-point Likert scale. Questions in the autonomy facet relate to freedom to make choices and feel in control of the future, and is the only facet used in this study.

The questions of the WHOQoL-BREF probe four quality of life dimensions identified by factor analytical studies: physical health (7 items: Questions 3, 4, 10, 15, 16, 17, 18), psychological well-being (6 items: Questions 5, 6, 7, 11, 19, 26), social relationships (3 items: Questions 20, 21, 22), and environmental factors (8 items: Questions 8, 9, 12, 13, 14, 23, 24, 25). The test also included global indicators of quality of life and satisfaction with health that are not included in any domain. Questions 2, 3, and 26 were negatively framed, and must therefore be recoded to form positively framed scores.

The instrument has been rigorously tested to assess validity and reliability by over fifty international field centres (WHO, 1997), and the BREF can be considered a reliable and valid measure of quality of life.

The Theory of Planned Behaviour Scale

The TPB scale is a 47-item inventory investigating the factors that prevent or encourage physical activity behaviours, as well as the components that motivate one to become physically active – subjective norm, attitudes towards the behaviour, and PBC. The current TPB instrument was based on Shen, McCaughtry & Martin's (2008) transcontextual model of Self-Determination Theory and the TPB. The TPB constructs were based on guidelines by Ajzen (2004) and Ajzen & Martin (1986). The TPB scales had established validity and reliability (Shen, McCaughtry & Martin (2008). Behavioural intention will be determined using five items on a 7-point Likert scale. The anchors of "definitely false/definitely true" were used.

Attitudes were assessed through sixteen items on a seven-point scale. Participants responded to four sets of anchors from "not at all true" to "very true". To assess the experiential aspect of attitudes, one question was anchored with "unenjoyable" and "enjoyable". The opposing anchors of "unhealthy" and "healthy" were used to measure the instrumental or functional part of attitudes. "Definitely false" and "definitely true," and "Good" and "bad" anchors were likewise used to assess attitudes.

Subjective norms were measured by examining the beliefs participants held regarding significant others' expectations of them to being physically active. The subjective norm factor consisted of nine items. Participants responded on seven-point Likert scales ranging from "not at all true" to "very true", "strongly agree "strongly disagree", and "definitely false" to "definitely true" anchors.

Perceived behavioural control was assessed with responses to the prompt "I participate in physical activity because…" with participants asked to respond to how various statements related to their physical activities using 7-point Likert scales, ranging from 1 (not at all true) to 7 (very true), from 1 (strongly disagree) to 7 (strongly agree), and from 1 (definitely false) to 7 (definitely true).

Procedure

Potential participants were sent a cover letter (Appendix B) inviting them to be involved in the study, and explaining the objectives of the current study. For the participants recruited through the ADHB, a letter from the ADHB was included with the cover letter, explaining the luteinizing hormone-releasing hormone (LHRH) register, which is a register of all men currently receiving ADT for prostate cancer, which is kept by the hospital. It was outlined in the AUT cover letter that if a potential participant did not wish to be involved in this study, then they were to contact the research supervisor within one week to have their name taken off the register. One week following the send-out of cover letters, the questionnaire, the Participant Information Sheet (Appendix C),

and a stamped return-addressed envelope were mailed to participants. An initial 205 letters of invitation to participate in the study were sent to potential participants. Questionnaires were number-coded against the ADHB LHRH register in order to track respondent replies. Two weeks following the initial distribution of questionnaires, a reminder letter (Appendix D), along with an additional questionnaire, were mailed to participants, expressing the researcher's thanks for their involvement in the study, and reminding them to return the questionnaire if they had not yet done so. The reminder letter also invited individuals to contact the researcher if they required assistance in completing the questionnaire. Inclusion of both a cover letter and a reminder letter were decided on as a study by Chun & Robertson (n.d.) indicated that advance and reminder letter combinations significantly reduce nonresponse rates.

Analysis

Data will be entered into Microsoft Excel. The following keys will be used:

RAPA: The Rapid Assessment of Physical Activity Scale

WHOQoL: WHOQoL-BREF and the WHOQoL-OLD Autonomy facet

TPB: The Theory of Planned Behaviour Scale

Once collected, data will be transferred into the Statistical Package for the Social Science (SPSS, v.16). The SPSS is noted to be an extremely comprehensive statistical data analysis package (Punch, 2005). For all inferential analysis a criterion of α=.05 will be adopted.

SPSS will be used to calculate descriptive statistics including means and standard deviations for all items. This will provide information on dispersion of data, identify floor and ceiling effects for items, and measure the discriminability of questions.

Reliability and validity of the three inventories, the RAPA, WHOQoL-BREF, and TPB questionnaire, will be assessed using Cronbach's alpha scores, which deem a scale above $\alpha_c = 0.7$ to be internally consistent. Item-total correlations will be reported as an

index of scale dimensionality (de Vaus, 2004), with a score greater than .3 indicating that an item belongs in the scale.

The TPB will be tested using hierarchical multiple linear regression, with age classified as a covariate and constituting the first model in the analysis. The use of hierarchical regression analyses utilising the forced entry at each step approach to variable order is consistent with what has been undertaken in the literature, and has been described as "the statistical analysis of choice" (Keats, Culos-Reed, Courneya, McBride, 2007). The predictors of the TPB - attitude, subjective norm, and PCB - will accompany age in the second model and an R^2-change statistic will be calculated and evaluated for significance. The β coefficients associated with each predictor variable will be tested for significance from zero using *t*-tests. An additional regression analyses will be undertaken but with the behavioural intention variable substituted with the RAPA grouping variable.

To assess the QoL of the sample, the means for each WHOQoL domain will be statistically compared to New Zealand national norms matched for age, gender, and geographical location (Shepherd, submitted). To this end, four independent samples *t*-tests, one for each WHOQoL domain, will be performed.

Results

Data was entered into a Microsoft Excel spreadsheet and subsequently transferred to the Statistical Package for the Social Sciences (SPSS v.16), where all data was prepared (i.e., reverse coded where necessary) and all analyses performed. Analysis consisted of the calculation of descriptive statistics, the assessment of scale validity and reliability, the generation of composite variables, and the computation of inferential statistics, including correlational analysis (Pearson's product-moment correlation coefficient, *r*), hierarchical multiple linear regression, and difference testing (independent samples *t*-tests).

Missing Data Analysis

From the initial 205 questionnaires posted to potential participants, 81 replies were received, yielding a 39 percent response rate.

Missing data analysis was undertaken separately for each scale, and respective subscales, from the questionnaire – the RAPA, TPB, WHOQoL-BREF and the WHOQoL-OLD Autonomy facet. The missing data analysis indicated that for the RAPA, one questionnaire remained unanswered, and for the TPB scale, 13 questionnaires contained substantial quantities of missing data and were deemed unsuitable for analyses, leaving 86 cases available to test the model. For the WHOQoL-BREF there were no missing values across all 81 questionnaires. For the WHOQoL-OLD Autonomy facet, five of the eleven questions contained missing data, but ranging only from one to two cases per item (<1% overall). SPSS handled how the missing data was managed during the course of the analysis.

Descriptive and Reliability Statistics

SPSS was used to calculate descriptive statistics, including means, standard deviations, and corrected item-total correlations for all individual scale items. This supplied information on the centrality and dispersion of data, and afforded identification of floor and ceiling effects, offering insight into the discriminability of questions.

Rapid Assessment of Physical Activity

Table 1 shows the frequency of 'yes' and 'no' responses for each item in the RAPA. It is clear from the raw frequencies that the respondents are generally active.

Table 1
Frequency of 'yes' and 'no' responses to the RAPA.

Item	*Yes*	*No*
I rarely or never do any physical activities.	13	68
I do some **light** or **moderate** physical activities, but not every week.	24	57
I do some **light** physical activity every week.	58	23
I do **moderate** physical activities every week, but less than 30 minutes a day or 5 days a week.	26	55
I do **vigorous** physical activities every week, but less than 20 minutes a day or 3 days a week.	8	73
I do 30 minutes or more a day of **moderate** physical activities, 5 or more days a week.	32	49
I do 20 minutes or more a day of **vigorous** physical activities, 3 or more days a week.	16	65
I do activities to increase muscle **strength**, such as lifting weights or calisthenics, once a week or more.	11	70
I do activities to improve **flexibility**, such as stretching or yoga, once a week or more.	19	62

As previously described, the RAPA classifies participants into one of five levels of activity: 1 = sedentary, 2 = underactive, 3 = regular underactive (light activities), 4 = regular underactive, and 5 = regular active. The activity levels of participants are shown in Figure 6.

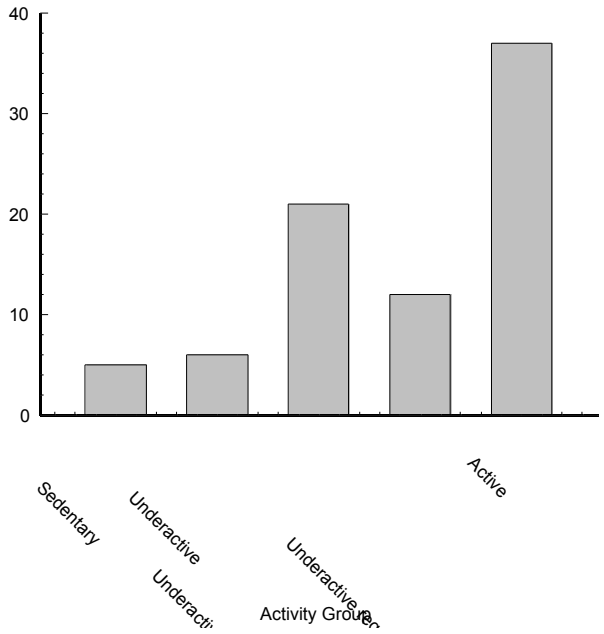

Figure 6: *Number of participants occupying each of the five RAPA activity categories.*

As indicated in Figure 6, the majority of participants (45.7%) lead an active lifestyle, and meet the recommended guidelines set out by the CDC of at least 30 minutes of moderate intensity activity on five or more days per week.

The Theory of Planned Behaviour

Item means and standard deviations are presented, along with corrected item-total correlations in Table 2 for the constructs of the TPB - subjective norm, attitude, perceived behavioural control, and behavioural intention. The corrected item-total correlations are correlations between an individual item and the total of scores on all other items and serve as an index of scale dimensionality. Here, a correlation below 0.3 indicates that an item may not be tapping into the same underlying dimension as the other items.

Table 2 provides means, standard deviations, corrected item-total correlations and Cronbach's alpha if item deleted, for each item in the TPB scale. Cronbach's alpha if item deleted was not calculated for the PBC component due to the divergent nature of questions in this scale.

Table 2

Means, standard deviations, corrected item-total correlation, and Cronbach's alpha if item deleted for the four components of the TPB. Low item-total correlations are presented in boldface type.

Item	*M*	*SD*	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Subjective Norm				
T1	2.35	2.09	.42	.79
T4	3.09	2.18	.34	.80
T10	2.91	2.17	.48	.78
T13	4.19	2.08	.42	.79
T25	3.87	2.21	.54	.78
T26	2.87	2.09	.69	.76
T27	4.30	2.20	.58	.77
T28	3.69	2.30	.69	.75
T34	4.89	1.93	**.26**	.81
Attitude				
T2	3.96	2.21	.58	.86
T3	3.51	2.05	.74	.86
T5	4.02	2.39	.55	.86
T6	2.97	2.08	.39	.87
T7	4.38	2.22	.80	.86
T9	5.33	1.96	.72	.86
T11	4.02	2.33	.46	.87
T12	3.90	2.20	.64	.86
T16	4.79	2.08	.57	.86
T20	4.39	2.42	.58	.86
T22	3.77	2.30	.63	.86
T23	4.85	2.27	.45	.87
T24	4.75	2.26	.50	.87
T29	5.20	2.10	.46	.87
T32	3.00	2.24	**-.29**	.90
T33	5.62	1.69	.62	.86
Perceived Behavioural Control				
T8	3.73	2.61	**.21**	-
T14	4.29	2.02	.56	-
T15	4.18	2.18	.58	-
T30	4.38	2.26	.39	-
T35	3.32	2.35	**-.14**	-
Behavioural Intention				
T17	3.12	2.15	.72	.78
T18	3.51	2.28	.82	.74
T19	3.23	2.32	.82	.74
T21	4.86	2.25	.58	.82
T31	5.77	1.70	**.25**	.88

Inspection of Table 2 indicates sensible mean scores and high standard deviations, illustrating the ability of the items to discriminate between respondents. Corrected item-total correlations are expressed as a number between –1.00 through to +1.00, and signify that individual items are well correlated with the composite scores. With reference to Table 2, Items T32 and T35 reported a negative correlation value, indicating that the item is actually lowering an individual's composite score rather than raising the score. Items

T8, T31, T32, and T34 are below adequate, indicating that these items may not be suitable candidates to include in a composite variable. However, to afford comparison with findings reported in the literature these items will be retained in subsequent analyses. Higher values indicate that items are well correlated with the composite scores. The large majority of item-total correlation scores for the TPB are psychometrically sound, indicating that individual items correlate well with the rest of the items in the scale.

Means, standard deviations, and Cronbach's alphas for each component of the TPB scale are shown in Table 3. From inspection of Table 3 it can be concluded that the Subjective Norm, Attitude, and Behavioural Intention components of the TPB scale were reliable and internally consistent, with Cronbach's alphas for each of the aforementioned components close to, or above, .7. A Cronbach's alpha of $\alpha_c = .517$ was obtained for Perceived Behavioural Control, suggesting that this component lacked internal consistency, though this is expected given the diffuse nature of the items contained within this scale.

Table 3
Descriptive statistics and Cronbach's alpha for the components of the TPB.

	# of items	***M***	***SD***	α_c
Subjective Norm	9	32.15	11.93	.798
Attitude	16	68.44	20.50	.873
Perceived Behavioural Control	5	19.89	6.69	.517
Behavioural Intention	5	20.49	8.34	.834

WHOQoL-BREF and WHOQoL-OLD Autonomy Facet

Means, standard deviations, corrected item-total correlations, and Cronbach's alpha if item deleted are presented in Table 4 for each item of the WHOQoL-BREF and WHOQoL-OLD Autonomy facet.

Table 4

Means, standard deviations, corrected item-total correlation, and Cronbach's alpha if item deleted for the four domains of the WHOQoL-BREF and the Autonomy facet of the WHOQoL-OLD.

Item	*M*	*SD*	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Physical				
W3	3.94	1.14	.44	.77
W4	3.15	1.16	.34	.79
W10	3.68	.88	.59	.75
W15	3.57	.93	.69	.73
W16	3.44	1.22	.34	.80
W17	3.70	.95	.63	.73
W18	3.19	1.09	.68	.72
Psychological				
W5	4.00	.85	.47	.46
W6	3.94	.81	.58	.41
W7	3.82	.67	.36	.52
W11	4.06	.85	.37	.50
W19	3.82	.90	.50	.43
W26	3.80	.81	.57	.76
Social				
W20	4.07	.95	.69	.67
W21	3.28	1.28	.69	.67
W22	4.02	.99	.56	.79
Physical				
W8	3.96	.75	.54	.80
W9	3.96	.75	.53	.80
W12	3.67	1.19	.42	.83
W13	3.95	.86	.60	.79
W14	3.88	.90	.47	.81
W23	4.43	.72	.68	.78
W24	4.43	.63	.68	.78
W25	4.30	.89	.54	.79
Autonomy				
W27	2.21	2.31	.95	.97
W28	1.92	2.07	.94	.97
W29	2.09	2.22	.94	.97
W30	1.72	1.91	.93	.97
W31	1.79	2.00	.91	.97
W32	1.85	2.01	.95	.97
W33	1.78	1.99	.90	.97
W34	1.42	1.71	.86	.97
W35	1.15	1.51	.76	.98
W36	1.02	1.41	.73	.98
W37	.95	1.31	.73	.98

The facets of the WHOQoL-BREF and WHOQoL-OLD depict strong means and healthy standard deviations, indicating a lack of floor and ceiling effects. Corrected item-total correlations for this scale were all above <.3, supporting the unidimensional nature of these scales. The Cronbach's alpha for the WHOQoL-OLD Autonomy facet was α_c = .776, with a mean of 36.10 and a standard deviation of 6.64.

Composite variables were constructed following guidelines contained in the WHOQoL-BREF Users Manual (Australian WHOQoL Field Study Centre, 2000). Four domain scores were calculated: physical, physiological, social, and environmental. The mean score of items within each domain constitutes the domain score. Domain means and standard deviations are listed in Table 5 along with Cronbach's alpha statistics for unstandardised scales.

For ease of comparisons with other data sets, raw domain scores need to be transformed to a 0-100 scale. This transformation converts the lowest possible score to zero and the highest possible score to 100. Scores between these values represent the percentage of the total possible score achieved (Murphy, Herrman, Hawthorne, Pinzone & Evert, 2000). Raw scores were transformed into standardised scores using the following formula:

$$\text{Transformed score} = \frac{(\text{actual raw domain score} - \text{lowest possible raw domain score}) \times 100}{\text{possible raw domain score range}} \quad \text{Eq.2}$$

Table 5
Unstandardised and standardised descriptive statistics and Cronbach's alpha for the domains of the WHOQoL-BREF and the Autonomy facet of the WHOQoL-OLD.

Domain	***Unstandardised***				***Standardised***	
	N	α_c	***M***	***SD***	***M***	***SD***
Physical	7	.785	24.66	4.91	63.10	17.54
Psychological	6	.796	23.21	3.51	71.71	14.64
Social	3	.790	11.39	2.72	69.86	22.65
Environmental	8	.816	32.58	4.51	76.81	14.10
Autonomy	11	.776	36.10	6.64	-	-

The Theory of Planned Behaviour

The Theory of Planned Behaviour suggests that a person's behavioural intention depends on the person's attitude towards the behaviour, the subjective norm, and their perceived control over performing the behaviour.

Multiple Linear Regression analyses were undertaken in order to provide summary coefficients of the nature of the relationship between behavioural intention and age (Model 1), and behavioural intention and age, with additional variables of subjective norm, attitude, and PBC (Model 2) (Table 6). In addition to explaining the nature of the relationship between the variables, multiple linear regression analyses supply variance measures which allow for the assessment of accuracy with which the regression equation can predict values on the criterion variable (Kachigan, 1991).

Table 6
Summary of the Regression Analyses: Model 1 and Model 2.

					Change Statistics				
Model	***R***	***R* Square**	**Adjusted *R* Square**	**Std. Error of the Estimate**	***R* Square Change**	***F* Change**	**df1**	**df2**	**Sig. *F* Change**
1	.180	.033	.180	1.66	.033	2.218	1	66	.141
2	.805	.649	.627	1.02	.616	36.852	3	63	.00

Goodness-of-fit statistics demonstrate that, for Model 1, R was not significantly different from zero ($F(1,66)=2.218$, $p=.141$), but Model 2 was different ($F(4,67)=29.097$, $p<.001$). The coefficient of determination, R, represents the correlation between behavioural intention and the linear sum of the predictor variables. From inspection of Table 7, Model 2 explains additional variability in the dependent variable, above and beyond Model 1. This is evident through the R^2 statistic. As R^2 is not significantly different from zero ($R^2=.033$) in Model 1, the model does not explain the variability inherent in the behavioural intention variable. In Model 2, however, R^2 is significantly different from Model 1 ($R^2=.649$), and thus Model 2 possesses additional explanatory power.

Table 7

Unstandardised and standardised coefficients for each of the hierarchical multiple linear regression analyses. The t-statistic and p-value indicate if the standardised beta coefficient is significantly different from zero.

Model		**Unstandardised Coefficients**		**Standardised Coefficients**	***t***	***p***
		B	**Std. Error**	***β***		
1	Constant	1.424	1.853		.768	.445
	Age	.035	.024	.180	1.489	.141
Predicted BI = 1.424 + .035 (Age)						
Model		**Unstandardised Coefficients**		**Standardised Coefficients**	***t***	***p***
		B	**Std. Error**	***β***		
2	Constant	-.321	1.174		-.273	.786
	Age	-.022	.015	-.011	-.134	.894
	Subjective Norm	.186	.123	.154	1.514	.135
	Attitude	1.045	.171	.791	6.104	.000
	PBC	-.148	.159	-.116	-.927	.357
Predicted BI = -.321 - .022 (Age) + .186 (SN) + 1.045 (Attitude) -.148 (PBC)						

Both unstandardised and standardised coefficients are reported, along with goodness-of-fit statistics (R^2) and regression equations in Table 7. Behavioural intention was employed as the dependent variable in both Model 1 and Model 2. In Model 1, age was employed as the sole predictor variable. In Model 2, age, attitude towards physical activity, subjective norm, and PBC were employed as predictor variables, and as a linear combination used to predict the behavioural intention variable. A *t*-test was undertaken to determine if β is significantly different from zero. As the results in Table 7 attest, age (as demonstrated in Model 1), does not predict behavioural intention. When the other three components – attitude, subjective norm, and PBC - are added, however (i.e., Model 2) a large correlation between behavioural intention and a linear combination of the predictors is evident. This reveals that the combination of variables explains approximately 60% of the variability in the behavioural intention model. As indicated in Table 7, attitude is the most important variable in terms of intention to exercise, relative to subjective norm and PBC.

Table 8

Summary of scores relating to barriers to being physically active. Item question: Please indicate how much each of the following factors influence you own activity level.

Item	***M***	***SD***
Lack of energy.	3.19	1.33
There are other things I would rather do in my spare time.	2.30	2.30
Pain.	2.26	1.29
Having a safe environment to exercise in.	2.25	1.93
I am not good at physical activity.	2.19	1.93
I am too out of shape to start.	2.16	2.30
Physical activity takes too much effort.	2.10	1.93
Nobody to be physically active with.	2.06	2.20
Incontinence.	2.05	2.08
Facilities are too hard to get to.	1.99	2.09
Lack of time due to other commitments (e.g., work, family).	1.91	1.18
Being physically active costs too much (clothes, equipment, etc.).	1.76	2.21

Barriers

Table 8 reports items 36-47 from the TPB scale. All items relate to particular barriers to being active. From inspection of the above scale it can be observed that the three largest reported factors that influence physical activity are "lack of energy", "there are other things I would rather do in my spare time", and "pain". With lack of energy, or fatigue, being a common side-effect of cancer and its treatment, including ADT, a Pearson product-moment correlation coefficient was computed to assess the relationship between fatigue, and the activity levels of participants. Additionally, behavioural intention was also assessed against fatigue. Surprisingly, no statistically significant correlation was evident between the variables of fatigue and activity levels (r= .002, p= .989), nor against fatigue and behavioural intention (r= -.108, p= .382).

RAPA

An additional multiple linear regression was undertaken to explore the association between actual behaviour (RAPA) and age (Model 1), and RAPA and a linear combination of age, subjective norm, attitude, and PBC (Model 2).

Table 9
Summary of Model 1 and Model 2.

					Change Statistics				
Model	***R***	***R* Square**	**Adjusted *R* Square**	**Std. Error of the Estimate**	***R* Square Change**	***F* Change**	**df1**	**df2**	**Sig. *F* Change**
1	.139	.019	.005	1.22	.019	1.308	1	66	.257
2	.152	.262	.215	1.09	.242	6.892	3	63	0.00

From inspection of Table 9, Model 2 explains additional variability in the dependent variable, more than Model 1 does. In Model 1, the variability in the RAPA scores are not sufficiently explained, as R^2 is not significantly different from zero (R^2= 0.19). In Model 2, R^2 is significantly different from Model 1 (R^2=.262), and therefore endows additional explanatory power. For Model 1, R was not significantly different from zero ($F(1,22)=1.308$, p=.257), whereas in Model 2, R was significantly different from zero ($F(4,63)=5.584$, p=<.001), again supporting the relationship between actual activity, attitudes to activity, subjective norms, and perceived control.

Table 10

Unstandardised and standardised coefficients for each of the two multiple linear regression analyses. The t-statistic and p-value indicate if the standard beta coefficient is significantly different from zero.

Model		**Unstandardised Coefficients**		**Standardised Coefficients**	***t***	***p***
		B	**Std. Error**	***β***		
1	Constant	2.403	1.366		1.759	.083
	Age	.020	.017	.139	1.144	.257
Predicted RAPA = 2.403 + .020 (Age)						
Model		**Unstandardised Coefficients**		**Standardised Coefficients**	***t***	***p***
		B	**Std. Error**	***β***		
2	Constant	1.681	1.246		1.349	.182
	Age	.022	.016	.014	.124	.901
	Subjective Norm	.050	.131	.056	.379	.706
	Attitude	.195	.182	.202	1.074	.287
	PBC	.273	.169	.293	1.616	.111
Predicted RAPA = 1.681 + .022 (Age) + .050 (SN) + .195 (Attitude) + .273 (PBC)						

Unstandardised and standardised coefficients, goodness-of-fit statistics (R^2), and regression equations are reported in Table 10. The RAPA was employed as the dependent variable in both models. In Model 1, age was the exclusive predictor variable, whereas in Model 2, age, attitude, subjective norm, and PBC were the four predictor variables. A *t*-test was carried out to examine whether of not standardised Beta's were significantly different from zero. As Table 10 demonstrates, Model 1, with age as the sole predictor variable, does not predict actual activity levels. Model 2, however, demonstrates a correlation between activity levels, and the linear combination of age, subjective norm, attitude and PBC, revealing that the combination of the variables do predict actual activity levels.

WHOQoL-BREF

Two-tailed independent samples *t*-tests were performed to compare the means of the current study's WHOQoL-BREF data set for the 70 – 79 year age group, against a New Zealand age-matched normative data set (Shepherd, submitted). The results are shown in Table 11.

Table 11
Two-tailed independent t-tests for the current WHOQoL-BREF data set and a New Zealand age-matched existing data set.

	Current Study Norms			***WHOQoL-NZ Norms***			***t***	***p***
Domain	***N***	***M***	***SD***	***N***	***M***	***SD***		
Physical	81	63.10	17.54	362	71.69	14.49	1.783	0.078
Psychological	81	71.71	14.64	362	73.48	12.33	0.379	0.706
Social	81	69.86	22.65	362	74.09	16.87	0.444	0.965
Environmental	81	76.81	14.10	362	79.83	12.43	0.675	0.501

As Table 11 illustrates, no significant differences were found for the physical (t (80) = 1.783, p = 0.078), psychological (t (80) = 0.379, p = 0.706), social (t (80) = 0.444, p = 0.965), and environmental (t (80) = 0.675, p = 0.501) domains. Although not statistically significant, the physical domain was close to significance (p=.078).

Correlational Analyses

Correlational analyses were undertaken between the four facets of the WHOQoL-BREF and the activity levels of participants (Table 12) in order to determine whether there was a relationship between higher or lower levels of activity, and QoL. No significant correlations were found, indicating that in men with prostate cancer, there appears to be no relationship between physical activity levels and QoL.

Table 12
Correlational analysis of physical activity level and the four facets of the WHOQoL-BREF.

	Activity Level	Physical	Psychological	Social	Environmental
Activity Level	1.000	.112	.129	-.098	.211
Physical	.112	1.000	.594**	.380**	.576**
Psychological	.129	.594**	1.000	.560**	.744**
Social	-.098	.380**	.560**	1.000	.527**
Environmental	.211	.567**	.744**	.527**	1.000

**. Correlation is significant at the 0.01 level (2-tailed).

Thematic analysis of open-ended questions

Responses to open-ended questions provided insight into additional preventative and supportive factors influencing participant's physically activity. A content analysis identified themes that prevented men from being physically active were: 1) Lack of energy; 2) Side-effects from ADT; 3) Disability; 4) Health problems, and 5) Other. Themes that arose which supported participants in being physically active were: 1) Mental health benefits; 2) Other benefits that come from being physically active; 3) Other activities participants were involved in which had a physical component, and 4) Other. A full list of these preventative and supportive factors are listed, organised by theme, in Appendix E.

Of the preventative factors, disability and additional health problems were the most common factors that prevented participants from being physically active. The most common factors that supported participants in being physically active were participating in other activities that had a physical component to them, for example, gardening and household tasks, and other factors such as supervision while exercising, and living alone, therefore having to undertake tasks independently.

Table 13 shows the frequency of responses to the preventative and supportive themes identified in the thematic analysis.

Table 13
Frequency of responses to themes that prevent and support physical activity in participants.

Supportive Factors	**Frequency**
Mental health benefits	3
Other benefits from being physically active	6
Other	14
Other activities with a physical component	16
Preventative Factors	**Frequency**
Lack of energy	1
Side effects from ADT	1
Other	10
Disability	13
Health problems (additional to prostate cancer)	26

Discussion

This report details an exploratory study that aimed to identify the physical activity intentions and behaviours, including factors that influence these behaviours, in men with prostate cancer currently receiving ADT. The TPB model was incorporated to see how accurately the components of this model predict physical activity intention and actual behaviour. Quality of life was also measured and compared to existing QoL normative data.

Physical Activity Levels

It was found that, in general, this group were classified predominantly under the active category of the RAPA activity levels. No New Zealand norms existed to draw a comparison to this finding, but the activity levels of participants in the current study reflect those reported in a previous study carried out by Denmark-Wahnefried et al. (2000) in the United States of America, indicating that the majority of men with prostate cancer report regular exercising.

Levels of Physical Activity and Age

The ages of participants in the current study ranged from 58 – 92 years of age. Correlation analyses found no relationship between age and activity level, providing insight that men with prostate cancer who are older are just as likely to be physically active, or not physically active, as younger men with prostate cancer.

These findings conflict with those reported by Salem, Skinner, Chodzko-Zajko, Proctor, Fiatarone Singh, Minson & Nigg (2009), who report that advancing age is associated with declines in physical activity volume and intensity. Additional conflicting evidence was found by The National Centre for Chronic Disease Prevention and Health Promotion (CDC) (n.d), which state that inactivity increases with age, and estimates that by the age of 75 one in three men engage in no physical activity. In the current study, however, one in sixteen men are physically inactive. Although no data currently exist to

support these findings, we could speculate that the diagnosis of prostate cancer makes one more aware of their health, and encourages healthy activity patterns.

Resistance Training

Of the 81 participants involved in this research, only 11 (13%) reported regularly partaking in resistance or strength training. These findings are consistent with research from Topolski et al., (2006), who reported 14% of older adult participants (M_{age} = 73.3 years), regularly engaging in resistance training activities. These low rates are perhaps due to age-related health problems such as degenerative musculoskeletal conditions, for example, osteoporosis, arthritis, and sarcopenia.

Preventative and Supportive Factors to being Physically Active

Participants identified a range of factors that both prevented and supported them in being physically active. From the identified factors, it would seem that health problems and disability are the highest preventative factors for this sample. Engaging in other activities, such as household chores, gardening, and other hobbies with physical components, appear to be the most highly rated supportive factors to being physically active.

Lack of energy was the most highly reported factor that prevented participants from engaging in physical activity. This was expected, as fatigue is a debilitating side-effect of both cancer and cancer treatment, including ADT. Similar findings have been reported by Fowler et al., (2002), who describe men with prostate cancer who are undergoing ADT as experiencing more negative effects of cancer and cancer treatment, and concern about lack of energy. Surprisingly though, when correlational analyses were performed, there was no statistical evidence of an association between fatigue and activity levels, or fatigue and behavioural intention.

The Theory of Planned Behaviour

Results of the current study indicate that a linear combination of the TPB constructs - subjective norm, attitude, and PBC - are predictors of ones intention to perform the behaviour at hand, and in performing the behavioural itself. The ability of the TPB to predict behavioural intention was significant, with an R^2 value of .649. Of the facets of the TPB, it is evident that attitude is the highest predictor of ones intention to perform the behaviour at hand, contradicting previous research (Connor & Sparks, 1996; Ajzen, 2002) that claimed PBC (or self-efficacy) to be the highest predictor of behavioural intention.

Attitude and Physical Activity

The finding that participants with more positive attitudes towards physical activity have greater intentions to participate in physical activity is not a new one. Previous studies have found that the formation of a positive attitude towards physical activity is an important step towards actual participation in activity (Smoll & Schutz, 1980; Godin & Shephard, 1986), and our data are consistent with these findings.

Our findings clearly show that of the three TPB components, individually, attitude has an influence of behavioural intention, whilst the subjective norm and PBC components do not. This statistically significant relationship found between behavioural intention and attitude has precedence in the literature (Courneya & Friedenreich, 1999; Hagger & Chatzisarantis, 2005; Courneya, Vallance, Jones & Reiman, 2005; Shen et al., 2008), and supports the notion that intentions to engage in physical activity can be influenced by targeting attitudes alone (Wood, 2008).

Perceived Behavioural Control and Physical Activity

In terms of actual behaviour, it would seem that PBC holds the greatest influence in performing physical activity. Even though the PBC variable did not produce a significant β value, its p-value was, according to visual inspection, substantially lower

than the other two predictors of the TPB. Research from Connor & Sparks (1996) supports this finding, and also considers PBC to be the greatest predictor of adherence to long-term behavioural practice.

Quality of Life Normative Comparison

The WHOQoL-BREF domain averages for 70 – 79 year olds for the current study were compared to the means of an age-matched New Zealand data set. Results obtained through two-tailed independent samples *t*-tests indicated close to significant differences (p=0.07) for only the physical QoL domain. Additionally, the current study's norms for the WHOQoL-BREF for this age group were compared to Hawthorne, Herrman & Murphy's (2006) Australian preliminary norms for the same age group. This was a valid comparison, as both studies utilised the same instrument (the Australian version of the WHOQoL-BREF), and are similar culturally. As the comparisons shown in Table 14 indicate, the Australian norms and the norms for the current study are largely equivalent, particularly for the psychological, social, and environment facets. However, as with the New Zealand normative data, the physical domain appears attenuated in the prostate cancer group. With differences in the physical domain for both norm comparisons, there is an indication that the cancer itself, or the cancer treatment, may be affecting the physical domain. There is also the possibility that men with prostate cancer are aware of their physical deterioration compared to other healthy men of the same age, therefore consider their physical quality of life to be lower than average.

Table 14
Comparison of the WHOQoL-BREF norms for the current study against the Australian WHOQoL-BREF norms for the 70-79 year age group.

	Current Study Norms			***Australian Norms***		
Domain	***N***	***M***	***SD***	***N***	***M***	***SD***
Physical	81	63.1	17.5	115	70.5	17.3
Psychological	81	71.7	14.6	115	70.4	13.7
Social	81	69.9	22.7	115	69.4	18.6
Environmental	81	76.8	14.1	115	76.9	11.9

Physical Activity and Quality of Life

Existing research informs us that physical activity has positive benefits on QoL (Brown et al., 2003; Lowe, Watanabe & Courneya, 2009; Newton & Galvao, 2008; Perkins et al., 2009). The results of the current study, however, contradict this conclusion, as results of correlational analyses between QoL and activity level were not significant, indicating that activity levels do not appear to be influenced by QoL. This result may, however, be forced by a low sample or the simple reality that, for men with cancer, ones QoL will remain low irrespective of other factors such as exercise.

Psychometric Properties

The TPB scale and the WHOQoL-BREF, including the WHOQoL-OLD Autonomy facet, all possessed high internal consistency and reliability. Topolski et al (2006) found the RAPA to be an easy-to-use, valid measure of physical activity for use with older adults, illustrating superior performance over other self-report physical activity measures.

In general, the psychometric properties of our TPB model were excellent. Overall, the variability in the dependent variable (i.e., behavioural intention) explained by the predictor variables was impressive (R^2=.649). This attests to the veracity of the TPB. This R^2 value falls between those reported in the literature, for example Gretlebeck, Black, Blue, Glickman, Huston & Gretebeck (R^2 = .72):(2007), and Courneya & Friedenreich (R^2 =.64):(1992).

For predicting actual exercising behaviour in the current study, the TPB constructs delivered an R^2 value of R^2=.262. Comparable findings are reported by Courneya & Friedenreich (R^2=.291): (1992).

The WHOQoL-BREF has previously demonstrated good discriminant validity, content validity, internal consistency and test-retest reliability (WHOQoL Group, 1998). The results of the current study confirm the psychometric integrity of these measures.

Limitations of the Current Study

The primary limitations of the current study are the use of a small convenience sample, inhibiting analytical options, and that it was a self-report inventory. Ideally, a larger sample size would have been more beneficial, as larger samples are less likely to violate the assumptions of parametric testing. A larger sample would have also endowed greater power in the inferential tests.

Self-report inventories, although they are the only practical way to measure physical activity levels in representative population samples, have a known tendency to over-report activity, and under-report sedentary behaviours – a tendency that may be increasing over time because of increasing social desirability bias (SPARC, 2004). A further limitation was that behavioural intention, and actual behaviour, were measured on the same occasion, therefore, as no observable measures of physical activity were incorporated in this study, for example, the use of pedometers, the actual activity levels of participants may not have been represented accurately. Ideally, levels of physical activity should be tested a week or so after measuring behavioural intention in order to get a true measure of intention to exercise, and inturn, an actual measure of behaviour.

Directions for further research

Previous research has demonstrated that men with prostate cancer who are receiving ADT may benefit from resistance training in order to increase bone strength, as they are at a high risk of developing osteoporosis. Findings from Culos-Reed et al., (2007) suggest that a physical activity intervention can provide tools for men with prostate cancer to adopt new behaviours and increase activity levels. A randomised control trial, therefore, investigating the usefulness of a resistance training physical activity intervention, aimed at preventing and/or alleviating the harmful side effects associated with ADT, of particular note, the loss of muscle mass, increased body fat and osteoporosis, will take place through AUT University's School of Sport and Recreation.

With substantial decreases in physical QoL, as indicated by the results of the current study, men with prostate cancer who are on ADT may benefit from physical activity programs such as the Never2Old program developed through AUT University and endorsed by the YMCA. Never2Old incorporates a range of exercises designed to increase strength, power, mobility and balance for adults 60 year of age and older. Benefits that may be gained through such a program, may not only be from participating in resistance training, but may also increase individual's perceptions of their physical QoL.

Conclusion

The results of the current study indicate that men with prostate cancer are predominantly active, however, the activity that is undertaken by these men is, for the most part, aerobic exercise, as opposed to resistance training. For all older adults, strength-training exercises are recommended to decrease the risk of falls and fractures and to promote independent living. The American College of Sports Medicine recommends that adults include strength training as part of a comprehensive physical activity program (CDC, 2004). Considering the detrimental side-effects associated with ADT, and the low measurements of physical QoL, as indicated in multiple studies, it is resistance training that may provide the greatest benefit for this group. Further research into the amount of resistance training men with prostate cancer are performing, as opposed to just aerobic exercise, would be beneficial for assessment of the advantages of strength training to manage the unfavourable side-effects caused by ADT, including decreased bone density, changes in body composition, and an increased rate of falls-related fractures.

It is indicative from the results of the current study, that men who have a diagnosis of prostate cancer, are who are currently receiving ADT, are a clinical population that appear to be relatively active. Their activity levels are guided by the components of the TPB – subjective norm, PBC, and attitude – with attitude being the highest predictor of one's intention to exercise.

Our data suggests that in order to motivate men with prostate cancer to exercise, including partaking in resistance training, targeting their attitudes would likely be the most successful intervention. We come to this conclusion based on our TPB model, which suggests that the attitude component is the greatest predictor of behavioural intention. However, in terms of actual behaviour, the perception of control to carry out physical activity emerges as the best predictor of actual behaviour. This was evident in our regression analysis in which the RAPA scores were the dependent variable, and the PBC was the best predictor of actual behaviour. These results have also been reported in previous studies.

If one is to target the physical activity behaviour of prostate cancer survivors, and attempt to increase their physical activities, including resistance training, our data suggests a two-tiered approach would be most successful. First, campaigns to change negative attitudes, or reinforce existing favourable attitudes towards physical activity. Second, identify barriers and facilitators of physical activity, and implement interventions that target these. It would be expected that by addressing barriers, or making physical activity more accessible, a survivors' PBC would increase, and inturn, there would be an increase in actual physical activity in this population.

APPENDICES

Appendix A: Questionnaire

- **By completing and returning the questionnaire below, you are expressing your consent to participate in this study.**
- **You are under no obligation to do so as your participation in this study is completely voluntary.**
- **You are also free to withdraw at any stage during the completion of the survey.**

How Physically Active Are You?

An assessment of level and intensity of physical activity

Contact: James P. LoGerfo, MD, MPH, logerfo@u.washington.edu

Rapid Assessment of Physical Activity

Physical Activities are activities where you move and increase your heart rate above its resting rate, whether you do them for pleasure, work, or transportation.

The following questions ask about the amount and intensity of physical activity you usually do. The intensity of the activity is related to the amount of energy you use to do these activities.

Examples of physical activity intensity levels:

Light activities • your heart beats slightly faster than normal • you can talk and sing	 Walking Leisurely  Stretching  Vacuuming or Light Yard Work
Moderate activities • your heart beats faster than normal • you can talk but not sing	 Fast Walking  Aerobics Class  Strength Training  Swimming Gently
Vigorous activities • your heart rate increases a lot • you can't talk or your talking is broken up by large breaths	 Stair Machine  Jogging or Running  Tennis, Racquetball, Pickleball or Badminton

How physically active are you? *(Check one answer on each line)*

		Does this accurately describe you?	
RAPA 1 1	I rarely or never do any physical activities.	Yes ☐	No ☐
RAPA 1 2	I do some **light** or **moderate** physical activities, but not every week.	Yes ☐	No ☐
RAPA 1 3	I do some **light** physical activity every week.	Yes ☐	No ☐
RAPA 1 4	I do **moderate** physical activities every week, but less than 30 minutes a day or 5 days a week.	Yes ☐	No ☐
RAPA 1 5	I do **vigorous** physical activities every week, but less than 20 minutes a day or 3 days a week.	Yes ☐	No ☐
RAPA 1 6	I do 30 minutes or more a day of **moderate** physical activities, 5 or more days a week.	Yes ☐	No ☐
RAPA 1 7	I do 20 minutes or more a day of **vigorous** physical activities, 3 or more days a week.	Yes ☐	No ☐
RAPA 2 (3 = Both 1 & 2) 1	I do activities to increase muscle **strength**, such as lifting weights or calisthenics, once a week or more.	Yes ☐	No ☐
RAPA 2 (3 = Both 1 & 2) 2	I do activities to improve **flexibility**, such as stretching or yoga, once a week or more.	Yes ☐	No ☐

ID # _____

Today's Date _____

PLEASE RESPOND TO THE FOLLOWING QUESTIONS THAT EXPLORE REASONS WHY YOU MAY PARTICIPATE IN PHYSICAL ACTIVITY

Circle the most appropriate option for you.

I participate in physical activity because:

1. Others would be disappointed in me if I didn't.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

2. I want to understand the benefits of being physically active.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

3. It's fun.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

4. That's what I'm supposed to do.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

5. I will feel bad about myself if I don't.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

6. I want to learn new things.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

7. I enjoy it.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

8. I'd be ashamed of myself if I didn't.

(Not all true) 1 2 3 4 5 6 7 (Very true)

I participate in physical activity because:

9. I think it is important to participate in physical activity.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

10. I am expected to.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

11. It bothers me when I don't.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

12. It's interesting.

(Not all true) 1 2 3 4 5 6 7 (Very true)

PLEASE RESPOND TO EACH OF THE FOLLOWING QUESTIONS IN TERMS OF HOW TRUE THE STATEMENT IS FOR YOU IN RELATION TO YOUR PHYSICAL ACTIVITIES

13. I rate my ability to perform physical activity very highly

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

14. I feel confident in my ability to be physically active.

(Not all true) 1 2 3 4 5 6 7 (Very true)

---

15. I am capable of being physically active.

(Not all true) 1 2 3 4 5 6 7 (Very true)

Please respond to the following statements:

16. I enjoy physical activity

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

17. I have decided to do physical activity that makes me breathe hard or feel tired during my leisure time over the next two weeks

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

18. I will try to do physical activity that makes me breathe hard or feel tired during my leisure time over the next two weeks

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

19. I plan to do physical activity that makes me breathe hard or feel tired during my leisure time over the next two weeks.

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

20. Not participating in physical activity that makes me breathe hard or feel tired puts my health at greater risk

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

21. My goal is to participate in physical activity at least three times per week

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

22. Participating in physical activity that makes me breathe hard or feel tired is

(Not enjoyable) 1 2 3 4 5 6 7 (Enjoyable)

---

23. Participating in physical activity that makes me breathe hard or feel tired is

(Unhealthy) 1 2 3 4 5 6 7 (Healthy)

24. Participating in physical activity that makes me breathe hard or feel tired is

(Bad) 1 2 3 4 5 6 7 (Good)

---

25. Significant others believe that it is important that I participate in physical activity that makes me breathe hard or feel tired during my leisure time

(Strongly disagree) 1 2 3 4 5 6 7 (Strongly agree)

---

26. How important is it to you that significant others believe you should participate in physical activity that makes you breathe hard or feel tired?

(Not at all) 1 2 3 4 5 6 7 (Very much)

---

27. My health care providers (e.g. Doctors, Nurses) think that it is important that I participate in physical activity that makes me breathe hard or feel tired during my leisure time

(Strongly disagree) 1 2 3 4 5 6 7 (Strongly agree)

---

28. How important is it to you that your health care provider thinks you should participate in physical activity that makes you breathe hard or feel tired?

(Not at all) 1 2 3 4 5 6 7 (Very much)

---

29. Participating in physical activity over the next week, for me, would be beneficial

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

30. If I want to, I can participate in physical activity that makes me breathe hard or feel tired during my leisure time.

(Strongly disagree) 1 2 3 4 5 6 7 (Strongly agree)

---

31. It is mostly up to me whether I participate in physical activity that makes me breathe hard or feel tired during my leisure time.

(Strongly disagree) 1 2 3 4 5 6 7 (Strongly agree)

---

32. Exercising during my treatment is/would have been useless

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

33. Being physically active is an important choice I really want to make

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

34. Most people who are important to me are physically active

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

---

35. My time to regularly participate in physical activity is limited

(Definitely false) 1 2 3 4 5 6 7 (Definitely true)

Please progress to the next page

Please indicate how much each of the following factors influences your own activity level					
	Does not influence me at all	Does not influence me much	Neutral	Influences me somewhat	Influences me a lot
Lack of energy	1	2	3	4	5
Lack of time due to other commitments (e.g., work, family)	1	2	3	4	5
Pain	1	2	3	4	5
Incontinence	1	2	3	4	5
Being physically active costs too much (clothes, equipment, etc.)	1	2	3	4	5
Facilities are too hard to get to	1	2	3	4	5
Nobody to do physical activity with	1	2	3	4	5
There are other things I would rather do in my spare time	1	2	3	4	5
Physical activity takes too much effort	1	2	3	4	5
I am too out-of-shape or unfit to start	1	2	3	4	5
I am not good at physical activity	1	2	3	4	5
Having a safe environment to exercise in	1	2	3	4	5

Are there any other factors that <u>prevent</u> you from engaging in physical activity? If so, please list

Are there any factors that <u>support</u> you in engaging in physical activity? If so, please list

PLEASE READ EACH QUESTION AND ASSESS YOUR FEELINGS, FOR THE *<u>LAST TWO WEEKS</u>*, AND CIRCLE THE NUMBER ON THE SCALE FOR EACH QUESTION THAT GIVES THE BEST ANSWER FOR YOU.

	Very poor	Poor	Neither Poor nor Good	Good	Very Good
1. How would you rate your quality of life?	1	2	3	4	5

	Very Dissatisfied	Fairly Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
2. How satisfied are you with your health?	1	2	3	4	5

The following questions ask about how much you have experienced certain things in the *<u>last two weeks</u>*.

	Not at all	A Small amount	A Moderate amount	A great deal	An Extreme amount
3. To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
4. How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
5. How much do you enjoy life?	1	2	3	4	5
6. To what extent do you feel your life to be meaningful?	1	2	3	4	5

	Not at all	Slightly	Moderately	Very	Extremely
7. How well are you able to concentrate?	1	2	3	4	5
8. How safe do you feel in your daily life?	1	2	3	4	5
9. How healthy is your physical environment?	1	2	3	4	5

	Not at all	Slightly	Somewhat	To a great extent	Completely
10. Do you have enough energy for every day life?	1	2	3	4	5
11. Are you able to accept your bodily appearance?	1	2	3	4	5
12. Have you enough money to meet your needs?	1	2	3	4	5
13. How available to you is the information you need in your daily life?	1	2	3	4	5
14. To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

	Not at all	Slightly	Moderately	Very	Extremely
15. How well are you able to get around physically?	1	2	3	4	5

The following questions ask you to say how good or satisfied you have felt about various aspects of your life over the *last two weeks*.

	Very Dissatisfied	Fairly Dissatisfied	Neither Satisfied nor Dissatisfied	Satisfied	Very Satisfied
16. How satisfied are you with your sleep?	1	2	3	4	5
17. How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
18. How satisfied are you with your capacity for work?	1	2	3	4	5
19. How satisfied are you with yourself?	1	2	3	4	5
20. How satisfied are you with your personal relationships?	1	2	3	4	5
21. How satisfied are you with your romantic life?	1	2	3	4	5
22. How satisfied are you with the support you get from your friends?	1	2	3	4	5
23. How satisfied are you with the conditions of your living place?	1	2	3	4	5
24. How satisfied are you with your access to health services?	1	2	3	4	5
25. How satisfied are you with your transport?	1	2	3	4	5

	Never	Infrequently	Sometimes	Frequently	Always
26. How often do you have negative feelings such as blue mood, despair, anxiety, depression?	1	2	3	4	5

	Not at all	Slightly	Somewhat	To a great extent	Completely
27. How much freedom do you have to make your own decisions?	1	2	3	4	5
28. To what extent do you feel in control of your future?	1	2	3	4	5
29. How much do you feel that the people around you are respectful of your freedom?	1	2	3	4	5
30. To what extent are you able to do the things you'd like to do?	1	2	3	4	5
31. To what extent do you feel that you have enough to do each day?	1	2	3	4	5
32. How satisfied are you with the way you use your time?	1	2	3	4	5
33. How satisfied are you with your level of activity?	1	2	3	4	5
34. How satisfied are with your opportunity to participate in community activities?	1	2	3	4	5
35. How concerned are you about the way in which you will die?	1	2	3	4	5
36. How much are you afraid of not being able to control your death?	1	2	3	4	5
37. How scared are you of dying?	1	2	3	4	5

Do you have any general comments about this study?

Demographic Information

Age ……

In which city/suburb do you live?

……

Ethnicity:	NZ European
	Maori
	Pacific Islander
	Asian
	Other ……
Marital Status:	Single
	Married/De-facto
	Divorced/Separated
	Widowed
Highest Completed Education Level:	Primary
	Secondary
	Tertiary
Current Employment Status:	Full Time
	Part Time
	Retired
	Disability/Sick Leave
	Other ……

Please progress to the next page

Approx Height……..… Approx Weight……

Most recent Gleason Number ……..

Most recent PSA level ……

Time since diagnosis ……

Length of hormone treatment (LHRH analogue e.g. Zoladex, Eligard, Lucrin injections)

……..

Any other chronic health conditions or injuries? E.g., Cardiovascular disease, osteoporosis, arthritis. *Please list….*

Thank you

Appendix B – Cover Letter

Hello, Kia ora, Kia orana, Fakaalofa lahi atu, Talofa lava, Gude tru olgeta, Taloha ni, Malo e lelei, Talofa, Ni sa bula vinaka.

My name is Clare Ryan and I am a researcher at AUT University.

As a prostate cancer patient residing in New Zealand, you are invited to take part in a study investigating physical activity, quality of life, and your opinion on the factors that influence your physical activity. You were selected as a potential participant in this study as you have previously been diagnosed with prostate cancer.

A questionnaire will be mailed to you in seven days time and will include a self-addressed pre-paid envelope meaning that there will be no postage expenses that you need to pay. You should be able to complete these questionnaires within half an hour. If you do not wish to be involved in this project, please contact the research supervisor, Dr Daniel Shepherd, on (09) 921 9999 extn. 7238, within the next week.

Please note, participation in the study is entirely voluntary (your choice), and you are free to withdraw from the study at any time.

You will need to write your name on the questionnaires so that we can match the results from each of these with the demographic and clinical data. You will not be identifiable in any way in the reports or other medical or scientific forums in which this data is reported and discussed.

By better understanding your barriers and motives to being physically active, the results of this study may prove beneficial to not only you, but also to other men with prostate cancer and to cancer clinicians and health promotion specialists. It may prompt you to reap the rewards of being more physically active and assist health promotion specialists and your clinicians to develop physical activity programmes that are not only safe and beneficial for you, but also take into account the barriers to exercise you may experience.

Please feel free to contact me if you wish to discuss the study further.

Kind regards,

Ms Clare Ryan
Department of Psychology
Faculty of Health
AUT University
Private Bag 92006
Auckland
09 921 9999 extn. 7661

Appendix C – Participant Information Sheet

Participant Information Sheet

Title of Project: Factors that influence physical activity in prostate cancer patients

Principal Investigator: Ms Clare Ryan

Dept of Psychology
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Private Bag 92006
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09 921 9999 x7661

Research Supervisor: Dr Daniel Shepherd

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INVITATION

As a prostate cancer patient in New Zealand, you are invited to take part in a study which asks you to complete a series of questionnaires on your physical activity levels, your quality of life, and your opinions of the factors that influence your physical activity. Participation in this study is entirely voluntary, and you can withdraw from the study at any time with no effect on your continuing health care.

ABOUT THE STUDY

The current study seeks to determine the:

1. Physical activity patterns of prostate cancer patients.
2. Factors that influence these patterns of physical activity.

You were selected as a potential participant in this study as you have previously been diagnosed with prostate cancer. Data collection will take place mid 2009, and it is anticipated that data analysis will be completed, and the final reports written by late 2009.

If you agree to participate in this study, you will be asked to respond to a number of questions asking about:

1. Current levels of physical activity
2. Intentions to be physically active
3. Quality of life

Most of these questions for the physical activity intentions and quality of life questionnaires involve you ticking boxes or circling numbers that best represent how you feel about a statement. Some demographic information (age, education level etc) and clinical data (time since diagnosis, PSA and Gleason score etc) will also be obtained from you, or if you are unsure, from your referring clinician. This data is required as these scores may influence the results of this study.

The questionnaires will be mailed to you along with a self-addressed pre-paid envelope meaning that there will be no postage expenses that you need to pay. We believe that you should be able to complete these questionnaires within half an hour. If you need assistance with these questions, please contact the researchers who will be only too happy to assist you.

Questionnaires will be subject coded in order to match demographic and clinical data. Questionnaires will be kept in a locked cabinet at AUT University. Following the completion of data entry, data will be transferred to a computer with all electronic copies of this data safely stored on password-protected computer. As a result, you will not be identifiable in any way in the reports or other medical or scientific forums in which this data is reported and discussed.

BENEFITS RISKS AND SAFETY

Many prostate cancer patients undergo androgen deprivation therapy (ADT) to slow down the progression of their cancer. This treatment, however, typically results in a number of side effects including significant loss of muscle and bone mass, muscular strength and endurance and functional ability, which collectively contribute to a four-times increase in the rate of falls-related fracture and reduced quality of life. To date, no studies have compared the physical activity patterns and determinants in prostate cancer patients who are on ADT to those who are not on ADT. The results of this study have much relevance as we currently do not know if New Zealand prostate cancer patients are sufficiently physical active, and if not, what reasons contribute to this. With this data, physical activity programs that focus on your specific needs may be developed and become a part of your usual care options.

As this study only involves completing a series of questionnaires, we would expect that there is little potential for any physical or psychological harm. However, if any psychological harm is experienced, counselling will be arranged for you through AUT University.

There will be no cost for you in this study except your time as the questionnaires will come with a pre-paid postage envelope. We would expect that most people will be able to complete these questionnaires within a period of half an hour.

PARTICIPATION

Your participation in this study is entirely voluntary. If you do agree to take part, you are free to withdraw from the study at any time without having to give a reason, and this will in no way affect your future health care.

Participation in this study will be stopped should any harmful effects appear or if your clinician feels it is not in your best interests to continue.

GENERAL

Your general practitioner or primary clinician/urologist will be informed of your participation in this study if you give consent. This is required as we need to obtain your current clinical data including your Gleason score and PSA levels that you may not know or remember.

At the conclusion of the study, you will be able to get a copy of the study's results and/or discuss your personal results. We would like to do further research in this area, with future studies looking at the benefits of community-based physical activity programs for you and other prostate cancer patients.

If at any time you have questions regarding the study, you can contact the principal investigator, or the research supervisor (details given on page 1).

If you have any questions or concerns about your rights as a participant in this research study you can contact an independent health and disability advocate. This is a free service provided under the Health and Disability Commissioner Act:

Telephone: (NZ wide) 0800 555 050
Free Fax (NZ wide): 0800 2787 7678 (0800 2 SUPPORT)
Email (NZ wide): advocacy@hdc.org.nz"

CONFIDENTIALITY

No material which could personally identify you will be used in any reports on this study. We will obtain clinical measures such as Gleason score and PSA scores from your clinician, as these may influence the results of our study. These scores will be matched to your questionnaire results, and from that point, subject codes will be used so you are not identifiable in any way.

Results will be stored for six years in a locked cabinet at AUT University. Electronic copies will be kept on password protected computers of the investigators. Only the investigators will have access to these records. After six years, data will be destroyed.

RESULTS

On completion of the study, results will be available to you on request. Results will be available in either report form, or can be directly discussed with you by the investigator/s. Such discussions can also involve your clinician. You need to be aware however that there can be a delay of several months from when you completed the questionnaires till when the data has been analysed and the reports written.

STATEMENT OF APPROVAL

This study has received ethical approval from the Multi-region Ethics Committee which reviews National and Multi regional studies.

Please feel free to contact the researcher if you have any questions about this study.

Appendix D – Reminder Letter

A few weeks ago you would have received a questionnaire that invited you to answer a variety of questions relating to your quality of life, physical activity levels, and factors which may motivate and prevent you from being physically active.

If you have already completed and returned the questionnaire, please accept our sincere appreciation for doing so. If you have not yet filled out the questionnaire and returned it in the stamped addressed envelope, please do so as soon as possible. If you have misplaced the questionnaire, we have enclosed an additional one for you. If you require assistance in filling out the questionnaire, do not hesitate to contact the researcher, Clare Ryan, on (09) 921 9999 extn. 7661.

Your involvement in this study will undoubtedly prove beneficial to other men with prostate cancer, health professionals, and health promotion specialists.

The information collected from these questionnaires will help us to identify what prevents and what motivates men with prostate cancer from being physically active, and help clinicians and other health professionals to develop interventions to increase physical activity participation in this population.

Once again, we thank you for your involvement, and will provide you with a report of our findings early in 2010.

Kind Regards

Clare Ryan
Research Assistant
AUT University

Appendix E – Thematic Analysis

Thematic Analysis of Physical Activity Preventative and Supportive Factors

Preventative Factors

Lack of Energy

Run short of energy in recent years

Side effects from ADT

Significant swelling in legs

Disability

Collapsed thigh and replaced bone in its place
Knee Replacement x2
Drop foot
Pain
No legs
Bad knees
Visual impairment x2
Deafness
Crippled leg
Back problem
Hip problems

Health Problems

Emphysema x3
Minor heart problems
Chronic respiratory problems x2
Incontinence x2
Short of breath
Cardia disorder
Metastatic prostate cancer
Spinal sclerosis
Peripheral vascular disease
Heart block
Arthritis x5
Cardiovascular problems
Osteoporosis
Rheumatoid arthritis when younger

Heart murmur
Diabetes x2

Other

Body weight
Age x3
Weather x3
Lack of strength
Laziness
Long work hours

Supportive Factors

Mental Health Benefits

Feeing good mentally after exercise
Clears the brain
Mind and body activities

Other benefits from being physically active

Feeling fitter
Prevents cramp
Assists digestion and body function
Promotes good health and wellbeing
Maintaining a certain level of fitness
Control diabetes

Other activities with a Physical Component

Gardening x5
Farm work
Animal welfare
Yoga
Hobbies x2
Household tasks x2
Tai chi
Walking with dog
Mowing laws x2

Other Factors

Supervision of another x2

Hip replacement
Having an active job that is paid x2
Living alone x2
Crippled leg
Disability Scooter
Walking frame
Summer weather
Drivers licence
Doctor’s suggestions x2

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