

An investigation into the effect of providing employees with a pedometer on overall exercise levels, barriers to physical activity, stress, and satisfaction with work and life.

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Abstract

Given the positive benefits of physical activity, workplaces have made many attempts to increase physical activity levels of sedentary employees, typically through the use of an exercise intervention. The main purpose of the present research was to investigate whether the simple act of supplying employees engaged primarily in sedentary office-type work, who were intent on becoming physically active, with a tool capable of measuring walking activity (a pedometer) would enhance their physical activity levels over an eight-week period. As predicted, those who received a pedometer reported a significant increase in physical activity from Time 1 to Time 2, while those who did not reported no change. Furthermore, changes in physical activity levels were found to be negatively correlated with perceived barriers to physical activity at Time 1 and also with changes in perceived barriers over the eight-week period. These findings offer a simple and cost-effective alternative to traditional exercise interventions and highlight the importance of reducing barriers to physical activity to increase success when implementing future physical activity initiatives. No relationships between changes to physical activity and life satisfaction, job satisfaction or work-related stress were found. Implications of these results and suggestions for future research are discussed.

Introduction

Overview

The health-enhancing effects of a physically active lifestyle are well established (Sallis & Owen, 1999). Many researchers have demonstrated that physical activity has a positive affect on both physical and mental health. A Surgeon General's report (U.S. Department of Health and Human Services [USDHHS], 2001) indicated that people who engage in physical activity, relative to those who do not, report fewer illnesses, better mental health, and have a longer life expectancy. For example, physical activity reduces the risk, and can aid the recovery, of many health-related problems, such as heart disease, cancer, diabetes, arthritis and high blood pressure (USDHHS, 2001; Vainio & Bianchini, 2002). Additionally, although psychological health benefits are less established (Griffiths, 1996), physical activity has been associated with the improvement in, and prevention of, several areas of poor mental health, including improved-self concept and confidence, prevention and reduction in symptoms of anxiety and improved mood, alleviation in symptoms associated with mild-to-moderate depression (Landers, 2009), and efficient stress prevention and reduction (Wijndaele et al., 2007).

Given the positive benefits of physical activity, there have been many attempts made to increase physical activity levels of sedentary individuals, as detailed below. These attempts have typically involved an exercise intervention but have taken many different forms and had differing degrees of success. The main purpose of the present research was to investigate whether supplying employees engaged primarily in sedentary office-type work, who were intent on becoming physically active, with a tool to measure walking activity (a pedometer) would enhance their overall physical activity levels. Links between physical activity levels (and changes in these over an eight-week period) with life

satisfaction, job satisfaction, perceived stress, work-related stress and barriers to physical activity were also examined.

Exercise and Physical Activity

The World Health Organisation ([WHO], 2010) defines physical activity as any bodily movement produced by skeletal muscle activation that requires energy expenditure. This differs from exercise, which Carr (2001) defined as “planned, structured and repetitive bodily movement done to improve one or more components of physical fitness” (p. 5). Extending upon these definitions, it is important to note that both leisure activities and exercise can be categorised as forms of physical activity, however, not all physical activities are encompassed in the definition of exercise (Chen & Millar, 1999). For the purposes of the current research, the WHO (2010) definition of physical activity will be used because of the broad scope of activity to which the definition can refer. Fundamentally, the WHO’s (2004) “Global Strategy on Diet, Physical Activity and Health” report recommendations for overall health and well-being suggest that individuals should partake in regular moderate-intensity physical activity for at least 30 minutes on most days of the week. However, population surveys indicate that more than 60% of adults in the Western world do not exercise on a regular basis, and 25% report no specific leisure-time physical activity (Sallis & Owen, 1999).

In New Zealand alone, it is conservatively estimated that \$160 million per annum could be saved in health-related costs by the government if the recommended physical activity guidelines were adhered to by all adults in the population (Bauman, 1997). Workplaces also suffer from the high cost of inactivity, with sedentary lifestyles being shown to decrease productivity, increase absenteeism and increase medical claims, all of which contribute to increasing the financial cost to businesses (Badland, 2004; O’Donnell,

2002). The effectiveness of physical activity in reducing illnesses and increasing individuals' overall health is now widely accepted by medical authorities worldwide (Fox, 1999; WHO, 2004). As a result, workplaces have attempted to become involved in promoting the benefits of increased exercise through the introduction of numerous health and well-being interventions.

Exercise and the workplace

Research dating from as early as the 1930s has examined the relationships between exercise and a variety of variables thought to impact behaviour in the workplace (Ilgen, 1990). For example, research by Cox, Evans and Jamieson (1979) found that people who maintain a regular exercise regime are less likely to be ill or remain ill which, in turn, affects workplace absenteeism, loss of productivity and increases in health insurance costs and claims (Lloyd & Foster, 2006).

Essentially, exercise is being viewed increasingly as a way of investing in employees, similar to the development of safe working conditions (LeGro, 2005). The development of safe working conditions arose through social and legal mandates that employees had the right to work in safe and non-harmful environments (Viteles, 1932). More recently, however, increasing focus on healthcare costs and corporate image has prompted employers to consider the overall health and wellness of employees in addition to aspects such as workplace safety (DeMoranville, Schoenbachler & Przytulski, 1998; Ilgen, 1990). That is, to be an 'employer of choice' and attract the best candidates for a job, companies must be seen to take care of their employees (McShane, Olekalns & Travaglione, 2010).

One way in which employers can be seen to take care of their employees is through attempts to reduce workplace stress. Fundamentally, stress is most often described as an

adaptive response to a situation that is perceived as challenging or threatening to a person's well-being (Barling, Weber & Kelloway, 1996). Illnesses, such as gastrointestinal problems, mental disorders and hypertension, have been reportedly caused or aggravated by stress at work (Krohe, 1999). Specific workplace Health and Safety legislation has been introduced to a number of countries which makes employers liable if their employees suffer from workplace stress (e.g., British *Health and Safety Act at Work*, 1974; New Zealand *Health and Safety in Employment Act*, 1992; United States of America *Occupational Health and Safety Act*, 1970). Therefore, the link between exercise and reduced stress is important to consider, not only from the health and well-being perspective of the individual, but also from the cost and accountability perspective of an employer.

A considerable amount of research has been conducted on the effects of stress on individuals in the workplace, and the detrimental effects stress can have on both individuals and organisations as a whole. Although stress has been an issue for a long time, in an unpredictable and constantly changing labour market, the effect of stress on individuals in the workplace has become more of an issue (Colligan & Higgins, 2006; Steptoe, Kearsley & Walters, 1993). For example, the New Zealand *Health and Safety in Employment Act* (1992) identified stress, which often results in physical and/or mental fatigue, as a hazard in the workplace. It is therefore critical to determine ways in which the occurrence of such a hazard could be reduced. In general, stress can lead to various health issues of both an emotional and physical nature, including high blood pressure, migraines and general psychological illnesses (Wilkins & Beaudet, 1998). At a work-specific level, previous research has shown stress to be related to absenteeism, reduced productivity and higher health insurance costs (Cooper & Carwright, 1994; Danna & Griffin, 1999).

Research has shown that physical activity is an effective means of reducing and preventing anxiety and various types of stress, including work-related stress, among adults (Bhui, 2002; Dunn, Trivedi, & O'Neal, 2001; Steptoe et al., 1993). There have been a number of explanations put forward to explain the positive impact of physical activity on stress. Some researchers (e.g., Schwartz, Davidson & Goleman, 1972) have argued that exercise distracts individuals from ruminating on their stressors. Other researchers (e.g., DiLorenzo et al., 1999; Pistacchio, Weinberg, & Jackson, 1989; Salmon, 2001) have argued that the effect is the consequence of the release of neurochemicals, such as endorphins, that increase an individual's sense of well-being. Whichever theory is correct, the beneficial effects of physical activity on stress have been well established.

In addition to exercise reducing stress, it is interesting to consider the effect exercise has on mood and attitudes. Numerous studies have found significant positive changes in mood state after one session of aerobic exercise. For example, running and bicycling have been shown to produce decreases in negative mood disturbances and anxiety in addition to increases in mental vigour (McGowan, Pierce & Jordan, 1991; Roth, 1989; Steptoe et al., 1993). Mood states are most positive 10 – 15 minutes after completion of exercise (Dyer & Crouch, 1988). However, positive residual effects have been found after 30 minutes (Steptoe et al., 1993) and even 24 hours later (Maroulakis & Zervas, 1993). Research has shown that exercise affects mood and attitudes in non-work related studies (e.g., DiLorenzo et al., 1999; McGowan et al., 1991; Steptoe et al., 1993; Pauley, Palmer, Wright & Pfeiffer 1982), and that this has been positively associated with general life satisfaction (Schwarz, Strack, Kommer, & Wagner, 1987). Building on previous research, it is possible that exercise might affect the mood state and attitudes of individuals at work and that this, in turn, might improve job satisfaction (Judge & Ilies, 2004). Typically, job satisfaction is defined as the degree to which employees have positive

attitudes about their jobs (Stone, 2008). Therefore, job satisfaction is an important factor that has an effect on individuals and the workplace. Higher job satisfaction levels have been linked to better job performance (Wright & Cropanzano, 2000), reduced absenteeism (Patchen, 1960) and reduced turnover (Butler, 1961).

Previous research has been conducted on the relationship between physical activity and job satisfaction; however, these studies have produced some contradictory results. For instance, research by Frew and Bruning (1988) showed increases in job satisfaction (as measured by the Job Description Index; Smith, Kendall, & Hulin, 1969) with physical activity whereas research by Gronningsaeter, Hytten, Skauli and Christensen (1992), and by Jet, Spector, Gudanowski and Newman (1991), reported a reduction in job satisfaction with increased physical activity. According to LeGro (2005), it is actually more common not to find a relationship between exercise and job satisfaction than to find either a positive or negative relationship. Overall, job satisfaction is a work-related attitudinal variable that could be affected by physical activity participation, but yet the supporting empirical evidence is inconsistent. The current research aims to clarify this relationship by investigating the links between physical activity, job satisfaction and life satisfaction, without any workplace intervention.

Numerous studies which have investigated the link between physical activity and job satisfaction have been based on exercise interventions introduced/provided by employers (e.g., Daley & Parfitt, 1996; Frew & Bruning, 1988; Gronningsaeter et al., 1992; Jet et al., 1991) and none, to the author's knowledge, have focused on physical activity undertaken outside of the workplace and the influence this may have on satisfaction in the workplace or on the job. The relationship between physical activity undertaken outside the workplace (without workplace intervention) and job satisfaction is important to consider for two reasons. Firstly, to establish whether increases in physical

activity are related to increases in job satisfaction without the influence of any significant physical activity intervention. Secondly, to determine more about the physical activity–job satisfaction relationship as this may provide a benchmark by which future physical activity interventions (supplied and supported by the workplace) can be assessed for effectiveness. For example, if no relationship is found between physical activity and job satisfaction without intervention, but a relationship is discovered with the use of a particular intervention, this may suggest that something particular about the specific intervention was successful in enhancing satisfaction at work. Therefore, the current research aimed to investigate whether there is a relationship between increases in physical activity outside the workplace (without any intervention from the workplace) and job satisfaction by measuring changes in these variables over an eight-week period among a group of full-time corporate employees who were intent on becoming physically active.

Workplace physical activity interventions

As outlined above, the resulting costs of an inactive lifestyle may be significant to both the individual and the workplace. Therefore, the need to develop or establish ways to encourage individuals to engage in physical activity is obvious. As a response to low levels of physical activity, many national authorities and workplaces have launched interventions with the aim of improving public and workplace health through increased physical activity (e.g., Auweele, Boen, Schapendonk & Dornez, 2005; Cale & Harris, 2006; Cooper & Cartwright, 1994; Frew & Brunning, 1988; Gilson, Mckeena Cooke & Brown, 2007; Griffiths, 1998; Kang, Marshall, Barreira & Lee, 2009; King, 1998; Nahas & Goldfine, 2003; Sallis et al., 1992; WHO, 2004). There are primarily two types of workplace physical activity interventions which have been employed: interventions supplied by the workplace that encourage employees to be more physically active at work, for example by

using posters and signage to promote stairwell use around the office, as opposed to elevator use (Auweele et al., 2005; Marshall et al., 2002) and interventions that encourage employees to be more physically active outside the workplace, for example by offering educational classes about physical fitness, with the intention of increasing physical activity outside the workplace (Aust & Ducki, 2004). It is important to note here that the scholars of a recent meta-analysis on workplace physical activity interventions have suggested that more investigations are needed to determine the impact of physical activity interventions on important work-related outcomes, including stress levels and job satisfaction (Conn, Hafdahl, Cooper, Brown & Lusk, 2009). Essentially, the second type of intervention is most relevant to this study because it focuses on the benefits of being physically active beyond the workplace. However, this research also aimed to further examine the effects of physical activity outside the workplace (without workplace intervention) on work-related factors such as stress and job satisfaction – an area of study which seems to be lacking in current literature.

In addition to measuring how effective an intervention can be in increasing physical activity, it is important to consider the period of time over which an intervention is effective. Successful short-term interventions are regarded as those that have had an impact on increasing physical activity levels over the period ranging from four weeks to twelve months (dependent on the length of the intervention), whereas successful long-term interventions result in physical activity behavioural change for twelve months or longer (Muller-Riemenschneider, Reinhold, Nocon & Willich, 2008). Interventions that encourage greater levels of physical activity over longer periods of time can be thought to provide more personal and health benefits to the individual as well as benefits to the workplace. A number of short-term workplace interventions, including traditional exercise classes, group led exercise sessions and enhancements to the work setting to encourage

stairwell use, have been successful in producing modest increases in physical activity during the study period (Blamey, Multrie & Aitchison, 1995; Boutelle, Jeffrey & Schmitz, 2001; Eves, Webb & Mutrie, 2006; Kerr, Yore, Ham & Dietz, 2004; Yancey et al., 2004). However, the long-term effects of such interventions are questionable.

Fundamentally, research has shown that among those who take up exercise through interventions, 50% are likely to drop out within a year (Sallis & Owen, 1999). Cale and Harris (2006) argued that what some of these previously employed interventions may have not considered is the ability to promote simple, realistic, attainable lifestyle physical activity using behaviour strategies, such as self-monitoring, goal setting, and feedback. In the past, these strategies have been shown to be effective in increasing overall-health (King, 1998). For example, a review on the effectiveness of physical activity interventions by Muller-Riemenschneider et al. (2008) found that interventions that used additional exercise prescriptions and booster strategies (e.g., phone, mail or internet reminders to reinforce the initial intervention) achieved the most substantial long-term increases in physical activity behaviour (i.e., over 12 to 24 months). Although time constraints meant that the current research was only able to be conducted over a short-term time span, it investigated how the use of a pedometer, a simple tool which can be used to monitor, measure and enhance one's awareness of their physical activity levels, may motivate individuals to become more physically active.

The use of pedometers for measuring physical activity

Walking is a common form of physical activity for many people in Western society and some success has been achieved in increasing walking in small-scale studies using electronic pedometers (i.e., a small device that measures ambulatory activity) (Iwane et al., 2000; Wyatt et al., 2005). The use of pedometers has become increasingly popular and can

assist people to monitor their amount of walking and potentially motivate them to increase it by providing immediate feedback on their progress. Butler and Dwyer (2004) disputed the motivating benefit of pedometers, however, by suggesting that pedometer use made no difference to whether trial members increased their walking. However, participants in Butler and Dwyer's (2004) research who were not able to read their pedometers but who knew that their walking and pedometer readings were being monitored by the researcher also showed an increase in their walking over the period of the intervention. Accordingly, the instant feedback from the pedometer was not an essential component of its impact – simply knowing that their activity levels were being monitored may have been significant motivation in itself to increase their activity. Previous research involving monitoring activity has been shown to motivate people to increase physical activity levels (Normand, 2008). Therefore, if used in combination with record keeping, pedometers may be used as an effective tool to help increase daily physical activity levels (Gesell, 2003). Although participants were not asked to keep record of their physical activity during the intervention period of the current research (they were only aware they would have to complete an online questionnaire eight weeks after initial contact), it was of interest to investigate whether the simple notion of providing individuals with a tool which could be used to record and monitor physical activity (i.e., a pedometer) might, in turn, increase overall physical activity levels.

Motivational readiness to change

It is worth considering that some individuals may respond better to being provided with certain tools to help measure and monitor physical activity levels than others. One recent study by Phipps, Madison, Pomerantz and Klein (2010) used a motivational

readiness model (Marcus, Selby, Niarua & Rossi, 1992) to determine levels of interest towards different forms of physical activity interventions.

Five stages were described in the model: *precontemplation* (currently not physically active and not intending to engage in physical activity in the next six months), *contemplation* (currently not physically active, but intending to become physically active in the next six months), *preparation* (currently not physically active but intending to start in the next 30 days), *action* (currently regularly active but have only been so in the last six months), and *maintenance* (currently regularly physically active and have been so for more than six months) (Marcus et al., 1992). According to Marcus and Simkin (1993), individuals progress through these stages at varying rates, with some remaining stable for prolonged periods of time, others progressing, and some relapsing to earlier stages. Hence, the model emphasises the dynamic nature of behaviour change and psychological preparation of behavioural change (Marcus & Simkin, 1993).

Phipps et al. (2010) found that individuals in contemplation and preparation stages of change (referred to as *intenders*) showed significantly more interest in engaging in new modes of physical activity, such as pedometer use, compared with individuals in precontemplation, action or maintenance stages of change. This may be because those individuals in the action and maintenance stages may not feel that they need new modes of physical activity.

Based on the above reasoning, the current study investigated whether presenting *intenders* (i.e., those aiming to increase their activity levels in the near future) with a device, such as a pedometer, that could be used to monitor, measure and enhance one's awareness of their physical activity levels, led to increases in physical activity levels.

Barriers to physical activity

In addition to identifying methods that may increase physical activity levels for individuals in different stages of change, identifying determinants of physical inactivity are warranted. Primarily, the results of such research could be used to help plan more effective physical activity initiatives in future.

Physical activity participation rates have been related to many factors, including health levels, socioeconomic status, and social and physical environments (Droomers, Schrijvers & Mackenbach, 2001). In a recent review regarding correlates of physical activity in adults, it was demonstrated that perceiving either environmental or personal barriers was inversely associated with physical activity level (Trost, Owen, Bauman, Sallis, & Brown, 2002). Additionally, research by Sallis et al. (1992) found that barriers to physical activity were significantly reduced with increases in exercise amongst a group of university students. Some research has concluded that low perceived barriers (i.e., factors perceived by individuals as having little influence on physical activity participation) are more important predictors of physical activity behaviour than high perceived benefits of exercise (Nahas & Goldfine, 2003; Taylor et al., 2002). The importance of minimising barriers to physical activity concurs with findings of Janz and Becker (1984) who reviewed over 50 studies related to health behaviour change and found that perceived barriers were the single most powerful predictors of health behaviour.

Given the important role that perceived barriers play in health behaviour change, it is surprising that they have not been studied more extensively with regard to physical activity behaviour. For example, only a few studies have investigated the relationship between changes in barriers to physical activity in association with a physical activity intervention (Kennedy, DeVoe, Skov, & Short-Degraff, 1998; Ransdall et al., 2004). However, no known research has investigated the relationship between changes in barriers

to physical activity which might occur as a result of providing individuals with a tool designed to measure and monitor physical activity (i.e., a pedometer). Therefore, the current research investigated the relationship between changes in barriers to physical activity with changes in exercise levels over an eight-week period. Following this, the relationship between changes in physical activity levels with initial barriers to physical activity for individuals who were provided with a pedometer was also examined. The results of such research may provide information worth considering in the design of future exercise interventions. For example, if participants with fewer initial barriers to physical activity showed greater increases in physical activity across the eight-week period in the current study, this may suggest that organisations need to take steps to identify and reduce and/or remove barriers to physical activity prior to implementing future exercise interventions to ensure success.

Rationale for the Present Research

Research has shown that there are many benefits to be gained from physical activity, including reduced stress, and increased general health and the potential for increased job satisfaction, which has been shown to generally improve productivity within organisations (Ganster & Schaubroeuck, 1991; Wright & Cropanzano, 2000). A large number of studies have outlined the effectiveness of pedometer interventions on increasing physical activity (for a review see Kang et al., 2009). These interventions include the 10,000 Steps Challenge, where individuals are encouraged to wear a pedometer and meet health recommendations of 10,000 steps daily (10,000 Steps, 2010), and the Global Corporate Challenge (GCC), where employees sign up through their company and track their personal, team and company step count against others around the world (GCC, 2010). However, employing interventions can be costly to organisations, particularly where

running such interventions requires the hiring of external consultants to carry out the programme. To the author's knowledge, no research has investigated whether the act of simply providing (without any further intervention) an individual with a tool which can be used as a feedback source to objectively measure one's exercise levels may indeed act as a motivator to increase physical activity. In terms of practicality, a pedometer is a low-cost, objective monitoring, feedback tool that is easily accessible. It is therefore of interest to see if providing individuals, who are intent on becoming physically active, with a pedometer can lead to an increase in physical activity levels over time. While the links between stress, general health and physical activity are well established, no known research has commented on the links between physical activity undertaken outside the workplace, without workplace intervention, work-related stress and job satisfaction. Furthermore, the role that perceived barriers play with regard to exercise uptake has had little research attention. For that reason, it is of interest to investigate the relationships between each of these measures with physical activity also.

The current research investigated the relationship between physical activity, life satisfaction, perceived (general) stress, work-related stress, job satisfaction and barriers to physical activity in a group of full-time corporate employees who were intent on becoming physically active within the next six months. Corporate employees (i.e., those largely engaged in sedentary office-type work) were identified for the participant pool as they were most likely to make up a group of participants who work structured business hours across a 40-hour week. This was to control for any effects that different types of professions may have had on physical activity levels and any barriers to activity which may have occurred as a result of working hours.

Participants were divided into two equal groups: an experimental group, presented with a pedometer, and a control group, presented with an alternative gift not related to

physical activity. Measures of physical activity, life satisfaction, perceived stress, work-related stress, job satisfaction and barriers to physical activity were taken prior to the participants being presented with their gifts (Time 1). These same measures were taken eight weeks later (Time 2), a time span which other research has shown to be long enough to determine any significant effects an intervention has on physical activity levels (Kang et al., 2009). All measures were assessed using online self-report questionnaires.

Based on the review of the literature above, the research hypotheses were as follows:

1. The experimental group will report increases in physical activity levels from Time 1 to Time 2. No such increase was expected for the control group.
2. There will be a positive relationship between increases in physical activity levels from Time 1 to Time 2 with changes in life satisfaction and job satisfaction.
3. There will be a negative relationship between increases in physical activity levels from Time 1 to Time 2 and changes in perceived stress, work-related stress and perceived barriers to physical activity.
4. There will be a negative relationship between perceived barriers at Time 1 with increases in physical activity from Time 1 to Time 2 for the experimental group. No such relationship was expected for the control group.

Method

Participants

Participants were employees recruited via e-mail advertisement from several corporate companies in New Zealand, in which most jobs entailed full-time desk-type work and operated a typical Monday – Friday standard office hour working week. Of the participants who completed the first questionnaire, 44.2% worked in a government department, 17.3% in an accounting firm, 9.6% in engineering company, 7.7% worked in the banking sector, 3.8% in insurance, and 17.3% worked in a variety of other sectors. It was a requirement for participation that participants answered ‘yes’ to the question ‘Do you intend to be physically active in the next six months?’ at the time of the first questionnaire. Fifty-two participants completed the first questionnaire (Time 1), 50% of the sample was female. Forty-one (78.8%) of these participants completed the second questionnaire (Time 2) eight weeks later, 56.1% of this sample was female.

Materials

Two confidential self-report, web-based questionnaires (Time 1 and Time 2) were developed for the purpose of this study and are included in Appendices B and E. Both Time 1 and Time 2 included scales designed to measure life satisfaction, job satisfaction, perceived (general) stress, work-related stress and perceived barriers to physical activity. Participants were asked to state their physical activity (i.e., type, intensity and duration) for each day in the *most recent week* in the Time 1 questionnaire. Participants were asked to state their physical activity (i.e., type, intensity and duration) for each day in the *previous eight weeks* in the Time 2 questionnaire.

A SP1029 pedometer was provided to participants assigned to the experimental condition and a LED key ring torch was provided to participants assigned to the control condition.

Questionnaires –

The first part of both questionnaires (Time 1 and Time 2) contained an introduction section. This section detailed that the purpose of the study was to investigate the effects of physical activity on life satisfaction, the experience of work stress and job satisfaction. Participants were also informed that their involvement in the research comprised the completion of two questionnaires spaced eight weeks apart. Participants were informed of the confidential nature of the questionnaires, and were told that the researchers were the only people to have access to the information collected. Participants were provided with the primary researcher's contact information in case they had any questions relating to the questionnaires or to the study in general. Participants were informed their incentives included one of four 'lucky dip' prizes (i.e., a pedometer, a wooden 15.0 x 16.5 cm photo frame, a LED key ring torch or a set of four glass coasters) awarded upon completion of Time 1 (although, only pedometers and LED key ring torches were awarded), and the chance to win one of two \$50 Westfield shopping vouchers upon the completion of Time 2. Lastly, it was explained that by continuing with the questionnaire, participants were giving their informed consent for their data to be included in the research, with anonymity and confidentiality assured.

As detailed above, both questionnaires included scales designed to measure life satisfaction, job satisfaction, perceived (general) stress, work-related stress and perceived barriers to physical activity. A physical activity measure was also included in both

questionnaires. The order in which each of these measures was presented was counterbalanced to ensure there were no order effects.

Personal details

Time 1 asked participants to indicate their sex and to provide postage details (so they could be rewarded for their participation). Again, participants were informed that the details they provided would be kept confidential to the researcher and that details would not be stored alongside their data; hence their data was anonymous. A unique code was provided to each participant to match up the data collected from Time 1 and Time 2.

The Satisfaction with Life Scale (SWLS)

The SWLS is a five-item scale designed to measure the satisfaction with one's life (Diener, Emmons, Larsen & Griffin, 1985). Participants indicated their response to each item (e.g., "in most ways my life is close to my ideal") using a 7-point Likert-type scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. A two-month test-retest of the scale showed a correlation coefficient of .82, and a coefficient alpha of .87 (Diener et al., 1985). In the present study, Cronbach's alpha was .93 at both Time 1 and Time 2.

Overall Job Satisfaction Scale (adapted version)

The adapted Overall Job Satisfaction scale is a six-item scale used to measure job satisfaction (Agho, Price & Mueller, 1992). The original scale comprised of 18-items developed by Brayfield and Rothe (1951). The six-item scale has an internal reliability ranging from .83 to .90 (Fields, 2002). The scale included items such as, "I like my job better than the average worker does", with response options on a 5-point Likert-type scale

ranging from 1 = *strongly disagree* to 5 = *strongly agree*. Cronbach's alpha for the current study was .85 for Time 1 and .93 for Time 2.

The 14-Item Perceived Stress Scale (PSS)

The PSS (14 item version; Cohen, Kamarck & Mermelstein, 1983) is a self-report questionnaire used to measure globally perceived stress. The questions in this scale asked participants about their feelings and thoughts during the last month (e.g., "In the last month, how often have you felt nervous and stressed?"). In each case participants were asked to indicate *how often* they felt or thought a certain way. Although some of the questions were similar, participants were instructed that there were differences between each one and they should treat them each as separate questions. Participants were also instructed that the best approach was to answer each question fairly quickly. More specifically, that they should not try and count up the number of times they felt a particular way, but rather indicate an alternative that seems like a reasonable estimate. Responses were obtained using a 5-point Likert-type scale where 5 = *all of the time*, 4 = *often*, 3 = *some of the time*, 2 = *rarely*, 1 = *never*. Reliability coefficients, using Cronbach's alpha, have ranged from .75 to .91 (Cohen et al., 1983). An internal consistency test for this study demonstrated Cronbach's alpha of .91 for Time 1 and .86 for Time 2.

The 15-Item Job Related Tension Index

The Job Related Tension Index was designed to measure psychological symptoms of stress (Kahn, Wolfe, Quinn & Snoek, 1964). The scale asked participants about the extent of a job's role overload, and the amount of stressful occurrences the job has (e.g., "I feel that my job tends to interfere with my family life"). The scale response options were on a 5-point Likert-type scale, ranging from 1 = *never* to 5 = *all of the time*. Coefficient

alpha values for the scale have ranged from .80 to .89 (Fields, 2002). An internal consistency test for the current research found Cronbach's alpha .80 for Time 1 and .87 for Time 2.

Barriers to Physical Activity Scale

The Barriers to Physical Activity Scale (Sallis et al., 1989) is a 24-item self-administered measure of perceived barriers to performing physical activity. For each item, respondents were asked if the situation or perception described prevented engagement in physical activities (e.g., "I am too tired to exercise"). Responses were scored on a 5-point Likert-type scale, ranging from 0 = *never* to 4 = *all of the time*. For each participant the number of items rated 0 (never) were recorded and subtracted from 24 to determine the total number of barriers identified. Following this, an average score of the barriers identified (i.e., all items rated 1–4) was calculated for each participant to determine the mean intensity score of all items identified as barriers. In college students, the one-week test-retest reliability of the revised scale was found to be adequate ($r = .79$) (Sallis et al., 1999).

Physical Activity

For the Time 1 questionnaire, participants were asked whether they completed any physical activity in the week prior to completing the questionnaire (from Monday to Sunday). For the days participants did do activity they were asked to (a) state what type of activity they completed (e.g., running, walking); (b) to give an intensity description of each activity (e.g., fast run, slow walk); (c) state how many minutes they spent engaged in each activity. For scoring purposes, type of activity and intensity were combined and recoded into a single metabolic equivalent of task (MET) score according to the Compendium of

Physical Activities (Ainsworth et al., 2000). A composite physical activity score was generated by multiplying the recoded type of activity and intensity (i.e., MET) score by the number of minutes (duration) participants were engaged in that activity. This calculation was repeated for every stated activity. A grand total physical index score was obtained for each participant by adding the composite scores for all activities across the week.

Time 2 (completed eight weeks later) comprised of all the above scales, however, for the physical activity scale participants were asked to recall, as best they could, their exercise for each day over the previous eight weeks. In addition, participants assigned to the experimental condition were also asked how often they used their pedometer and to provide a total number of steps recorded by their pedometer.

Pilot study

To see if any amendments needed to be made to the initial questionnaires, a pilot study was conducted, involving eight university students, prior to the main study. The pilot study created useful feedback to improve the questionnaire, such as re-formatting sections for ease of use. Results of the pilot study also showed that it took approximately 10 – 15 minutes to complete the questionnaire. This information was used in the e-mail advertisement.

Procedure

An e-mail recruitment advertisement (refer to Appendix A) was sent to 17 businesses in which employees typically engaged in desk-type work across a typical Monday – Friday, standard office hours, working week. The recruitment letter explained that the researcher was only interested in collecting information from individuals who

were not currently physically active, but intended on being so over the following six months. Potential participants were also informed that the research involved two stages – completion of a 10 – 15 minute online questionnaire at the current point in time, and completion of second 10 – 15 minute questionnaire eight weeks later. Participants were informed that, upon completion of the first questionnaire, as a small token of appreciation, they would be sent a ‘lucky dip’ package containing one of four types of gift: a pedometer, a wooden 15x16.5cm photo frame, a LED key ring torch, or a set of four glass coasters. Additionally, they were informed that, upon completion of the second questionnaire, they had the opportunity to enter into the draw to win one of two \$50 Westfield Shopping Vouchers. At the bottom of the recruitment e-mail, participants were asked to express interest in taking part by replying to the sender and providing information about their sex, working hours, whether or not they were currently physically active, and whether they intended to be so in the next six months, to ensure the selection criterion was met. The first 26 male and 26 female respondents to meet the inclusion criteria were sent a link to the Time 1 questionnaire website address, and a unique user code which they were required to enter to access the survey. Individuals who responded after the first 26 males and 26 females had been selected were thanked for their interest in the study, but informed by e-mail that required participant numbers had already been met.

Once the link was opened, participants were given further detailed instructions about their participation and researcher contacts. They were also directed to a button to click to complete the Time 1 questionnaire.

The questionnaire followed the same format for each participant, however, the order in which the scales were presented was counterbalanced to ensure there were no order effects. Upon completion of Time 1, participants were thanked for their time and participation and were instructed that their ‘lucky dip’ would be in the post within the next

week and that the researcher would be in touch eight weeks later to provide a link to the second questionnaire. At this point, participants were randomly assigned to one of two conditions with equal numbers of males and females in each: the experimental condition, whose participants were sent a pedometer, or the control condition, whose participants were sent a LED key ring torch.

Eight weeks later the same participants were contacted via e-mail and invited to complete the second questionnaire (refer to Appendix C). A maximum of two reminder e-mails were sent, each spaced a week apart, to participants who did not respond to the initial Time 2 invitation (refer to Appendix D). Participants were provided with a link to the Time 2 website address and a unique user code to access the survey. Once this link was opened, participants were again presented with researcher contacts and given more detailed instructions about their participation. Participants were directed to a button to click to complete the questionnaire.

The Time 2 questionnaire contained exactly the same questions and scales as the first questionnaire, excluding demographic information. However, participants were asked to recall their physical activity, as best they could, for each week over the previous eight weeks as opposed to one week (as in the first questionnaire). Towards the end of the questionnaire participants were required to respond 'yes' or 'no' to the question 'Did you receive a pedometer as your lucky dip prize eight weeks ago?'. Participants who received a pedometer were asked a) if they used the pedometer and b) approximately how many steps in total they accumulated when using their pedometer.

Lastly, participants were asked if they wished to be included in the prize draw to win one of two \$50 Westfield shopping vouchers and to provide preferred contact details. Participants were informed that these details would also be kept confidential. After

submitting the questionnaire, participants were thanked for their time and provided with debriefing sheet (refer to Appendix E) outlining the true nature of the study.

The current research was reviewed and approved by the University of Canterbury Human Ethics Committee.

Results

Physical activity coding

The Compendium of Physical Activities (Ainsworth et al., 2000) was used to code the physical activity data (i.e., activity and intensity description statements) into a MET score ranging from 1 to 15. A composite physical activity score was then generated by multiplying the recoded type of activity and intensity (i.e., MET) score by the number of minutes (duration) participants were engaged in that activity. This calculation was repeated for every stated activity. A grand total physical index score was obtained for each participant by adding the composite scores for all activities across each week. The number of physical activity sessions participants reported each week was also recorded.

Due to the differences between activities in New Zealand and the United States of America where the compendium was developed, there were some modifications made to the coding protocol. The nearest match was used for activities that were not listed (e.g., basketball was used in place of netball, and flag football was used in place of touch rugby).

An additional clarification was also made because of the different ways participants responded to the description of activity, intensity and duration sections of both questionnaires. For example, some participants described different physical activity sessions they completed in one day, for example, “120 [minutes] walking to work and dancing”. In this instance, the two activities were combined to give an average MET score,

which was then multiplied by the duration to give an overall physical activity score. This was recorded as two physical activity sessions. However, some participants would describe the data, in what appeared to be one physical activity session, for example, “30 [minutes] bike and run”. As above, the MET scores for biking and running were averaged and multiplied by the duration reported to give an overall physical activity score. This was recorded as one physical activity session.

Preliminary analyses

One female participant in the experimental condition was excluded from the analyses due to reporting extreme physical activity levels at Time 1.¹

The internal reliability of the life satisfaction, job satisfaction, perceived stress and work-related stress scales at both Time 1 and Time 2 were computed. The Cronbach’s alpha for each of these scales was .93, .85, .91, and .80 respectively at Time 1 and .93, .93, .86, and .87 respectively at Time 2, indicating that each scale was found to be reliable. A single score was computed for each participant at each testing time for each scale, according to the scoring protocols detailed in the method section. Table 1 lists the descriptive statistics for life satisfaction, job satisfaction, perceived stress and work-related stress for the experimental (i.e., those who received a pedometer) and control (i.e., those who received a LED key ring torch) conditions at Time 1.

¹ The extent to which this individual participated in a particular activity (i.e., house painting) was unlikely to be a regular activity, hence the exclusion.

Table 1.
Scale Statistics for Life Satisfaction, Job Satisfaction, Perceived Stress and Work-Related Stress for Time 1 as a Function of Experimental Condition

Scale	N	Mean	S.D.	Min. Value	Max. Value
Life satisfaction					
• Experimental	21	23.67	6.30	6.00	35.00
• Control	19	23.32	6.08	9.00	30.00
Job satisfaction					
• Experimental	21	22.95	4.20	15.00	30.00
• Control	19	21.32	4.90	11.00	30.00
Perceived stress					
• Experimental	21	36.57	8.94	19.00	53.00
• Control	19	38.16	6.82	28.00	49.00
Work-related stress					
• Experimental	21	35.71	7.79	18.00	47.00
• Control	19	36.68	6.65	22.00	50.00

Descriptive statistics for life satisfaction, job satisfaction, perceived stress and work-related stress for the experimental and control conditions at Time 2 are listed in Table 2. Given the high correlation between the two stress measures ($r=.60$ at Time 1, and $r=.52$ at Time 2), and the similarity in the pattern of results found when considering each separately, it was decided only work-related stress would be included in the main analyses as this was more closely related to the theme of the study.

Table 2.
Scale Statistics for Life Satisfaction, Job Satisfaction, Perceived Stress and Work-Related Stress for Time 2 as a Function of Experimental Condition

Scale	N	Mean	S.D.	Min. Value	Max. Value
Life satisfaction					
• Experimental	21	25.09	6.06	9.00	33.00
• Control	19	24.47	5.68	13.00	31.00
Job satisfaction					
• Experimental	21	23.81	3.19	17.00	30.00
• Control	19	22.53	5.51	9.00	30.00
Perceived stress					
• Experimental	21	34.10	7.31	22.00	51.00
• Control	19	35.32	5.03	27.00	48.00
Work-related stress					
• Experimental	21	34.00	6.30	18.00	43.00
• Control	19	33.89	8.74	17.00	54.00

Table 3 details the descriptive statistics for perceived barriers to physical activity, total physical activity scores and total number of physical activity sessions for the experimental and control conditions at Time 1. Two scores were devised to measure barriers to physical activity. Participants were asked to identify the extent to which 24 different situations or perceptions prevented them from engaging in physical activities on a scale from 0 = *never* to 4 = *all of the time*. An average barrier intensity score was calculated by taking the mean of all factors identified as barriers (i.e., responses which ranged from 1 = *rarely* to 4 = *all of the time*) for each participant. In addition, the total number of barriers identified was calculated by subtracting the number of factors scored as 0 (i.e., *never*) from 24 (i.e., the total number of barriers presented) for each participant.

Table 3.
Descriptive Statistics for Perceived Barriers to Physical Activity and Total Amounts of Physical Activity for Time 1 as a Function of Experimental Condition

Scale	N	Mean	S.D.	Min. Value	Max. Value
Average barrier intensity					
• Experimental	21	2.00	.43	1.22	3.06
• Control	19	1.84	.36	1.33	2.75
Total barriers identified					
• Experimental	21	19.71	3.95	9.00	24.00
• Control	19	18.00	4.69	9.00	24.00
PA total score					
• Experimental	21	890.76	1004.34	.00	3320.00
• Control	19	1209.00	1217.19	.00	4830.00
PA total sessions					
• Experimental	21	4.38	4.31	.00	14.00
• Control	19	4.26	3.45	.00	13.00

Descriptive statistics for average intensity of barriers to physical activity, total number of barriers identified, total physical activity score and total number of physical activity sessions for the experimental and control conditions at Time 2 are detailed in Table 4.

Table 4.
Descriptive Statistics for Perceived Barriers to Physical Activity and Total Amounts of Physical Activity for Time 2 as a Function of Experimental Condition

Scale	N	Mean	S.D.	Min. Value	Max. Value
Average barrier intensity					
• Experimental	21	1.74	.45	1.00	2.52
• Control	19	1.74	.42	1.05	2.60
Total barriers identified					
• Experimental	21	18.38	5.51	7.00	24.00
• Control	19	16.79	6.49	6.00	24.00
PA total score					
• Experimental	21	1924.14	1478.79	240.00	5902.50
• Control	19	1230.92	936.09	.00	3450.00
PA total sessions					
• Experimental	21	5.33	2.52	1.00	10.00
• Control	19	4.21	3.49	.00	15.00

An initial 2 (condition: experimental/control) x 8 (time: weeks) ANOVA with weeks (Time 2) as the repeated measure was computed to determine whether there was a trend in reported physical activity levels at Time 2. Since no obvious trend in physical activity levels were found across the eight-week period (refer to Figures A1 & A2 and Tables A1 & A2 in Appendices F & G) and a number of participants reported being unable to recall their physical activity accurately beyond the most recent week, only physical activity data from Week 1 (the week prior to the Time 2 questionnaire) was used to represent Time 2 activity in the main analyses.

Of the 21 participants assigned to the experimental condition, six reported using their pedometer; however, the majority of these participants were unable to accurately recall the step count recorded on their pedometer. Therefore, no relationship between pedometer use and physical activity could be established. Additionally, no differences were found between those in the experimental group who did and those who did not report using their pedometer (refer to Appendix H), therefore all the participants in the experimental group were considered as a single group for the main analyses, regardless of reported pedometer use or not.

Further preliminary analyses at this point revealed no effects of sex on any of the dependent variables (i.e., life satisfaction, job satisfaction, stress, barriers to physical activity and physical activity levels) at Time 1 or Time 2. Hence, sex was not considered as a factor in the subsequent analyses. Full details of these analyses can be found in Appendix I.

Main analyses

To investigate Hypothesis 1, that the experimental group would report increases in physical activity from Time 1 to Time 2, but there would be no such increase for the control group, separate 2 (condition: experimental/control) x 2 (Time: 1/2) ANOVAs, with time as a repeated measures factor, were computed on total physical activity score and on total number of physical activity sessions.

The main effect of time was significant, with $F(1, 38) = 6.42, p < .05, \eta_p^2 = .15$; participants in both conditions reported greater physical activity scores at Time 2 than at Time 1 ($M_s = 1594.86$ vs. 1041.93). This effect was, however, qualified by a significant interaction between condition and time, $F(1, 38) = 5.90, p < .05, \eta_p^2 = .13$, as shown in Figure 1. Post-hoc tests (Tukey HSD, $p < .05$) revealed no significant differences between the experimental and control conditions at Time 1 ($M_s = 890.76$ vs. 1209.00) or at Time 2 ($M_s = 1924.14$ vs. 1230.92). However, participants who received pedometers (experimental condition) showed significant increases in physical activity scores from Time 1 to Time 2 ($M_s = 890.76$ vs. 1924.14), whereas participants who did not receive pedometers (control condition) had no significant increase ($M_s = 1209.00$ vs. 1230.92) from Time 1 to Time 2. These results support Hypothesis 1.

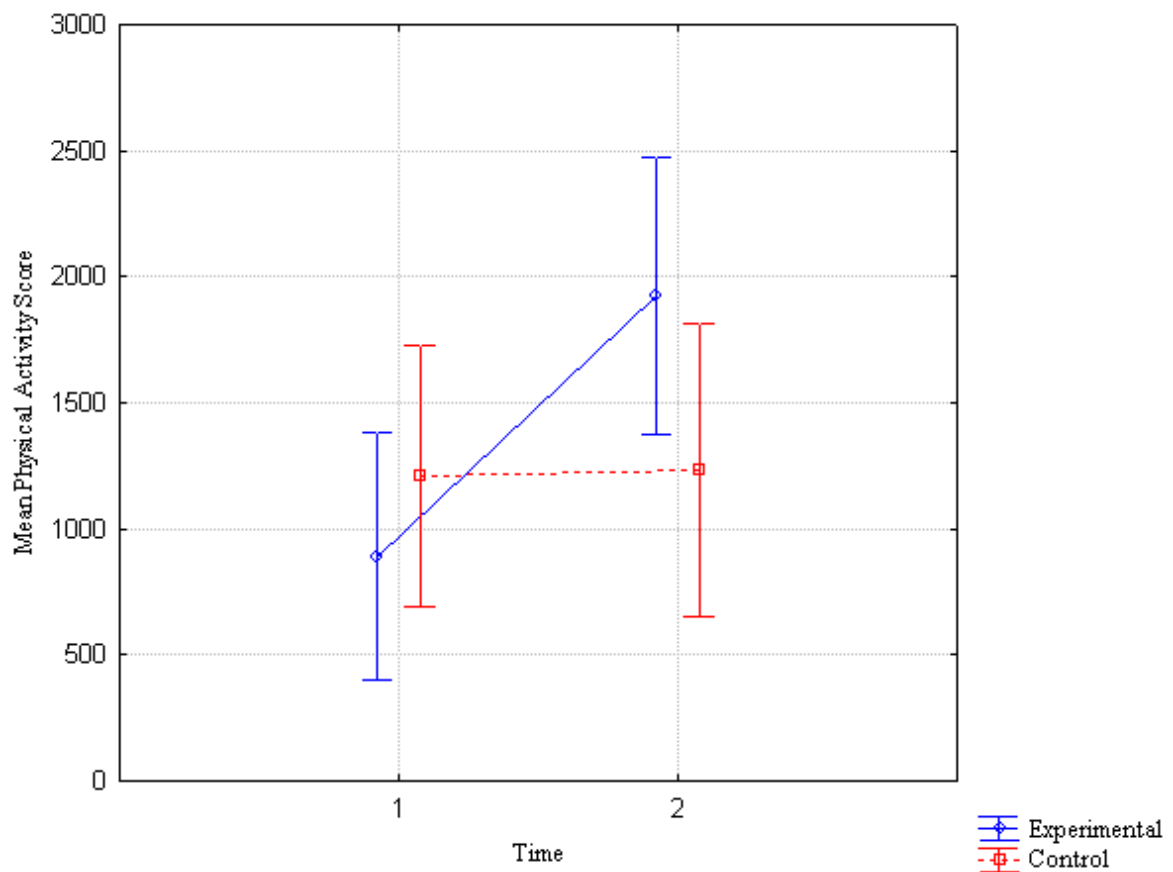


Figure 1.
Means for total physical activity scores at Time 1 and Time 2. Vertical bars denote .95 confidence intervals.

No significant main effects of condition or time were found when considering total number of physical activity sessions and there was no significant interaction effect.

Hypothesis 2 predicted that there would be a positive relationship between increases in physical activity levels (i.e., total scores and number of sessions) from Time 1 to Time 2 and changes in life satisfaction and job satisfaction. Conversely, Hypothesis 3 predicted that there would be a negative relationship between increases in physical activity levels from Time 1 to Time 2 and changes in work-related stress and barriers to physical activity (i.e., average intensity and total number identified). Bi-variate correlations were computed between the difference scores (i.e., Time 2 – Time 1) for the dependent

measures to test these hypotheses for the 40 participants who completed both questionnaires. The correlations are listed in Table 5.

Table 5.
Correlations Between Changes in Each Dependent Variable Between Time 2 and Time 1

	1.	2.	3.	4.	5.	6.
1. Life satisfaction	1.00					
2. Job satisfaction	.410*	1.00				
3. Work-related stress	-.321*	-.372*	1.00			
4. Average barrier intensity	-.296	-.193	-.231	1.00		
5. Total number of barriers	-.169	-.345*	.161	.234	1.00	
6. PA total score	-.115	-.080	-.038	-.348*	-.242	1.00
7. PA total sessions	-.083	-.211	.057	-.257	-.072	.520**

* $p < .05$ ** $p < .01$ (two-tailed)

Changes in physical activity levels from Time 1 to Time 2 were found to have no relationship with changes in life satisfaction, job satisfaction or work-related stress. However, a significant negative relationship was found between changes in total physical activity scores and changes in average barrier intensity. That is, increases in physical activity scores were associated with decreases in average barrier intensity. Interestingly, a significant negative relationship was found between changes in total number of barriers identified with changes in job satisfaction. More specifically, increases in total number of barriers were associated with decreases in job satisfaction. These findings provide partial support for Hypothesis 3.

Correlations between perceived barriers to physical activity (i.e., average intensity and total number identified) and physical activity levels (i.e., total score and number of sessions) at Time 1 were calculated to determine whether there was a link between these variables in a group intent on taking up exercise. As detailed in Table 6, the results of this analysis found non-significant negative relationships between physical activity levels (i.e.,

total scores and number of sessions) at Time 1 and barriers to physical activity (i.e., average intensity and total number identified) at Time 1.

Table 6.
Correlations Between Physical Activity at Time 1 and Perceived Barriers at Time 1

	1.	2.	3.	4.
1. Average barrier intensity	1.00			
2. Total number of barriers	.300	1.00		
3. PA total score	-.251	-.277	1.00	
4. PA total sessions	-.230	-.205	.623**	1.00

* $p < .05$ ** $p < .01$ (two-tailed)

It was predicted that there would be a negative relationship between perceived barriers (i.e., average intensity and total number identified) at Time 1 and increases in physical activity levels (i.e., total scores and number of sessions) between Time 1 and Time 2 for the experimental group, but no such relationship was predicted for the control group. To test this hypothesis, difference scores for changes in physical activity levels (i.e., Time 2 – Time 1) were calculated and correlated with perceived barriers at Time 1 only, as detailed Table 7 below.

Table 7.
Correlations Between Perceived Barriers at Time 1 and Changes in Physical Activity for the Experimental and Control Condition

	1.	2.	3.	4.
1. Average barrier intensity (Time 1)		.208	-.374	.075
2. Total number of barriers (Time 1)	.350		-.466*	-.099
3. PA total score (change)	.300	.086		.545*
4. PA total sessions (change)	.230	.203	.368	

* $p < .05$ ** $p < .01$ (two-tailed)

NB: items above the diagonal denote the experimental group and items below the diagonal denote the control group.

As detailed in Table 7, a significant negative relationship between total number of barriers identified at Time 1 and changes in total physical activity score in the experimental condition was found. No relationships between barriers (i.e., average

intensity and total number of identified) at Time 1 and changes in physical activity levels (i.e., total score and number of sessions) were found in the control condition. These results follow the prediction of Hypothesis 4.

Separate 2 (condition: experimental/control) x 2 (Time: 1/2) ANOVAs, with time as the repeated measures factor, were computed with average barrier intensity score and total number of barriers identified as dependent measures. For average intensity of barriers only a significant main effect of time was found $F(1, 38) = 8.89, p < .01, \eta_p^2 = .19$, with a higher average intensity at Time 1 than at Time 2 ($M_s = 1.92$ vs. 1.74).

No significant main effects of condition or time were found when considering total number of barriers identified and there was no significant interaction effect.

Discussion

The current research investigated whether the simple act of supplying individuals with a tool designed to measure and monitor activity levels (i.e., a pedometer) led to increases in overall physical activity. To test this, a sample of employees who engaged in sedentary office-type work, but who were intent on becoming physically active, were provided with a pedometer. Their physical activity levels were measured before and after being given the pedometer and were compared to a control group, who were also intent on becoming physically active but received an alternative gift not related to physical activity. While the links between stress, general health and physical activity are well established (Bhui, 2002; Dunn et al., 2001; Sallis & Owen, 1999; Steptoe et al., 1993; USDHHS, 2001; Vainio & Bianchini, 2002; Wijndaele et al., 2007), no known research had investigated the link between physical activity undertaken outside the workplace (without workplace intervention) with work-related stress and job satisfaction. These relationships are particularly important for determining the value and effectiveness of some exercise

related workplace interventions. Additionally, little focus had been given to the role that perceived barriers to physical activity play with regard to exercise uptake. For that reason, these relationships were examined also.

The following section outlines the main findings, including an exploration of the hypotheses. Subsequently implications, limitations and suggestions for future research are also discussed.

Interpretations and implications of the results

Participants in the current research completed two online questionnaires which measured life satisfaction, job satisfaction, perceived stress, work-related stress, barriers to physical activity, and overall exercise eight weeks apart (i.e., Time 1 and Time 2). Participants were either assigned to the experimental condition (i.e., provided with a pedometer) or to the control condition (i.e., provided with a LED key ring torch). As predicted in Hypothesis 1, participants in the experimental condition reported significant increases in total physical activity scores from Time 1 to Time 2, whereas the control group did not. A similar, but non-significant, trend was seen in the analysis of the total number of physical activity sessions reported by participants. These findings indicate that providing individuals with a simple tool that can be used to provide feedback and monitor physical activity levels, leads to increases in physical activity. According to King (1998), similar strategies have previously been shown to be effective in increasing overall health. It is important to note, however, that preliminary analyses revealed no significant differences in the physical activity levels between participants in the experimental group who used the pedometer and those who did not. The mere act of being presented with a tool which could be used to record and monitor physical activity levels may have been a strong enough prompt to promote physical activity by itself. This finding has particularly

important implications for the use and administration of exercise interventions. Specifically, the simple act of providing employees with a tool designed to record and measure physical activity (e.g., a pedometer, heart rate monitor or GPS tracker) may provide organisations with a more cost-effective alternative to some traditional interventions (e.g., providing fitness facilities at the worksite or organising motivational and/or educational sessions) designed to increase physical activity participation.

Since research has shown that physical activity positively affects mood and attitudes (e.g., DiLorenzo et al., 1999; McGowan et al., 1991; Pauley, Palmer & Roth, 1989; Steptoe et al., 1993; Wright & Pfeiffer 1982), a positive relationship between changes in physical activity levels and changes in life satisfaction was expected (Hypothesis 2). Similarly, it was expected that exercise might affect the mood state and attitudes of individuals at work and that this, in turn, might improve job satisfaction (Judge & Illies, 2004). However, Hypothesis 2 was not supported as no relationship was found between changes in physical activity levels (i.e., total physical activity scores or number of sessions) with changes in life or job satisfaction from Time 1 to Time 2. One important observation in the data was that the mean scores for life and job satisfaction were quite high at Time 1. Therefore, it is quite possible that life satisfaction and job satisfaction scores were showing a ceiling effect and, as a result, it may have been difficult to identify whether there was any impact due to changes in physical activity. One reason for such high scores could be that happier workers (e.g., those with greater life and job satisfaction) were more willing to participate in this type of research. It would be interesting to determine whether more of an effect might have been found with a less satisfied group of employees. Although a relationship was predicted, a number of past studies have also shown no significant relationship between exercise levels and job satisfaction (e.g.,

Altchiler & Motta, 1994; Cox, Shepard, & Corey, 1981; Edwards & Gettman, 1980; LeGro, 2005).

Contrary to previous research (Bhui, 2002; Dunn et al., 2001; Steptoe et al., 1993), no significant relationship was found between changes in physical activity and work-related stress. A further important observation in the data was that the mean scores for work-related stress were quite low at Time 1. Therefore, it is quite possible that work-related stress scores were showing a floor effect and, as a result, it may have been difficult to identify whether there was any impact due to changes in physical activity. One reason for such low scores could be that less-stressed workers were more willing to take the time to participate in this research. It would be interesting to determine whether more of an effect might have been found in a group of employees with greater levels of stress. A second possible explanation for this could be that increases in physical activity take longer than eight weeks to impact on stress levels, or that participants in the current study did not increase their exercise levels enough. A third possible explanation could be that physical activity does not lead to decreased stress for individuals who primarily engage in office-type work. That is, previous research has suggested that different occupational groups have different coping methods in relation to stress (Kabanoff & O'Brien, 1986). Moreover, it may be that different types of physical activity are more strongly associated with reduction in stress for different levels of jobs (e.g., executive/managerial vs. clerical/administrative roles), which were not examined in the current research. For example, following the findings of Cherry (1978; 1984), it might be that those in higher level jobs (e.g., executive/managerial-type roles) achieve more relief from stress by participating in recuperative and passive types of exercise (e.g., yoga or tai-chi). In contrast, those in lower level jobs (e.g., clerical/administrative-type roles) may be more likely to achieve stress relief by participating in physical activities which are more challenging, require greater

skill utilisation and variety (e.g., team sports or outdoor activities). Therefore, future research might collect specific details of types of jobs so this idea can be further investigated.

A significant negative relationship between changes in average intensity of barriers to physical activity with changes in total physical activity scores was found. This finding follows research by Sallis et al. (1992), who reported significant decreases in perceived barriers to physical activity as a result of increases in overall exercise. Essentially, these results offer partial support for Hypothesis 3, which predicted that there would be a negative relationship between changes (i.e., Time 2 – Time 1) in physical activity levels with changes in stress and perceived barriers. Due to the correlational design of this analysis, however, it is difficult to establish what the direction of causation is for the relationship between increased physical activity and reduced perceived barriers. For example, it may be possible that a reduction in barriers to physical activity led to increases in exercise. Conversely, it may be possible that individuals who attempted exercise may have realised that their barriers were not as prominent as they had initially thought, thus leading them to exercise more.

Additionally, a significant negative relationship between changes in the total number of perceived barriers and changes in job satisfaction was identified (i.e., more barriers equalled lower job satisfaction). This finding is important to consider as it might imply that individuals who perceive more barriers to physical activity are less happy in their workplace or on the job. Therefore, if workplaces make an effort to reduce and/or remove barriers to physical activity, it may follow that employees will be happier in their work. This may, in turn, have important workplace outcomes including better job performance, (Wright & Cropanzano, 2000), reduced absenteeism (Patchen, 1960) and reduced turnover (Butler, 1961).

It was interesting to discover a significant negative relationship between total number of barriers identified at Time 1 with changes in physical activity scores for the experimental condition but not the control condition (Hypothesis 4). This finding might indicate that receiving the pedometer acted as a motivator to try and increase exercise levels for those in the experimental condition and, as a result, their barriers at Time 1 may have had a marked impact on whether their physical activity levels increased or not. However, because the control group did not receive the motivational gift they may not have tried to increase their physical activity levels and hence their perceived barriers at Time 1 were irrelevant. Although caution must be exercised when inferring causal relationships, this trend follows the notion that people with fewer perceived barriers to physical activity are more likely to benefit from exercise interventions (Seefeldt, Malina & Clark, 2002). These results highlight the importance of identifying and taking steps to reduce and/or remove perceived barriers to physical activity to enhance the likelihood of success in physical activity interventions. It is therefore recommended that workplaces attempting to promote physical activity focus on reducing and/or removing obstacles (e.g., by suggesting/offering convenient places to do physical activity, creating flexibility around working hours to allow time for exercise) which may interfere with the acceptance of and adherence to exercise before administering any type of physical activity intervention.

Research limitations and suggestions for future research

As discussed earlier, research has shown that half of those who take up exercise through interventions are likely to drop out within a year (Sallis & Owen, 1999). Essentially, the current research investigated how the use of a pedometer, a simple tool which can be used to monitor, measure and enhance one's awareness of their own physical activity levels may motivate individuals to become more physically active. Cale and Harris

(2006) argue that the reason some exercise interventions only have short-term effects is because they may not have considered the promotion of such simple, realistic and attainable behaviour strategies. Due to time restrictions, no follow up could be done on this study beyond eight weeks. Therefore, a longitudinal study of the same nature to investigate whether the pattern of results found in the present study may extend to 12 months or longer is recommended.

More significant results might have been seen with a larger sample size. For example, the minimum sample size for a 2x2 ANOVA (with an alpha level of .05 and anticipated effect size (f) of .4) for a statistical power level of .8 is 52, however, although 52 participants were recruited at Time 1, only 40 participants completed the study. Essentially, a larger sample size would have helped to build a more convincing picture of the trends between outcomes of the experimental group in comparison to the control group. Since only a small number of participants in the experimental group reported using the pedometer, most of which were unable to provide an accurate estimate of the total number of steps taken when using the pedometer, the current research was unable to establish whether there was any relationship between pedometer use and overall physical activity levels. This information would have been particularly useful for determining whether the *actual use* of a pedometer further increased physical activity levels beyond the increase caused by the *mere receipt* of a pedometer.

Furthermore, research has shown that self-report measures can be prone to bias and/or inaccuracy because of occasional over-reporting by participants (Krosnick, 1999). One limitation in this study was that, at Time 2, participants who reported using the pedometer were unable to accurately report the total number of steps recorded and number of times they used their pedometer. There was little that could be done to reduce this, as having told participants to take note of their activity during this period would have likely

hindered results and the purpose of the research. Therefore, future research could be targeted at determining whether similar significant patterns of results could be found using different forms of technology which could record such information. For example, with the rapidly increasing use of smartphones (e.g., mobile phones that offer advanced capabilities, often with PC-like functionality) in many organisations (Analysys Mason, 2010), it would be interesting to determine whether providing employees with applications on their phones designed to measure and monitor physical activity levels would enhance overall physical activity levels. More specifically, applications such as MapMyFitness (www.mapmyfitness.com, 2011) and RunKeeper (www.runkeeper.com, 2011) can be downloaded and installed onto smartphones for free or a small fee to track and record walking, running and cycling activity. Since many of these applications store data (e.g., workouts), the use of such a tool may get around many self-report issues as individuals (and researchers) would be able to retrieve a more accurate account of their physical activities.

As previously mentioned, little research has focussed on the role perceived barriers to physical activity have with regard to physical activity participation. Although the current research identified relationships between perceived barriers to physical activity with physical activity levels (and changes in each of these variables), much more is to be determined about this relationship.

Conclusions

The present study has several important outcomes. It has provided initial evidence for a link between the act of simply providing a tool to measure physical activity to employees who engage in sedentary-type office work, and are intent on becoming physically active, with increases in physical activity. This finding has important

implications for the direction of future physical activity interventions and may provide a more cost-effective alternative to traditional exercise interventions supported and supplied by the workplace. Additionally, relationships between lower perceived barriers to physical activity at Time 1 with increases in physical activity (i.e., from Time 1 to Time 2) for the experimental condition were found. However, no such relationships were found for the control condition. These results reaffirm the importance of reducing and/or removing barriers when attempting to successfully promote increases in physical activity. As predicted, changes in physical activity levels were also negatively associated with changes in barriers to exercise. No relationships were found between changes in physical activity levels with changes in life satisfaction or job satisfaction. This may have been due to ceiling effects which would have made it difficult to determine changes in satisfaction. In contrast to previous research, changes in physical activity were not related to work-related stress as expected. Further exploration into the different types of exercise that may be successful in reducing stress for different levels of jobs (e.g., with various factors leading to stress) is recommended.

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Appendix A: E-mail advertisement (recruitment)

Not currently physically active, but intending to be so? Then read on...

Hello,

My name is Liana Styles, and I am currently studying towards a Masters of Science in Applied Psychology at the University of Canterbury. As part of my studies I am required to complete a year-long dissertation.

I have approached X from your company and obtained approval to invite staff to become involved in my research project, which is investigating the relationship between physical activity, and life satisfaction, general stress, work stress and job satisfaction. To investigate this I have written a two-part questionnaire which I am currently seeking full-time employees working relatively fixed office hours (e.g. 9am – 5pm Monday to Friday). For the purposes of this research, I am only interested in collecting information from individuals who are not currently physically active, but intent on being so in the next six months. If you fit this criteria, I would really appreciate if you would take the time to complete the questionnaire.

The first questionnaire will only take 10 – 15 minutes, and is entirely confidential and is only available to the researchers (myself, and my thesis supervisors, Dr. Sanna Malinen and Professor Lucy Johnston). Employers and participants will be offered an overall summary of my research findings but the identity of individual participants will remain confidential and individual results will not be made available to anybody, including to employers. You may withdraw from the research at any point. However, once you have submitted your completed questionnaire your data will be combined with that from other participants and cannot be identified. So once you submit the completed questionnaire you are no longer able to withdraw your data.

At the end of the first questionnaire, as a small token of appreciation, you will be sent a 'lucky dip' package with one of four types of gift: a pedometer, a wooden 15x16.5cm photo frame, a LED key ring torch, or a set of four glass coasters. You will be asked for contact details to send you this gift but these details will be kept confidential to myself and will not be stored alongside your data, hence your data will be anonymous.

If you complete the first questionnaire, I will email you again in eight weeks time with the second questionnaire. Again, this will only take 10 – 15 minutes to complete and is entirely confidential. Upon completion of the second questionnaire, you will be invited to enter into a prize draw to WIN ONE OF TWO \$50 WESTFIELD SHOPPING VOUCHERS. If you wish to enter the prize draw you will be asked for some contact details but these details will be kept confidential; to myself and will not be stored alongside your data, hence your data will be anonymous.

If you would like to participate in my research, please e-mail me at ljs101@uclive.ac.nz with the following details: 1) your current working hours and 2) your sex (to ensure I have even participant numbers across both sexes). I will then send you the link to the first online questionnaire.

Thanks for your time, and I would really appreciate your participation. Please do not hesitate to email me if you have any questions.

Kind regards,
Liana Styles

Appendix B: Time 1 online questionnaire

INFORMATION SHEET

You are invited to take part in this research project which is being conducted by Liana Styles as part of the requirements for her M.Sc. in Applied Psychology at the University of Canterbury. Liana is being supervised by Professor Lucy Johnston and Dr. Sanna Malinen.

The aim of this study is to investigate the effects of physical activity on life satisfaction, the experience of work stress, and job satisfaction.

Your involvement in this project will be the completion of a voluntary questionnaire which will take approximately 10 – 15 minutes. At the end of the first questionnaire, as a small token of appreciation, you will be sent a ‘lucky dip’ package with one of four types of gift: a pedometer, a wooden 15x16.5cm photo frame, a LED key ring torch, or a set of four glass coasters. You will be asked for contact details to send you this gift but these details will be kept confidential to myself and will not be stored alongside your data, hence your data will be anonymous.

As a follow-up to this investigation, you will be asked to complete an additional questionnaire eight weeks from now, which will take approximately 10 – 15 minutes.

You have the right to withdraw your participation at any time, however, once you have submitted your completed questionnaires at each stage your data will be combined with that from other participants and cannot be identified. So once you submit the completed questionnaires you are no longer able to withdraw your data.

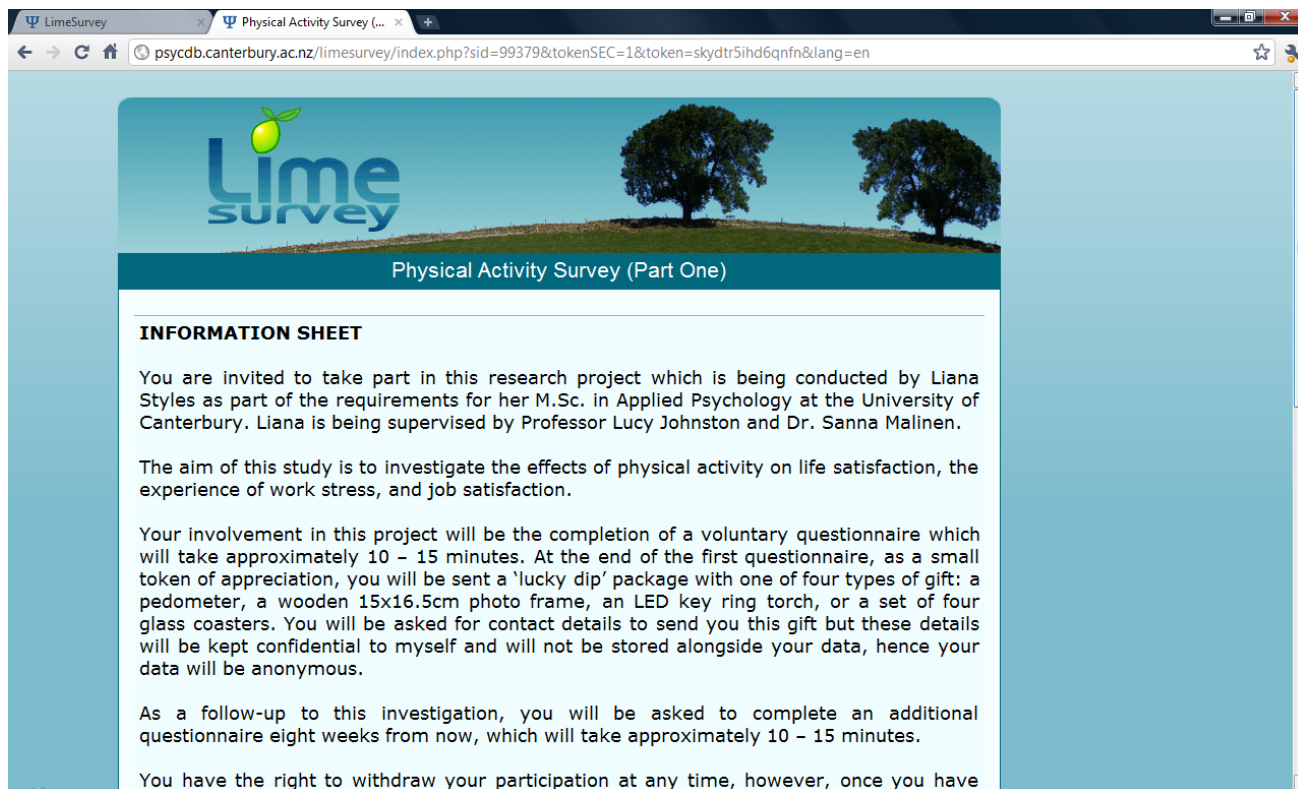
The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation. Although this survey requires you to provide a postal address, please note that this is only to courier the ‘lucky dip’ on completion of the first questionnaire, and \$50 Westfield Shopping Voucher prizes on completion of the second questionnaire and the address list will be stored separately from the data files. To ensure confidentiality, the researchers will be the only people who will have access to the information collected.

By continuing with this survey, please note that you are giving your informed consent to participate in this study.

Liana Styles can be contacted on 0276323216 or ljs101@uclive.ac.nz and is pleased to discuss any concerns you may have about the participation of this project. Additionally, you may contact Liana’s supervisors, Dr. Sanna Malinen on sanna.malinen@canterbury.ac.nz, and Professor Lucy Johnston on lucy.johnston@canterbury.ac.nz.

The project has been reviewed *and approved* by the University of Canterbury Human Ethics Committee.

NB: Displayed below are a series of images detailing what participants saw on the screen as they completed their online questionnaire.



Initial Questions: Details

Please fill in the appropriate details below.

NB: This section asks you to provide contact details. These details will be kept confidential and will not be stored alongside your data, hence your data will be anonymous.

1. Please indicate your sex: [male or female]
2. Do you intend to be physically active in the next six months?
3. Please provide postage details (so you may be rewarded for your participation).

Physical Activity Survey (Part One)

0% 100%

Please fill in the appropriate details below.
NB: This section asks you to provide contact details. These details will be kept confidential and will not be stored alongside your data.

• Please indicate your sex?

☐ Female

☐ Male

• Do you intend to be physically active in the next six months?

☐ Yes

☐ No

• Please provide your postage details (so you may be rewarded for your participation).

The Satisfaction with Life Scale (SWLS)

Five-item measure:

Responses are obtained using a 7-point Likert-type scale where 7 = *strongly agree*, 6 = *agree*, 5 = *slightly agree*, 4 = *neither agree nor disagree*, 3 = *slightly disagree*, 2 = *disagree*, 1 = *strongly disagree*.

Items:

1. In most ways my life is close to my ideal
2. The conditions of my life are excellent
3. I am satisfied with my life
4. So far I have gotten the important things I want in life
5. If I could live my life over, I would change almost nothing

Physical Activity Survey (Part One)

0% 100%

Please rate the five following statements as honestly and accurately as possible where 1 = strongly disagree and 7 = strongly agree.

	Strongly Disagree 1	2	3	Neutral 4	5	6	Strongly Agree 7
In most ways my life is close to the ideal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The conditions of my life are excellent.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with my life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
So far I have gotten the important things I want in life.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Overall Job Satisfaction Scale (adapted version)

Six-item measure:

Responses are obtained using a 5-point Likert-type scale where 5 = *strongly agree*, 4 = *agree*, 3 = *undecided*, 2 = *disagree*, 1 = *strongly disagree*.

Items:

1. I am often bored with my job (R)
2. I feel fairly well satisfied with my present job
3. I am satisfied with my job for the time being
4. Most days I am enthusiastic about my work
5. I like my job better than the average worker does
6. I find real enjoyment in my work

Items denoted with (R) are reverse scored.

0% ☐ 100%

Please rate the five following statements as honestly and accurately as possible where 1 = *strongly disagree* and 5 = *strongly agree*.

	Strongly Disagree 1	2	3	4	Strongly Agree 5
I am often bored with my job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel fairly well satisfied with my present job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am satisfied with my job for the time being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most days I am enthusiastic about my work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like my job better than the average worker does	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find real enjoyment in my work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The 14-Item Perceived Stress Scale (PSS)

14-item measure:

Responses are obtained using a 5-point Likert-type scale where 5 = *all of the time*, 4 = *often*, 3 = *some of the time*, 2 = *rarely*, 1 = *never*.

Items and instructions:

The questions in this scale will ask you about your feelings and thoughts during the last month. In each case you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between each one and you should treat them as a separate question. The best approach is to answer each question fairly quickly. That is, do not try and count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

1. In the last month, how often have you been upset because of something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and “stressed”?
4. In the last month, how often have you successfully dealt with irritating life hassles? (R)
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life? (R)
6. In the last month, how often have you felt confident about your ability to handle your personal problems? (R)

7. In the last month, how often have you felt things were going your way? (R)
8. In the last month, how often have you felt that you could not cope with all the things you had to do?
9. In the last month, how often have you been able to control irritations in your life? (R)
10. In the last month, how often have you felt that you were on top of things? (R)
11. In the last month, how often have you been angered because of things that happened that were outside your control?
12. In the last month, how often have you found yourself thinking about things you have to accomplish?
13. In the last month, how often have you been able to control the way you spend your time? (R)
14. In the last month, how often have you felt difficulties piling up so high that you could not overcome them?

Items denoted with (R) are reverse scored.

Physical Activity Survey (Part One)

0% ☐ 100%

The questions in this scale will ask you about your feelings and thoughts during the last month. In each case you will be asked to indicate how often you felt or thought a certain way. Although some of the questions are similar, there are differences between each one and you should treat them as a separate question. The best approach is to answer each question fairly quickly. That is, do not try and count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate.

	Never	Rarely	Some of the time	Often	All of the time
In the last month, how often have you been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month					

The 15-Item Job Related Tension Index

15-item measure:

Responses are obtained using a 5-point Likert-type scale where 5 = *all of the time*, 4 = *often*, 3 = *some of the time*, 2 = *rarely*, 1 = *never*.

Items and instructions:

All of us occasionally feel bothered by certain kinds of things in our work. How frequently do you feel bothered by each of these?

1. Feeling that you have too little authority to carry out the responsibilities assigned to you
2. Being unclear on just what the scope and responsibilities of your job are
3. Not knowing what opportunities for advancement or promotion exist for you
4. Feeling that you have too heavy a work load, one that you can't possibly finish during an ordinary day
5. Thinking that you'll not be able to satisfy the conflicting demands of various people over you
6. Feeling that you're not fully qualified to handle your job
7. Not knowing what your supervisor thinks of you, how he/she evaluates your performance
8. The fact that you can't get information needed to carry out your job
9. Having to decide things that affect the lives of individuals, people that you know
10. Feeling that you may not be liked and accepted by the people you work with
11. Feeling unable to influence your immediate supervisor's decisions and actions that affect you
12. Not knowing just what the people you work with expect of you
13. Thinking that the amount of work you have to do may interfere with how well it gets done
14. Feeling that you have to do things on the job that are against your better judgement
15. Feeling that your job tends to interfere with your family life

Physical Activity Survey (Part One)

0% ☐ 100%

All of us occasionally feel bothered by certain kinds of things in our work. How frequently do you feel bothered by each of these?

	Never	Rarely	Some of the time	Often	All of the time
Feeling that you have too little authority to carry out the responsibilities assigned to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being unclear on just what the scope and responsibilities of your job are	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not knowing what opportunities for advancement or promotion exist for you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling that you have too heavy a	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Barriers to Physical Activity Scale

25-item measure:

Responses are obtained using a 5-point Likert-type scale where 4 = *all of the time*, 3 = *often*, 2 = *some of the time*, 1 = *rarely*, 0 = *never*.

Items and instructions:

How often have each of these situations or perceptions prevented you from engaging in physical activity?

1. Self conscious about my looks
2. Lack interest in physical activity
3. Lack self-discipline or willpower
4. Lack time
5. Lack energy
6. No one to do physical activity with me
7. Do not enjoy physical activity
8. Hate to fail, so I do not try
9. Lack equipment
10. The weather is too bad
11. Lack skills
12. Too tired to exercise
13. Lack knowledge on how to do physical activities
14. Poor health
15. Fear injury
16. Physical activity is hard work
17. Lack a convenient place to do physical activity
18. Too overweight
19. Physical activity is boring
20. Minor aches and pains
21. Work demands
22. Social demands
23. Family demands
24. Lack money

Physical Activity

Please list below all the physical activities that you have been involved in over the last week. In the **activity/activities** box please *include all physical exercise (e.g. running) and physical leisure (e.g. tramping; gardening)* completed during a particular day. In the **description** box please *describe the intensity of the activity/activities completed on a given day (e.g. slow walk or fast run)*. In the **length of time** box please *describe the length of time (in minutes)* that you engaged in each specific activity. **If no physical activity was completed on a particular day then please leave the row for that day blank.**

LimeSurvey Physical Activity Survey (Part One)

0% ☐ 100%

How often have each of these situations or perceptions prevented you from engaging in physical activity?

	Never	Rarely	Some of the time	Often	All of the time	No answer
Self conscious about my looks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack interest in physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack self-discipline or willpower	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack energy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
No one to do physical activity with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do not enjoy physical activity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hate to fail, so I do not try	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lack equipment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The weather is too	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

LimeSurvey Physical Activity Survey (Part One)

0% ☐ 100%

Please list below all the physical activities that you have been involved in over the past week.

In the **activity/activities** box please *include all physical exercise (e.g. running) and physical leisure (e.g. tramping; gardening) completed during a particular day.*

In the **description of intensity** box please *describe the intensity of the activity/activities completed on a given day (e.g. slow walk or fast run).*

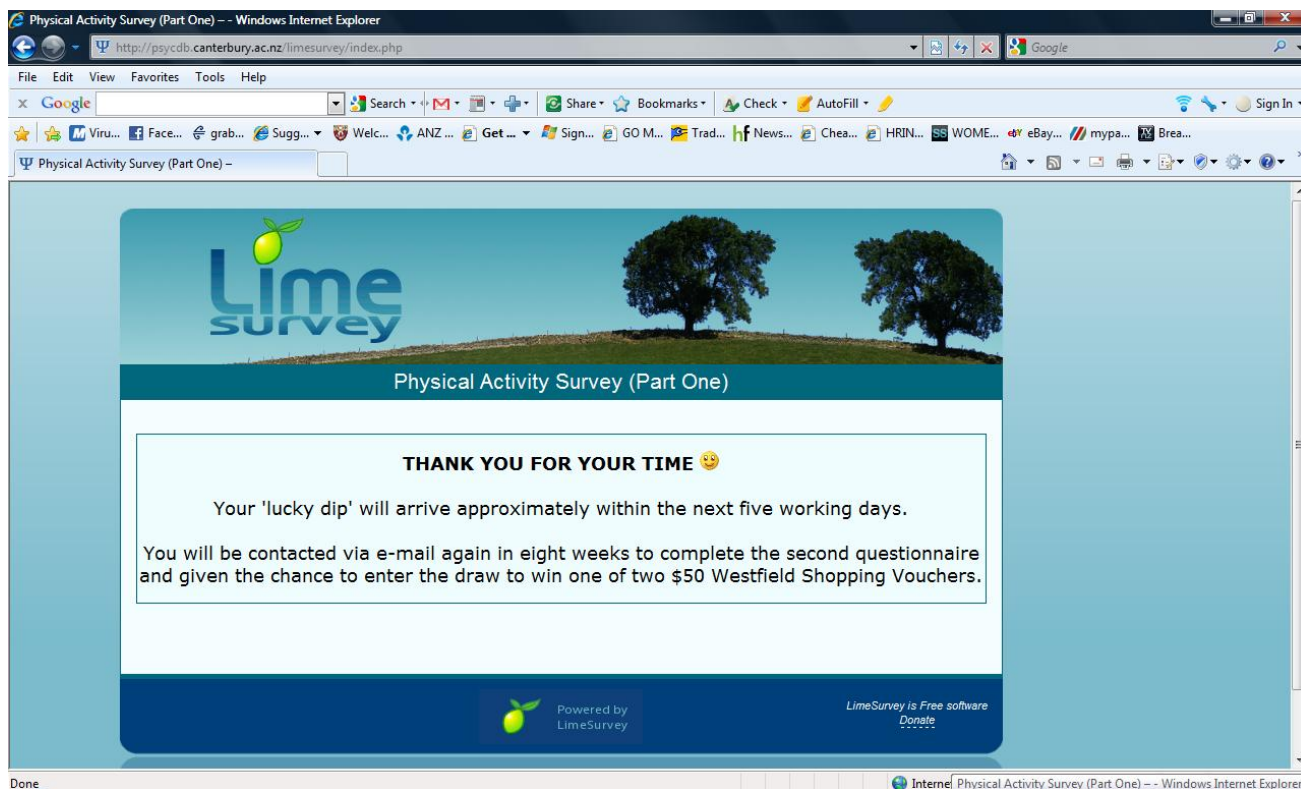
In the **length of time** box please *describe the length of time (in minutes) that you engaged in each specific activity.*

If no physical activity was completed on a particular day then please leave the row for that day blank.

Monday

Activity/Activities	<input type="text"/>
Description intensity	<input type="text"/>
Length of time	<input type="text"/>

Thank you for your time. Your 'lucky dip' will arrive approximately within the next five working days. You will be contacted via e-mail again in eight weeks to complete the second questionnaire and given the chance to enter the draw to win one of two \$50 Westfield Shopping Vouchers.



Appendix C: Invite to complete Time 2 online questionnaire

Hi [insert name],

Eight weeks ago you completed an online questionnaire as the first part of my research project, which is investigating the relationship between physical activity, and life satisfaction, general stress, work stress and job satisfaction. I would really appreciate it if you could take the time to complete the second (final) part of my research, which involves completing another online questionnaire (approximately 10-15 minutes). In order to answer my research questions, it is important that all participants complete both questionnaires.

At the end of this questionnaire you will have the opportunity to go into the draw to win one of two \$50 Westfield Shopping Vouchers.

To access the questionnaire please click on the following link:

<http://psycdb.canterbury.ac.nz/limesurvey/index.php?sid=38914&lang=en>

This questionnaire will require you to enter a token (e.g. a password). When it prompts you to do so, please enter the following:

[insert token]

Thank you again for your help and participation. I really appreciate it.

Kind regards,
Liana Styles

University of Canterbury

Appendix D: Reminder to complete Time 2 Questionnaire

Hi [insert name],

Recently you were invited to participate in the second part of a research project, which is investigating the relationship between physical activity, and life satisfaction, general stress, work stress and job satisfaction. It would be appreciated if you could take the time to complete the second (final) part of the research, which involves completing another online questionnaire (approximately 10-15 minutes). In order to answer the research questions, it is important that participants complete both questionnaires.

We note that you have not yet completed the survey, and wish to send you a friendly reminder that the survey is still available should you wish to take part.

The survey is titled: Physical Activity Survey (part two).

To participate, please click on the link below:

<http://psycdb.canterbury.ac.nz/limesurvey/index.php?sid=38914&lang=en>

This survey will require you to enter a token (e.g. password). When it prompts you to do so, please enter the following:

[insert token]

Kind regards,
Liana Styles

Appendix E: Time 2 online questionnaire

INFORMATION SHEET

You are invited to take part in this research project which is being conducted by Liana Styles as part of the requirements for her M.Sc. in Applied Psychology at the University of Canterbury. Liana is being supervised by Professor Lucy Johnston and Dr. Sanna Malinen.

The aim of this study is to investigate the effects of physical activity on life satisfaction, the experience of work stress, and job satisfaction.

Your involvement in this project thus far has included the completion of a voluntary questionnaire (eight weeks ago) which took approximately 10 – 15 minutes. At the end of the first questionnaire, as a small token of appreciation, you were sent a ‘lucky dip’ package with one of four types of gift: a pedometer, a wooden 15x16.5cm photo frame, a LED key ring torch, or a set of four glass coasters. You were asked for contact details to send you this gift but these details were kept confidential to myself and have not been stored alongside your data, hence your data is anonymous.

As a follow-up to this investigation, you are now being asked to complete an additional questionnaire which will also take approximately 10 – 15 minutes. At the end of this questionnaire you will have the opportunity to enter the prize draw to win one of two \$50 Westfield Shopping Vouchers.

As previously stated, you have the right to withdraw your participation at any time, however, once you have submitted your completed questionnaires at each stage your data will be combined with that from other participants and cannot be identified. So once you submit the completed questionnaires you are no longer able to withdraw your data.

The results of this project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation. Those who wish to go into the prize draw for the chance to win one of two \$50 Westfield Shopping Vouchers will be asked to provide contact details at the end of this questionnaire. Please note that this information will be stored separately from the data files. To ensure confidentiality, the researchers will be the only people who will have access to the information collected.

By continuing with this survey, please note you are giving your informed consent to participate in this study.

Liana Styles can be contacted on 0276323216 or ljs101@uclive.ac.nz and is pleased to discuss any concerns you may have about the participation of this project. Additionally, you may contact Liana’s supervisors, Dr. Sanna Malinen on sanna.malinen@canterbury.ac.nz, and Professor Lucy Johnston on lucy.johnston@canterbury.ac.nz.

The project has been reviewed *and approved* by the University of Canterbury Human Ethics Committee.

Physical Activity Survey (Part Two) - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php?sid=38914&tokenSEC=1&token=erhxrchi0hghb&lang=en

Physical Activity Survey (Part Two) -

Physical Activity Survey (Part Two)

INFORMATION SHEET

You are invited to take part in this research project which is being conducted by Liana Styles as part of the requirements for her M.Sc. in Applied Psychology at the University of Canterbury. Liana is being supervised by Professor Lucy Johnston and Dr. Sanna Malinen.

The aim of this study is to investigate the effects of physical activity on life satisfaction, the experience of work stress, and job satisfaction.

Your involvement in this project thus far has included the completion of a voluntary questionnaire (eight weeks ago) which took approximately 10 – 15 minutes. At the end of the first questionnaire, as a small token of appreciation, you were sent a 'lucky dip' package with one of four types of gift: a pedometer, a wooden 15x16.5cm photo frame, an LED key ring torch, or a set of four glass coasters. You were asked for contact details to send you this gift but these details were kept confidential to myself and have not be stored alongside your data, hence your data is anonymous.

As a follow-up to this investigation, you are now being asked to complete an additional questionnaire which will also take approximately 10 – 15 minutes. At the end of this questionnaire you will have the opportunity to enter the prize draw to win one of two \$50 Westfield Shopping Vouchers.

As previously stated, you have the right to withdraw your participation at any time,

Please note that the above sections for life satisfaction, job satisfaction, perceived stress, work-related stress and barriers to physical activity (refer to Appendix B) were inserted here. Personal details were not included in this questionnaire.

Physical Activity Survey (Part Two) - Physical activity (last week) - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php

Physical Activity Survey (Part Two) - Physical acti...

Physical Activity Survey (Part Two)

0% ☐ 100%

The next few sections will ask you to list the physical activities that you have been involved in over the last eight weeks as best you can remember. You will be asked to start by listing the physical activities you have been involved in from the most recent week finishing with physical activities you were involved in eight weeks ago.

Please list below all the physical activities that you were involved in during the **most recent week** as best you can remember.

In the **activity/activities** box please *include all physical exercise (e.g. running) and physical leisure (e.g. tramping; gardening) completed during a particular day.*

In the **description of intensity** box please *describe the intensity of the activity/activities completed on a given day (e.g. slow walk or fast run).*

In the **length of time** box please *describe the length of time (in minutes) that you engaged in each specific activity.*

If no physical activity was completed on a particular day then please leave the row for that day blank.

Monday

Activity/Activities	<input type="text"/>
Description intensity	<input type="text"/>
Length of time	<input type="text"/>

Physical Activity

The next few sections will ask you to list the physical activities that you have been involved in over the last eight weeks as best you can remember. You will be asked to start by listing the physical activities you have been involved in from the most recent week finishing with physical activities you were involved in eight weeks ago.

Please list below all the physical activities that you have been involved during the **most recent week** as best you can remember. In the **activity/activities** box please *include all physical exercise (e.g. running) and physical leisure (e.g. tramping; gardening)* completed during a particular day. In the **description** box please *describe the intensity of the activity/activities completed on a given day (e.g. slow walk or fast run)*. In the **length of time** box please *describe the length of time (in minutes) that you engaged in each specific activity*. **If no physical activity was completed on a particular day then please leave the row for that day blank.**

Physical Activity Survey (Part Two) – Prize type - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php

File Edit View Favorites Tools Help

Google Search

Physical Activity Survey (Part Two) – Prize type

Lime survey

Physical Activity Survey (Part Two)

0% 100%

Did you receive a pedometer as your 'lucky dip' prize eight weeks ago?

☐ Yes

☐ No

<< Previous Next >>

[Exit and clear survey]

Resume later

Done Internet | Protected Mode: On 100%

Lucky dip type.

Did you receive a pedometer as your 'lucky dip' prize eight weeks ago?

Pedometer use.

If you answered 'yes' to being awarded a pedometer as your lucky dip prize please answer the questions below. If you answered 'no' please ignore this page and proceed to the next section.

Did you use your pedometer?

If yes, please give an approximate of the number of times you used your pedometer.

Please provide an estimate of the total number of steps recorded on your pedometer.

Physical Activity Survey (Part Two) - Pedometer - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php

0% 100%

If you answered 'yes' to being awarded a pedometer as your lucky dip prize please answer the questions below. If you answered 'no' please ignore this page and proceed to the next section.

Did you use your pedometer?

☐ Yes

☐ No

☒ No answer

If yes, please give an estimate of the total number of times you used your pedometer.

Please provide an estimate of the total number of steps recorded on your pedometer.

Done Internet | Protected Mode: On 100%

Prize draw.

Please note that the details recorded from this section will be kept confidential and will not be stored alongside your data.

Would you like to be included in the prize draw to win one of two \$50 Westfield Shopping Vouchers?

If you clicked yes above, please provide your preferred contact details (e.g. email or phone). These details will be kept confidential.

Physical Activity Survey (Part Two) - Details (prize draw) - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php

File Edit View Favorites Tools Help

Google Search

Physical Activity Survey (Part Two) - Details (priz...

Physical Activity Survey (Part Two)

0% ☐ 100%

Please note that the details recorded from this section will be kept confidential and will not be stored alongside your data.

Would you like to be included in the prize draw to win one of two \$50 Westfield Shopping Vouchers?

☐ Yes

☐ No

If you clicked yes above, please provide your preferred contact details (e.g. e-mail or phone). These details will be kept confidential.

<< Previous Submit

Done Internet | Protected Mode: On 100%

Physical Activity Survey (Part Two) - - Windows Internet Explorer

http://psycdb.canterbury.ac.nz/limesurvey/index.php

File Edit View Favorites Tools Help

Google Search

Physical Activity Survey (Part Two) -

Physical Activity Survey (Part Two)

DEBRIEFING

Thank you for taking part in this research project. 😊

The study aims to investigate the effect(s) of providing individuals, who are not currently physically active but intent on being physically active (referred as *intenders*), with a pedometer, on physical activity across an eight week period. The impact of increased physical activity, on other factors, including life satisfaction, job satisfaction, perceived stress, and specific work-related stress and barriers to physical activity, were also measured.

Previous research has shown that individuals who are intent on becoming physically active (but are not currently physically active) are likely to show more interest in different types of physical activity interventions, such as pedometer use, than those who have no desire to become physically active or are already physically active (Lorentzen, Ommundsen & Holme, 2007). However, no research to date has investigated whether simply providing *intenders* with some form of exercise-prompt or measurement tool, such as a pedometer, has an impact physical activity levels. For the current study, it is predicted that individuals presented with a pedometer (e.g. a form of measurement tool) will be more likely to engage in greater levels of physical activity than those who are not presented with a pedometer. It is also predicted that an increase in physical activity will be linked to increases in levels life satisfaction and job satisfaction and decreases in barriers to physical

Done Internet | Protected Mode: On 100%

DEBRIEFING

Thank you for taking part in this research project. 😊

The study aims to investigate the effect(s) of providing individuals, who are not currently physically active but intent on being physically active (referred as *intenders*), with a pedometer, on physical activity across an eight week period. The impact of increased physical activity, on other factors, including life satisfaction, job satisfaction, perceived stress, and specific work-related stress and barriers to physical activity, were also measured.

Previous research has shown that individuals who are intent on becoming physically active (but are not currently physically active) are likely to show more interest in different types of physical activity interventions, such as pedometer use, than those who have no desire to become physically active or are already physically active (Lorentzen, Ommundsen & Holme, 2007). However, no research to date has investigated whether simply providing *intenders* with some form of exercise-prompt or measurement tool, such as a pedometer, has an impact physical activity levels. For the current study, it is predicted that individuals presented with a pedometer (e.g. a form of measurement tool) will be more likely to engage in greater levels of physical activity than those who are not presented with a pedometer. It is also predicted that an increase in physical activity will be linked to increases in levels life satisfaction and job satisfaction and decreases in barriers to physical activity and levels of perceived and work-related stress.

Fundamentally, because this study required investigation into whether providing a pedometer to individuals effects levels of physical activity and related measures compared to individuals not provided with a pedometer, there were two groups of participants in this study. After completion of the first questionnaire, participants were assigned to either one of two groups: the experimental group (sent a 'prize' pedometer), or the control group (sent a 'prize' LED key ring torch). The research was organised in this way to avoid giving away the true nature, or expected outcomes of the experiment, as knowledge of this may have (without realising) influenced individual results and, as a consequence, failed to give a true depiction of the outcome(s).

This study required each participant to reflect on their own life satisfaction, job satisfaction, perceived (general) stress, and work-related stress. It is possible that such self-reflection may lead to uncertainly or distress amongst individuals. If you to talk to someone about personal concerns you may have with any of these areas in your life then LifeLine New Zealand can be contacted for free on 0800 534 354. Additionally, for more information and tips on dealing with stress, visit www.headspace.org.nz.

All information collected for this study will remain confidential, and the data will be securely stored at all times. For further questions or for a summary of the findings of this research, please contact Liana Styles on ljs101@uclive.ac.nz.

The winners of the \$50 Westfield Shopping vouchers for this study will be contacted via email or phone by 15 December 2011.

Appendix F: Time 2 physical activity score results

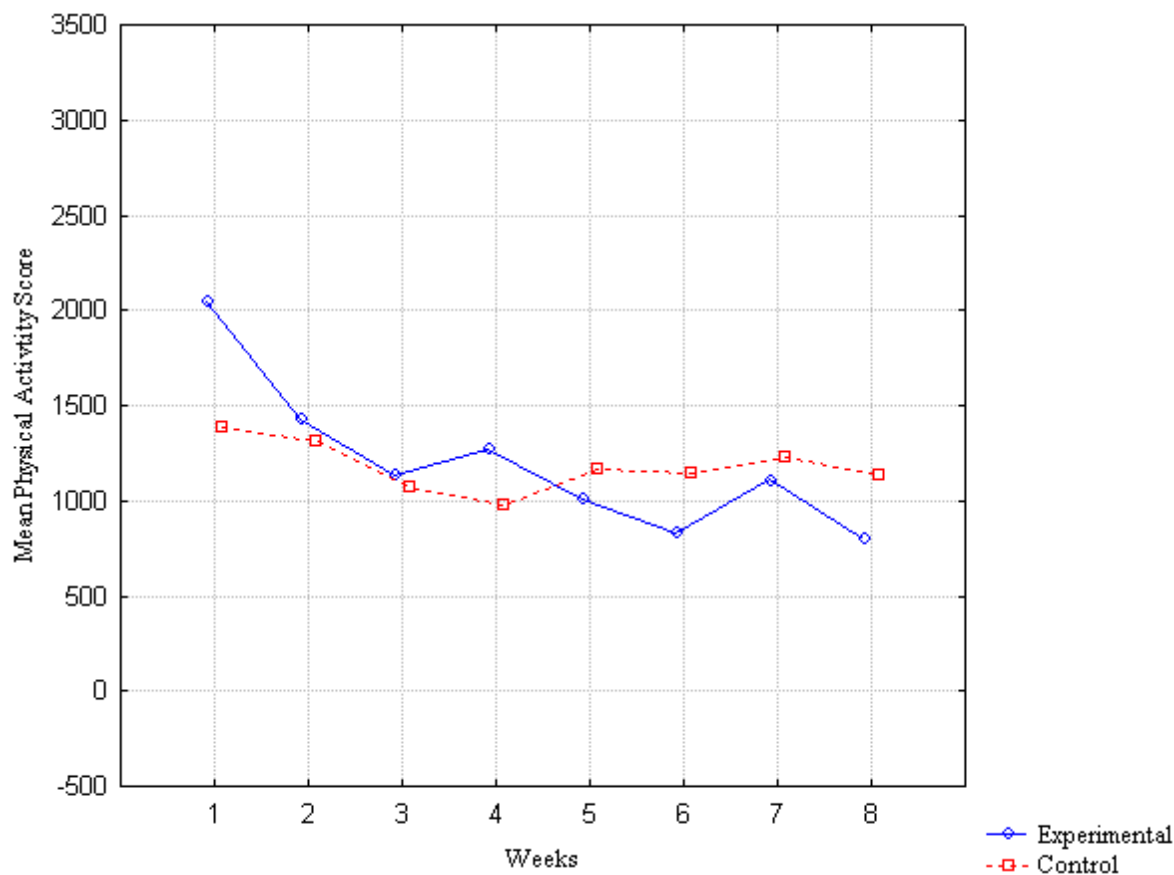


Figure A1.

Means for physical activity scores across eight weeks recorded at Time 2.

NB: Week 1 = week prior to Time 2 questionnaire, week 8 = week following Time 1 questionnaire

Table A1.

2 (Experimental/Control) x 8 (Weeks) ANOVA, with Weeks as the Repeated Measure, on Physical Activity Score Results

	SS	df	MS	F	p-value
Time	4918527.62	1	4918527.62	3.13	.10
• Error	26730235.68	17	1572366.81		
Group	23383.85	1	23383.85	.00	.95
• Error	1.007E8	17	5925369.62		
Time x Group	2704791.68	1	2704791.68	1.72	.21

Appendix G: Time 2 physical activity session results

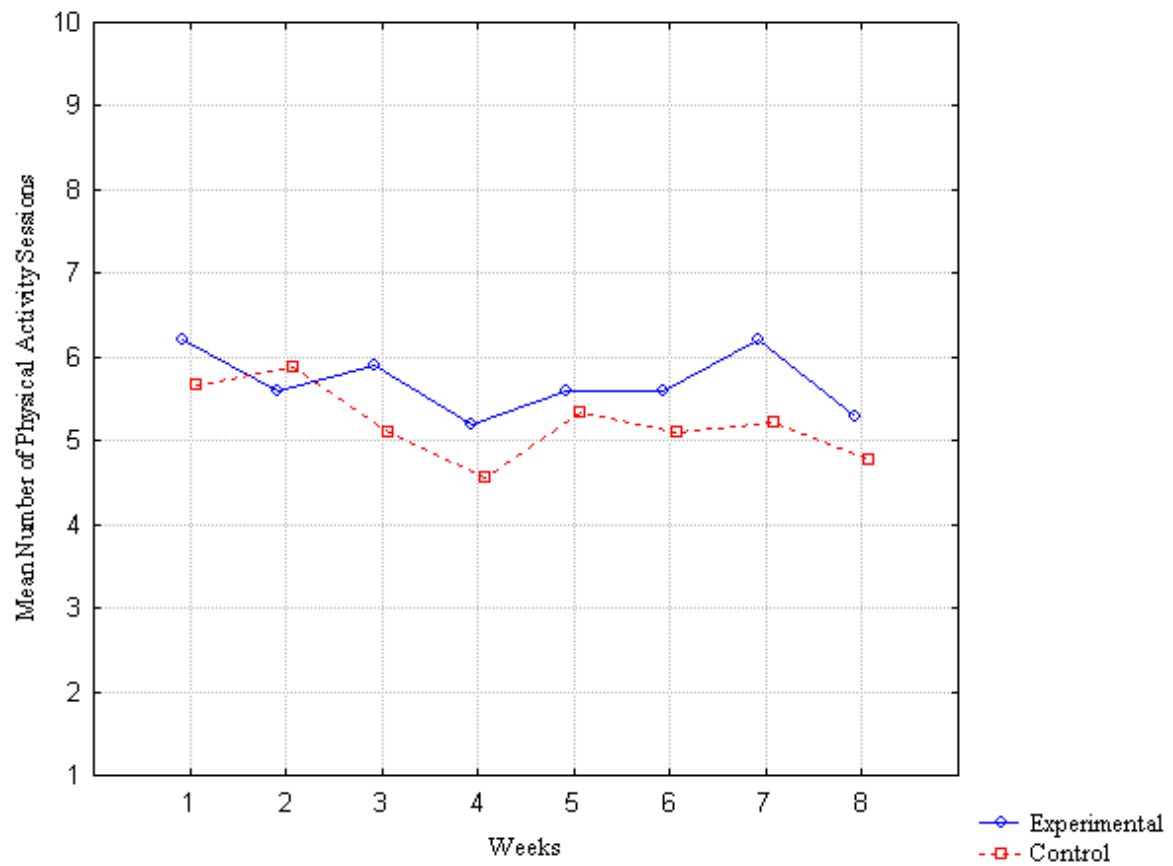


Figure A2.

Means for physical activity sessions across eight weeks recorded at Time 2.

NB: Week 1 = week prior to Time 2 questionnaire, week 8 = week following Time 1 questionnaire

Table A2.

2 (Experimental/Control) x 8 (Weeks) ANOVA, with Weeks as the Repeated Measure, on Physical Activity Session Results

	SS	df	MS	F	p-value
Time	4.00	1	4.00	4.24	.06
• Error	16.05	17	.94		
Group	8.55	1	8.55	.07	.79
• Error	2032.36	17	119.55		
Time x Group	.52	1	.52	.56	.47

Appendix H: Pedometer use vs. no pedometer use results

Table A4.

Changes From Time 2 – Time 1 Between Pedometer Use and No Pedometer Use for the Experimental Condition

Scale	Pedometer Use (N=6)	No Pedometer Use (N=15)	t-value	df	p-value
Life satisfaction	2.67 (2.88)	.93 (4.10)	.88	19	.36
Job satisfaction	2.50 (4.32)	.20 (2.27)	2.92	19	.10
Perceived stress	-6.00 (6.99)	-1.07 (8.34)	.24	19	.63
Work-related stress	-4.50 (6.41)	-.60 (7.16)	.02	19	.90
Average barrier intensity	-.51 (.40)	-.15 (.35)	.32	19	.58
Total barriers identified	-2.33 (6.28)	-.93 (2.76)	3.62	19	.07
PA total score	754.00 (1207.99)	1145.13 (1717.99)	.43	19	.52
PA total sessions	.50 (3.94)	1.13 (4.47)	.36	19	.56

Appendix I: Male vs. female results at Time 1 and Time 2

Table A3.

Differences Between Sex in Dependent Variables at Time 1 and Time 2

Scale	Males (N=18)	Females (N=22)	t-value	df	p-value
Life satisfaction					
• Time 1	24.11 (6.90)	23.00 (5.51)	.34	38	.56
• Time 2	24.50 (6.42)	25.05 (5.41)	.09	38	.77
Job satisfaction					
• Time 1	22.11 (4.24)	22.23 (4.91)	.54	38	.47
• Time 2	22.78 (3.92)	23.55 (4.88)	2.31	38	.14
Perceived stress					
• Time 1	36.78 (8.56)	37.77 (7.57)	.10	38	.75
• Time 2	35.83 (6.04)	33.73 (6.45)	.35	38	.56
Work-related stress					
• Time 1	36.17 (8.18)	36.18 (6.48)	1.06	38	.31
• Time 2	33.83 (7.94)	34.05 (7.22)	.76	38	.39
Average barrier intensity					
• Time 1	1.72 (.32)	2.09 (.39)	.96	38	.33
• Time 2	1.68 (.45)	1.79 (.41)	.09	38	.76
Total barriers identified					
• Time 1	18.06 (3.83)	19.59 (4.71)	1.06	38	.31
• Time 2	17.89 (5.43)	17.41 (6.49)	1.08	38	.31
PA total score					
• Time 1	1148.25 (835.38)	954.93 (1302.35)	2.13	38	.15
• Time 2	1870.00 (1587.41)	1369.75 (950.88)	1.59	38	.22
PA total sessions					
• Time 1	4.89 (4.36)	3.86 (3.45)	1.22	38	.28
• Time 2	5.00 (3.12)	4.64 (3.02)	1.03	38	.32