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Examination of the transtheoretical model of behaviour change to increase physical activity within an organisational setting

Justine L. Goldspink
Edith Cowan University

Edith Cowan University

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Running Head: PHYSICAL ACTIVITY INTERVENTION

Examination of the Transtheoretical Model of Behaviour Change to Increase Physical Activity Within an Organisational Setting

Justine L. Goldspink

"A Report Submitted in Partial Fulfilment of the Requirements for the Award of Bachelor of Arts (Psychology) Honours Faculty of Community Studies, Education and Social Sciences, Edith Cowan University."

October 2002

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Examination of the Transtheoretical Model of Behaviour Change to Increase Physical Activity Within an Organisational Setting

Abstract

This study explored the application of Prochaska and DiClemente's (1982) transtheoretical model of behaviour change (TTM) to the area of physical activity adoption and maintenance within an organisational setting. One hundred and nine employees of the Bunbury Centrelink Call Centre participated in a six-week physical activity intervention modelled on the Take Charge Challenge (TCC) (Leonard, 2000). Based on the TTM, this program attempts to increase individual physical activity through organisational change in order to counterbalance the sedentary nature of roles undertaken by staff and to maximise physical and psychological health benefits for employees. Time (in minutes/ week) engaging in physical activity was measured at week one, three and six of the intervention, and compared with the physical activity levels of employees in the control group. In conjunction with the measurement of physical activity, stage of change profiles of the intervention and control groups were also contrasted at these three measurement points. Results of a Split-plot Analysis of Variance confirmed the hypothesis that the TCC would lead to increased physical activity for participating employees but would have a negligible effect on control participants. The study's second hypothesis, that an increase in physical activity for TCC participants would coincide with changes in their stage of change profiles, was also supported. Chi Square analyses revealed that by week six, TCC participants identified with later stages of the TTM, demonstrating significant forward movement within the model. In contrast, the dispersion of control participants within the TTM remained relatively stable, with no significant change in this profile occurring throughout the six-week period. The confirmation of these hypotheses suggests preliminary support for both the efficacy of workplace physical activity interventions for increasing employee physical activity participation, and the validity of the TTM in accounting for the behaviour change that occurs when individuals incorporate increased physical activity within their lifestyle. It is hoped that the success of this intervention, reflected by increased physical activity participation and forward stage of change movement for participating employees, will facilitate the inclusion of the TCC into the organisation's existing work culture. This will allow for greater sustainability of physical activity, thus providing relapse prevention strategies in the workplace.

Author: Justine Goldspink

Supervisor: Genevieve Stone

Submitted: October, 2002

Declaration

I certify that this thesis does not incorporate, without acknowledgment, any material previously submitted for a degree or diploma in any institution of higher education and that, to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where due reference is made in the text.

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Examination of the Transtheoretical Model of Behaviour Change to Increase Physical Activity Within an Organisational Setting

Physical activity is potentially the most important lifestyle behaviour of the 21st century (Bull, Rosenberg & MacGowan, 2000). A sedentary lifestyle is recognised as the second most significant health risk factor after smoking and alone accounts for 7% of the total burden of injury and disease in Australia (Bull et al., 2000). Booth and his colleagues (1993) found that 22% of Australian adults are physically inactive, 40% occasionally participate in physical activity and only 38% of the population are regularly physically active and plan to continue. Consequently, increasing levels of physical activity in the Australian population is a major public health target, with participation in physical activity providing many advantages for physical, social, and psychological wellbeing (Bull et al., 2000).

Regular physical activity plays a role in the prevention, treatment and management of coronary heart disease, osteoporosis, diabetes, obesity, hypertension and depression (U.S. Surgeon General's Report, 1996). Additional psychological benefits include enhanced self-concept and reduced state anxiety (Gorley & Gordon, 1995; Kimiecik, 1992). In light of these clear advantages to physical and psychological health, researchers and clinicians are faced with two distinct challenges; firstly, how to encourage the uptake of physical activity behaviour and secondly, how to support those already active to maintain this behaviour.

In the complex area of physical activity adoption, adherence and maintenance, the recommendations from major consensus statements continue to advocate for a link between applied problems and theory (Brawley, 1993). To date, research has focused on

variables that might explain adherence to regular physical activity. However, much of this work has yielded inconsistent findings, primarily due to past studies lacking a theoretical base (Yordy & Lent, 1993). This has resulted in fragmented information that has not been connected by a logical progression of inquiry, prompting several authors to express concern over the largely atheoretical basis of physical activity research (Cardinal, 1996; Yordy & Lent, 1993). Thus, there is a need for applied physical activity research that has been informed by behaviour change theory, as these theories implicitly or explicitly provide frameworks upon which health promotion initiatives may be based (Bunton, Murphy & Bennett, 1991). One potentially promising theory for this purpose is the transtheoretical model of behaviour change (TTM) (Prochaska & DiClemente, 1982).

The Transtheoretical Model Of Behaviour Change

The TTM is a prominent theory in the field of health promotion (Prochaska & DiClemente, 1982). In the early 1980s, theorists and practitioners alike began to search for common principles of behaviour change. The goal was to systematically integrate and reunite a field that had splintered into more than 300 theories of psychotherapy (Prochaska & DiClemente, 1982; Prochaska & Velicer, 1997). This process was enhanced by findings from an empirical analysis of "self-changers" compared to continuing smokers in professional smoking cessation treatments (Prochaska, DiClemente,Velicer & Rossi; 1993, p.399). The results of this study revealed that participants employed particular processes at different times during their attempts to quit smoking. It was inferred from these findings that behaviour change may unfold through a series of stages (Prochaska & Velicer, 1997).

The TTM was developed to link behaviour health goals to staged movements that aimed at bringing about long-term behaviour change (Prochaska & Marcus, 1994). From the original studies of smoking cessation, the model expanded in scope and has been reported as successfully applied to a broader range of health-related behaviours (DiClemente, Prochaska, Fairhurst,Velicer, Velasquez & Rossi, 1991; Prochaska, et al., 1993). Applications have included reducing alcohol intake (Prochaska et al., 1994), improving stress management (Laforge, Velicer, Richmond & Owen; 1999), overcoming drug addiction (Prochaska et al., 1994), improving weight control and dietary change (Campbell, DeVellis, Strecher, Ammerman, DeVellis & Sandler, 1994; Glanz, Patterson, Kristal, Feng, Linnan, Heimendinger & Hebert 1998), promoting safe sex practices, sunscreen use (Taylor, 1999) and mammography screening (Bowen, Kinne & Urban, 1997), as well as increasing physical activity levels (Proshaska & Marcus, 1994). These studies suggest that common processes may be involved in initiating a positive behaviour such as increasing physical activity and ceasing a negative behaviour such as smoking (Marcus, Eaton, Rossi & Harlow, 1994). A critique of this position is presented later in this introduction.

The TTM derives its name from the eighteen different theoretical backgrounds it draws together in an attempt to understand the mechanisms of change (Curtis, 2000; Godin, 1994; Hagger, Chatzisarantis & Biddle, 2002; 2001). These theoretical underpinnings include social cognitive theory (SCT) (Bandura, 1986), self-efficacy theory (S-E) (Bandura, 1986), Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980) and Theory of Planned Behaviour (Ajzen, 1985). The contribution of each of these theories to the development of the TTM is outlined in the following section.

Maddux (1993) suggests that the most basic unifying characteristic of the major models of health and physical activity behaviour is that each is an example of a more general social cognitive theory. SCT is an approach to understanding human cognition, action, motivation, and emotion that assumes that individuals are capable of self-reflection and self-regulation (Bandura, 1986). According to SCT, most behaviour is purposive or goal-directed and is guided by forethought (anticipating, predicting and planning). This aspect of SCT corresponds to the contemplation and preparation stages proposed by the TTM (Maddux, 1993). Thus, SCT's emphasis on the role of beliefs, expectancies and intentions in the prediction and determination of behaviour provides the TTM with an important theoretical foundation (Maddux, 1993).

Self-efficacy (S-E) is a central mechanism in the self-regulation of behaviour highlighted by SCT (Bandura, 1986). Self-efficacy beliefs (personal judgements about one's ability to perform particular behaviours) are conceptualised as pervasive influences of motivation and action (Bandura, 1986). When applied to participation in physical activity, S-E reflects an individual's abilities to perform active behaviours (Hagger et al., 2001). A number of studies have shown that S-E provides an additional influence on physical activity intentions and behaviour that may be closely aligned to stages of change (Armstrong, Sallis, Hovell & Hofstetter, 1993; Hagger et al., 2002). Indeed, the two concepts are so closely intertwined that S-E has been integrated into the transtheoretical model (Armstrong et al., 1993). A review of four cross-sectional studies of employees from workplaces in the United States and Australia demonstrated that S-E differentiated employees at most stages (Armstrong et al., 1993). Furthermore, S-E was found to influence the adoption of healthy behaviours, the cessation of unhealthy behaviours, and

the maintenance of these behavioural changes in the face of challenge and difficulty (Maddux, 1993; Gorley & Gordon, 1995). These studies highlight the importance of S-E to subsequent behaviour change and also show that the staged concept of behaviour change is enhanced by the incorporation of S-E into the transtheoretical model (Hagger et al, 2001).

In contrast to S-E theory, TRA suggests that behaviour is immediate and solely determined by the intention to perform or not perform that behaviour (Ajzen & Fishbein, 1980; Yordy & Lent, 1993). The TPB added the notion of perceived behavioural control to the TRA, in order to extend the model's explanatory potential under conditions in which volitional control may be problematic (Godin, 1994). Perceived behavioural control reflects an assessment of individual capacity and of limiting or facilitating factors that influence behavioural engagement (Hagger et al., 2002). Physical activity provides a good example of such behaviour, given that extraneous factors, such as time pressures, weather conditions, or injuries, may affect performance (Yordy & Lent, 1993).

In a physical activity context, researchers have demonstrated that the TPB is superior to the TRA in accounting for the variance in the intention to be active. This conclusion is based primarily on findings indicating that perceived behavioural control has a larger effect on physical activity intentions in the TPB (Hagger et al., 2002). However, both of these models have been criticised for not adequately considering how past behaviour or habit influence future action (Rosen, 2000). When applied to physical activity, the TRA and TPB focus only on behaviour (e.g. the length of time an individual has been regularly physically active) *or* behavioural intention (degree of intention to change the level of physical activity) (Rosen, 2000). The TTM overcomes this limitation.

The stage concept includes intentional moderated baseline behaviour through the progression of stages, a framework that presumes modest changes in physical activity intervene between intent and adoption of regular physical activity (Rosen, 2000). Thus, an important attribute of the stage concept is that it encompasses both behaviour *and* behavioural intention to characterise an individual's readiness to change across an ordered sequence of stages (Laforge et al., 1999; Marcus, Simkin, Rossi & Pinto, 1996).

The Stages of Change

Prior to the development of the TTM, leading theories of behavioural change did not contain a core construct representing time, despite the implication that 'change' involves processes occurring over time (Prochaska & Velicer, 1997b). This issue is addressed by the TTM by acknowledging that behaviour change is a process that unfolds over time and through a sequence of stages (Marcus et al., 1996). A breakdown of the stages of change as applied to physical activity appears in Appendix A. The TTM is divided into five stages representing the temporal, motivational and constancy aspects of change. These stages are both stable and open to change, with this temporal dimension conceived to be dynamic, with individuals progressing, regressing, or stalling at different stages (Prochaska & DiClemente, 1982). The stages within the TTM model are precontemplation, contemplation, preparation, action and maintenance (DiClemente et al., 1991). Relapse is an event that terminates the action or maintenance phase, resulting in a cyclical movement back through the initial stages of precontemplation or contemplation (DiClemente et al., 1991).

Precontemplation is the stage in which action is not intended in the foreseeable future, generally measured as the next sixth months. Precontemplators tend to avoid

reading, discussing or thinking about their high-risk behaviours (Prochaska & Velicer, 1997). Individuals may be in this stage because they are uninformed or under-informed about the consequences of their behaviour. Similarly, individuals may have made several attempts to initiate behaviour change but have encountered various barriers blocking their efforts (DiClemente et al., 1991). *Contemplation* is the stage in which individuals are intending to change in the next six months. There is an increased awareness of the benefits of changing and also of the inherent costs. This balance between the advantages and disadvantages of behaviour change can produce a state of ambivalence that stalls individuals in this stage for long periods of time (Prochaska & Velicer, 1997).

Preparation is the stage in which individuals are intending to take action in the immediate future, usually measured as the next month, even though they may have relapsed from significant action in the past year (Prochaska & Velicer, 1997). These individuals have prepared a plan of action, such as joining a gym or buying a bike. *Action* involves carrying out the plan devised in the preparation stage. It is the stage in which individuals have made specific overt modifications in their lifestyle within the past six months, such as riding a bike daily to work. Since action is observable, behaviour change is often equated with action (Prochaska & Velicer, 1997).

Maintenance is the stage in which individuals are working to prevent relapse and are increasingly more confident that they can continue their positive changes (Prochaska & Velicer, 1997). *Relapse* is the return from action or maintenance to an earlier stage. In the area of physical activity, approximately 15% of individuals regress to the precontemplation stage while the vast majority return to contemplating or preparing for another serious attempt at action (Prochaska & Velicer, 1997). According to the TTM,

participation in physical activity should be distinctive for individuals in the various groups of stages (i.e., precontemplation/contemplation, preparation and action/maintenance) with physical activity levels increasing as the stages progress (Marcus & Simkin, 1993).

Critique of the Transtheoretical Model of Behaviour Change

The TTM has drawn criticism for what is perceived to be a simplistic reliance on the above five stages to explain the complex nature of behaviour change (Bandura, 1997). However, although a pivotal feature, the TTM is not based solely on the concept of stages. Ten processes of change also have been identified to represent the cognitive and behavioural strategies used when attempting to change behaviour (Weinstein, Rothman & Sutton, 1998). Processes of change are the covert activities (experiential processes) and overt activities (behavioural processes) used to progress through the stages over time (Marcus, Rakowski & Rossi, 1992; Prochaska & Velicer, 1997b). Theoretically, these processes are derived from a variety of therapy systems, including behavioural, cognitive, existential, experiential, gestalt, humanistic, interpersonal, psychodynamic and radical therapies (Marcus et al., 1996). Definitions of the theorised processes of change are presented in Table 1.

Table 1

Processes of Change

Process	Definition
Experiential processes	
Consciousness raising	Efforts by the individual to seek new information and to gain understanding and feedback about the problem
Dramatic relief	Affective aspects of change, often involving intense emotional experiences related to the behaviour
Environmental Re-evaluation	Individual's consideration and assessment of how the problem affects the physical and social environments
Self re-evaluation	Emotional and cognitive reappraisal of values by the individual with respect to the behaviour
Social liberation	Individual becomes aware of, and accepts, the availability of alternative lifestyles
Behavioural Processes	
Counter-conditioning	Individual substitutes alternative behaviours for the problem behaviour
Helping relationships	Individual trusts, accepts and utilises the support of caring others during attempts to change the behaviour
Reinforcement Management	Individual changes the contingencies that control or maintain the behaviour
Self-liberation	Individual's choice and commitment to change the problem behaviour, including the belief that one can change
Stimulus control	Individual attempts to take control of situations and other causes that trigger the problem behaviour

Adapted from (Marcus et al., 1992; Prochaska & Velicer, 1997)

Critics of the TTM have suggested that the behavioural, psychodynamic and existential theories from which the TTM is forged offer contradictory prescriptions on the mechanisms underlying behaviour change (Bandura, 1997). However, the discovery of systematic relationships between the stages that individuals are in, and the processes they apply, has allowed the integration of processes from theories that were typically seen as incompatible and conflicting (Prochaska & Velicer, 1997b). This integration suggests that in early stages, individuals apply cognitive, affective, and evaluative processes to progress through the stages. In later stages, individuals rely on commitments, conditioning, contingencies, environmental controls, and social support for progressing towards maintenance (Prochaska & Velicer, 1997). This position rejects limiting conclusions that behaviour change is determined singularly by internal cognitions, environmental conditions, personal commitments, social consequences, social support *or* stimulus control (Prochaska & Velicer, 1997). To confine an understanding and explanation of human behaviour to a single theory denies the diversity of human behaviour and behaviour change.

Albert Bandura (1997) argues that human functioning is too multifaceted and multidetermined to be categorised into discrete stages and, predictably, substages or transitional stages must be created to encompass human diversity. However, counter-criticism suggests that this is a basic misinterpretation and potential misapplication of the TTM (Prochaska & Velicer, 1997b). The misinterpretation is that because the TTM is a stage theory it relies on a few discrete categories to account for the complexities of human functioning. Instead, the TTM calls on 15 core constructs (ten processes and five stages) to account for *one* human function, intentional behaviour change (Prochaska &

Velicer, 1997). Ten change processes (described in Table 1) were theoretically derived from therapies of behaviour change and stages were empirically discovered in studies of how individuals were applying these processes in attempts to overcome addictive behaviours. Thus, the stage variable is not a substitute for process instead the stage variable provides an integration of processes (Prochaska & Velicer, 1997).

Not only have the broad theoretical underpinnings of the model been questioned, but the external validity of the model has also been queried with respect to its transfer to multiple topic domains. To date, the central focus of the transtheoretical framework has been understanding and examining behaviour change for problematic behaviours (in particular smoking cessation), a focus that persisted until the late 1990s (Bunton, Baldwin, Flynn & Whitelaw, 2000; DiClemente et al., 1991). It has been suggested that caution must be taken in using the TTM to make comparisons between the initiation of positive, preventative health behaviours and the elimination of potentially harmful behaviours, as the two are not equivalent (Marcus et al., 1992; Whitelaw, Baldwin, Bunton & Flynn, 2000). In an effort to expand the scope of the model Prochaska and his colleagues (1994) investigated the stages of change and decisional balance for 12 problem behaviours identified earlier in this introduction. Stage of change constructs and the relationships between them were found to hold for behaviours differing on such dimensions as acquisition and cessation, addictive and non-addictive, frequent and infrequent, legal and illegal, public and private, and socially acceptable and less socially acceptable (Prochaska et al., 1994).

Whitelaw and her associates (2000) proposed that the disproportionate popularity of the TTM maybe skewing the practical and conceptual nature of health promotion. This

is primarily due to the observation that stage of change activities are seen to equate to 'health promotion' at the expense of other activities and approaches. Furthermore, there is a tendency for the strength of the evidence base regarding the efficacy of TTM-modelled interventions to be over-stated. There is less high-quality evidence associated with the model than generally assumed, especially measurements of short-term outcome (Whitelaw et al., 2000). Therefore, despite the 'TTM's common sense capacity to segment populations and allow compatible interventions to be targeted, it is possible that the accepted credibility surrounding the model is derived to a significant extent from a general faith and persuasive rhetoric (Whitelaw et al., 2000).

Regardless of this popularity, deserved or otherwise, it is important to note that many physical activity models, theories and resulting interventions, have failed to acknowledge the complex nature of physical activity behaviour. Traditionally, individuals have been characterised as either 'active/exercisers' or as 'inactive/non-exercisers' (Buxton, Wyse & Mercer, 1996). Such an all-or none dichotomy fails to recognise the different levels and types of physical activity behaviours and consequently ignores the different transitions experienced by individuals in the adoption and maintenance of regular physical activity (Armstrong et al., 1993; Buxton, et al., 1996). Thus, a major contribution of the TTM lies in its recognition of the complex and dynamic nature of behaviour change, such as becoming and remaining physically active (Buxton et al., 1996).

After considering these limitations of the TTM, there remains pervasive evidence to suggest that facilitating progress through even one stage can double the chance of successful behavioural change in the near future (DiClemente et al., 1991). The model is

attractive for professionals involved in promoting healthier lifestyles, not least because it provides a framework for partitioning the complex process of behaviour change into more manageable pieces (Whitehead, 1997). Additionally, the stage-based approach is appreciated by clients and is readily comprehensible to health professionals who are not experts in behaviour modification (Steptoe, Kerry, Rink & Hilton, 2001). The prospect of enhancing behaviour change, in an area health promotion practitioners have previously found difficult to address, is a key reason for the practical application of the TTM to physical activity adoption and maintenance within an organisational setting (Peterson & Aldana, 1999).

Workplace Physical Activity

Employed adults may spend up to half of their waking hours at work. Consequently, facilities and programs to support physical activity in and around the workplace may increase participation for many adults (Bull et al., 2000). In a survey conducted to assess the physical activity levels of Western Australian adults only 15% of respondents reported that "physical activity facilities or fitness groups at their place of work (were) provided by their employer" (Bull et al., 2000, p.52). In addition, adults who reported undertaking recommended levels of activity (16%) were more likely to report access to facilities or programs at the workplace, compared with adults who were categorised as inactive (10%) or insufficiently active (15%) (Bull et al., 2000). These results highlight the importance of physical activity-oriented workplaces for enhancing employees' health status.

There are many diverse benefits for employees who participate in workplace physical activity programs and who incorporate physical activity into their everyday

lifestyle (Blake, Caspersen, Finnegan, Crow, Mittlemark & Ringhofer 1996). At the individual level, employees may find that their fitness levels improve, their self-concept and sense of wellbeing is enhanced, and that fatigue, anxiety and depressive symptoms are reduced (Marks & Rippe, 1997). The advantages for employers and their organization of regularly active employees may include increased physical work capacity, improved morale among co-workers, less absenteeism and lowered staff turnover and health care costs (Blake et al., 1996; U.S. Department of Health and Human Services Public Health Service, 1993). As a result of these benefits, organisational interest in health promotion has arisen from companies' desire to maintain a competitive edge in recruiting employees, reducing absenteeism, and enhancing employee potential. In essence, work places are increasingly recognising that healthy employees contribute to healthy companies (Blake et al., 1996).

In recognition of the benefits to individual employees and of the organisational importance of having an active workforce, a number of workplaces have participated in programs designed to increase physical activity (Marcus, Rossi, Selby, Niaura & Abrams, 1992; 1996). The "Director's 50th Anniversary Physical Activity Challenge" was one such program, designed to promote regular, moderate physical activity among employees working in an American federal agency (Cole, Leonard, Hammond & Fridinger, 1998). The objective of the study was to assess the short-term effects of a 50-day intervention by examining the stages that 1,192 employees went through as they attempted to make permanent increases in physical activity. Employees participating in the challenge set personal physical activity goals and then formalised these goals in a behavioural contract. Employees then monitored their own activity level during the intervention using an

activity record. In this one-group, pre-test/post-test design, the PACE scale (Long et al., 1996; cited in Cole et al., 1998) was used to classify participants into stages before and after the physical activity intervention. The results of the study demonstrated that more than a third [n =423 (35.4%)] of participants progressed one or more stages during the intervention (Cole et al., 1998). In light of this finding, the researchers concluded that the intervention appeared successful in raising physical activity levels among willing participants of a workplace population (Cole et al., 1998).

The above design assumes that any changes in pre-intervention performance were attributable to the effects of the intervention. However, it is difficult for the true effect of the physical activity intervention to be determined as stage of change profiles for a control group were not obtained. Thus, alternative explanations, such as stage of change movement as a function of time, cannot be ruled out. An additional limitation involves the justification of the study. The TTM, the theory upon which the physical activity intervention was based, was neither challenged nor critiqued by the researchers. Instead, the TTM was assumed to correctly account for any behaviour change (such as the increased physical activity of participants) occurring throughout the intervention. Furthermore, the design did not allow for a concurrent measure of behaviour change to validate stage of change movement. The design may have been strengthened by providing an indication of behaviour change, in conjunction with stage of change movement. This modification would not have been difficult to incorporate into the study as participants recorded their own physical activity levels throughout the intervention. Thus, a more complete design may have involved a comparison of employees' physical activity level and stage of change category prior to the intervention (baseline), with their

physical activity level and stage of change category at its conclusion (post-test), for both a control and intervention group. If an increase in physical activity (the desired behaviour change) corresponded with stage of change movement for the intervention group only, the effect of the physical activity intervention could be more accurately determined and additional support for the TTM would be provided.

Critique of Workplace Physical Activity Interventions

The limitations highlighted in the previous study appear almost characteristic of physical activity intervention studies. The following section of the introduction outlines several physical activity interventions that contain serious methodological flaws, such as lack of a control group, indirect measures of behaviour change and failure to secure baseline physical activity data.

The "Imagine Action" campaign was a community-wide event incorporating the involvement of local workplaces and community agencies (Marcus et al., 1992b). The study examined the utility of the TTM for enhancing physical activity participation. The 610 participants were enrolled in a six-week intervention program designed to encourage participation in physical activity. The registration form included one question designed to assess current stage of physical activity adoption. The intervention included written materials designed to encourage participants to initiate or increase physical activity, a resource manual describing activity options in the community, and weekly 'fun walks' and 'activity nights'. A Stuart-Maxwell test for correlated proportions revealed that participants were significantly more active after the six-week intervention, as 62% of participants in the contemplation stage and 61% of participants in the preparation stage became more active. Although this finding is encouraging, no control group was

employed, preventing the researchers from attributing stage of change movement solely to the effect of the intervention. The effect of the intervention on employee physical activity participation could have been more accurately evaluated had a control group or a delayed-treatment comparison group been utilised. An additional problem was that behaviour change (increased physical activity level) was not directly measured. The design relied on constructs, the stages of change, to reflect rather than measure, observable behaviour change. Increased participation in physical activity, documented by participants in activity logs, may have improved the study's design by providing direct evidence of behaviour change.

The Minnesota Heart health program conducted physical activity programs between 1982 and 1989 within three communities to reduce behavioural risk for cardiovascular disease. The "Shape Up Challenge" was a workplace physical activity competition designed, in conjunction with other campaign activities, to assess organizational and employee participation and to increase physical activity levels (Blake et al., 1996). Of the 365 companies invited to participate, 33% chose to be involved. Thus, 119 companies (17, 626 employees) participated in a four-week long competition during which employees recorded minutes spent daily participating in physical activity. An incentive system was established to promote intragroup cooperation within the companies and intergroup competition between them. A one-group, post-test only design was used to measure physical activity. The reported increase of physical activity for employees of participating companies led the researchers to conclude that workplace physical activity competitions appear to be a viable strategy for promoting employee physical activity, particularly for smaller companies (Blake et al., 1996). However, in the

absence of controls, specific conclusions regarding the intervention's effectiveness at increasing physical activity levels cannot be made, primarily because baseline physical activity data was not obtained. Furthermore, there was no control group to compare physical activity levels to before and after the Shape Up Challenge. The absence of baseline physical activity data and lack of a control group make it impossible to gauge the true effect of the Shape Up Challenge on employees' physical activity.

In 1997, Marks and Rippe implemented a 20-week physical activity challenge for employees at Life Fitness Corporation, a manufacturer of electronic exercise equipment. Of the 82 participants, 56 completed final testing. A comparison of pre-test and post-test scores revealed significant improvements were made by all participants completing the challenge in every parameter tested, including percentage body fat and the number of sit-ups, push-ups, leg-extensions and chest presses that could be performed. Although it appears that significant improvements in participant's fitness levels occurred, a control group was not part of this project's design, thus the intervention itself can not be evaluated effectively. Participant attrition was another confounding factor as there was a 32% drop out rate from the program. The researchers hypothesised that this may have been a response to the contest-prize atmosphere (Marks & Rippe, 1997). It is possible however, that employees with greater motivation or fitness levels at baseline completed the challenge, skewing the results. A further limitation of this study was that although observable physiological changes were measured, no attempt was made to associate these changes with psychological processes involved with behaviour change. Potentially, this study may have contributed more to our understanding of employee participation in workplace physical activity interventions had it been informed by a psychological theory

of behaviour change. As it stands, the study is what Cardinal (1996, p.273) describes as "atheoretical".

The Take Charge Challenge

The Take Charge Challenge (TCC) was piloted by the National Coalition for Promoting Physical Activity in 38 sites throughout the United States in 1998 (Leonard, 2000). In its complete form, the TCC is a ten-week physical activity workplace intervention developed by the Georgia Coalition for Physical Activity and Nutrition (GPAN) and to this candidate's knowledge, is yet to be implemented in Australia. The physical activity intervention implemented in this study was based on the TCC. In contrast to Marks and Rippe's (1997) physical activity intervention, the TCC is informed by psychological theory, specifically, Prochaska and DiClemente's TTM. The TCC offers advantages over other intervention models. As noted in the preceding critique of workplace physical activity interventions, the success of previous interventions has been difficult to assess due to the absence of control groups and unavailability of pre-program baseline data (Donovan, Jones, D'Arcy, Holman & Corti, 1998). The study overcame this methodological concern by providing the entry stage of change point for each participant at the beginning of the intervention (week one) as well as a measure of their initial physical activity levels. A measure of behaviour change was provided by comparing initial physical activity levels with physical activity levels at the conclusion of the intervention (week six). Comparison of physical activity levels with stage of change profiles allowed for the efficacy of the TCC intervention to be assessed within theoretical boundaries.

An increasing body of evidence indicates that physical activity interventions such as the TCC appear to be cost-effective health promotion strategies for small and moderate sized companies, given the limited resources necessary for implementation and the simplicity of the approach (Blake et al., 1996). The workplace has a number of advantages for intervention, including large numbers of individuals who may be educated and included in programs simultaneously, the presence of organisational structures backing and enabling the program, and built-in social support systems encouraging participation (Taylor, 1999). Due to access to large numbers of individuals and a defined population, workplaces are also appealing avenues for research (Thompson, van Leynseele & Beresford, 1997). The unique research opportunity the workplace provides has ramifications for the design and implementation of physical activity interventions. Programs that are successful in increasing physical activity levels in one workplace may be transferable to others. This study attempts to test this assumption by implementing the TCC in an Australian government organization and comparing its effects to those reported in studies involving American workplaces.

Model Outline

The TCC was developed to facilitate individual physical activity within organizational settings. The TCC was developed around the core constructs of the TTM, and therefore recognises varying physical activity levels and an individual's interest and motivation to be physically active. As the program considers individual employees' wants and needs, and aims to increase physical activity levels from the originating stage of change, all participants in the program have the potential to be successful (Leonard, 2000). Those not "successful" (in terms of the TTM) do not move stages, reach their

identified goals, or withdraw from the program. The TCC uses both an individual and team approach to increase levels of physical activity. Due to time constraints associated with this project, participants set personal goals for regular activity over six weeks, rather than the recommended ten-week period. Activities ranged from moderate/vigorous activities such as gardening to more intense participation in running and swimming.

Participants record daily physical activity (in minutes) with the goal of being active for at least 30 minutes on most days of the week. This level of activity complies with the minimum recommendations for a health benefit (United States Surgeon General's Report 1996). Record keeping plays an important role in facilitating the adoption and maintenance of new behaviours (Davison & Neale, 2001). The self-recording involved in completing the personal activity logs is designed to raise self-awareness of the target behaviour, increased physical activity. Self-recording has been shown to typically increase the demonstration of positive behaviours and decrease negative behaviours (Davison & Neale, 2001). Therefore, it was expected that this component of the TCC intervention would assist participants to increase their physical activity levels.

The TCC allows for all participants, regardless of their current level of physical activity or position in the stage of change model, to start on an "even playing field" (Leonard, 2000, p. 6). If participants are inactive at the beginning of the program, they can set minimal, achievable goals. If already active, participants may set goals that will encourage regular adherence and maintenance. Goal setting is an essential component of the TCC as individuals with goals generally outperform people without goals and the same person will perform better with goals than without (Poag & McAuley, 1992). This is because goals energise and direct behaviour as well as increase persistence (Poag &

McAuley, 1992). Goals generate motivation by focusing an individual's attention on the discrepancy between their present level of accomplishment and their ideal level of accomplishment (Reeve, 2001). One form of goal-performance discrepancy is discrepancy creation, based on a feed-forward system in which the individual proactively sets a future, higher goal, such as increasing the amount of physical activity they participate in by ten minutes each day (Reeve, 2001). Thus, one of the intervening functions of the TCC involves individuals setting personally relevant and realistic goals to increase their physical activity levels.

The TCC rewards participants for reaching or exceeding their physical activity goals (the Method section provides an outline of this study's incentive program). Incentives are used in the TTC as part of a more comprehensive feedback system that informs participants of goal attainment on individual and team levels. This feedback also includes the degree to which goals are met or not met so that participants have a greater understanding of their progress. Feedback is a crucial aspect of the TCC intervention as it makes goal setting effective. Goal setting translates into increased performance only in the context of timely feedback that documents the performer's progress in relation to the goal (Reeve, 2001). Without feedback, performance (in this context, increased participation in physical activity) can be emotionally unimportant and uninvolving (Reeve, 2001).

Objectives of the Study

This study had a two-pronged focus. First, it aimed to implement and evaluate a physical activity intervention modelled on the TCC within an organisation. Since individuals in the control group were not exposed to the intervention, it was expected that

their physical activity levels would remain relatively stable over the six-week period. Increased physical activity levels of participants in the intervention group but not the control group would reflect the influence of the TCC in promoting the adoption of physical activity for those participants currently inactive and the maintenance of adequate levels of participation for participants already active.

The second aim of the study was to examine the utility of the TTM in describing the hypothesised behaviour change (increased physical activity participation). Stage of change profiles for the intervention and control groups were contrasted throughout the intervention at weeks one, three and six. According to the TTM, if behaviour change occurred in the six- week period (such as an increase in physical activity participation) then a corresponding change in the individual's stage of change, such as from preparation to action, would also be expected. As the control group was not exposed to the intervention, minimal stage of change movement as a function of time was expected. These expectations were based on the premise that the TTM adequately describes the stages of change theorised to correspond to the adoption, increase and/or maintenance of physical activity behaviours.

Consequently, the two primary hypotheses of the study were

1). The physical activity levels of participants in the intervention group would increase over the six-week period, suggesting that the physical activity intervention influenced the physical activity levels of participants.

2). Individuals in the intervention group would demonstrate greater stage of change movement by the conclusion of the intervention than individuals in the control group.

Method

Participants

The participant pool for this study were employees of the Commonwealth Department of Social Security operating as "Centrelink" in Bunbury, the south-west regional centre of Western Australia. Centrelink provides a number of services including a family support office (a separate operation) and a Call Centre. The latter setting was the focus of this study.

Management from the Call Centre approached the research team to conduct a wellness program for Centrelink employees. Initially, the participant pool consisted of 280 employees. After a commitment to conduct the research was made, an unforseen staff cut reduced this potential pool of participants to 209. Therefore, 209 staff of the Bunbury Centrelink Call Centre were invited to participate in the TCC program. The manager of the Call Centre provided written consent for the organisation to take part and understood that the data collected would be used for research purposes and remained the property of Edith Cowan University (see Appendix B).

Centrelink covers three floors of the Bunbury Tower, a large government building within the central business district of the City of Bunbury. A randomised, controlled intervention across the whole staff population would be the ideal experimental design. However, staff affiliate mostly within floors and not usually between floors and for this reason floors one and seven were selectively assigned to the intervention (a total of 153 staff), and floor four staff (56) were selectively assigned to a control group. For ethical reasons the control group was invited to participate in a second intervention in six months time. Staff on each floor are actively encouraged by management to interact and work

closely with one another. Accordingly, it was decided that the confounding effects of having members from the intervention and control groups working side by side would risk contaminating the research conditions. Assignment of different floors to each research condition was therefore considered the only viable option. All participating employees provided written informed consent (see Appendix C) prior to commencing the intervention.

A naturally occurring team structure already existed within the organisation. The ten work teams currently operating within the organisation were utilised to assign participants to TCC teams. The work teams comprise 19 members each. As team members already work closely with one another it was hoped that utilising these pre-existing teams would facilitate the organisation and implementation of the program. The heads of these naturally occurring teams (or a volunteer), were the team leaders for the TCC.

Of the 153 employees invited to participate in the TCC, 82 chose to be involved, a participation rate of 54%. This rate compares favourably with TCC interventions implemented in American workplaces. Of the 50 workplaces and 30, 000 participants involved in previous TCC interventions, the average participation rate per workplace has been 45% (Leonard, 2000). Other documented workplace physical activity interventions noted an average participation rate that ranged from 20 to 40% (Blake et al., 1996). The participation rates of the seven individual teams on floors one and seven were 89%, 74%, 68%, 53%, 53%, 32%, and 26%. One team chose not to participate.

In the intervention group 73 participants were female and 9 of the participants were male. This gender difference is reflected by the disproportionate number of males

(17) and females (136) employed on the first and seventh floors. In the control group, 7 of the participants were male and 20 were female. Again, rather than a systematic participation bias, this breakdown appears to reflect a gender difference in the number of males (11) and females (45) employed by Centrelink on the fourth floor. However, males were slightly more likely than females to participate in both research conditions.

Materials

All individual self- report surveys, individual and aggregate data collection forms and physical activity logs required for the intervention were adapted from the original Take Charge Challenge (Leonard, 2000). All forms are included in Appendix D.

The Stage of Change Instrument

The most common tool used to operationalise stage of change is a staging algorithm, which allows participants to categorise themselves into one of five stages of change (precontemplation, contemplation, preparation, action or maintenance) on a five-point choice response format (Reed, Velicer, Prochaska Rossi & Marcus, 1997). Consequently, stage of physical activity was assessed using an adapted stage-of change instrument (SCI), a five-item ordered-categorical scale that is theoretically based on the TTM and conceptually resembles a ladder, with each rung of the ladder relating to one of the five posited stages (Wyse, Mercer, Ashford, Buxton & Gleeson, 1995). Among adult samples, this measurement approach has evolved as the preferred stage of physical activity assessment technique (as opposed to a Likert scale or 'True/False' approach for each stage), as it facilitates individual's placement into stages while minimising (as much as possible) the problem of non-classification or misclassification observed in self-report methods (Cardinal, 1996; 1997; Wyse et al., 1995).

Four main advantages of using the SCI to categorise individuals into their appropriate stage of change have been suggested. First, the need for brevity in survey research often requires that measurement instruments are short and easily applied (Laforge et al., 1999). Second, the questionnaire enables limited resources to be well targeted; third it provides information on which to base appropriate interventions; and finally, it allows evaluation to be an integral part of the project (Loughlan & Mutrie, 1994).

Marcus and her colleagues (1992) demonstrated the reliability of the SCI. The Kappa index of reliability over a two-week period was 0.78. Other researchers reported that stage of change surveys demonstrated a moderate level of reliability [$k = 0.52$] when measuring stages of change for increasing physical activity (Donovan et al., 1998). The SCI has been shown to have an association with the 7-day physical activity recall questionnaire, thus demonstrating concurrent validity (Gorley & Gordon, 1995).

Incentives

Incentives for goal attainment at the midpoint (week three) and conclusion (week six) of the intervention were sourced in negotiation with the organisation. Care was taken at all times to ensure that incentives did not disrupt the workplace. Although incentives are an important component of the TCC for increasing and maintaining motivation, at no point in the study were incentives used to coerce individuals into participating. The major incentive was a team lunch provided by Centrelink for the team with the highest level of goal attainment at week six. Individual incentives included helium balloons and confectionary presented to team members who reached or exceeded their personal physical activity goals at weeks three and six. From a motivational perspective, it was

hoped that the colourful and cheery presence of helium balloons would also act as a reminder of the goals and objectives of the TCC. There were no penalties associated with the attainment or non-attainment of incentives, and incentives did not influence how employees' work performance was rated. All participants had an equal chance of receiving incentives as their provision was based upon individual goal attainment.

Procedure

Team captains informed team members about the TCC by distributing registration information and encouragement to potential participants. There was continuous promotion of the objectives of the TCC during the intervention period. The Call Centre's marketing group (one of the work teams) provided posters displaying Occupational Health and Safety (OH&S) messages throughout the course of the intervention to floors one and seven only. These posters encouraged TCC participants to use their OH&S breaks (approximately five minutes for every hour spent answering the Call Centre telephones) for physical activity, such as movement around the office. The posters also encouraged participants to use the stairs rather than the elevator, to deliver messages in person rather than e-mail where appropriate, to park their car further away and walk to work, and to try new physical activities.

Participants provided informed consent to participate in the TCC by completing a pre-challenge "Registration Stage of Change Survey". On this form participants indicated the total amount of time (in minutes) they were physically active in the past week. This provided an indication of the participants' pre-intervention physical activity levels (baseline physical activity level at week one). On this same form participants were required to endorse one of the five descriptions of physical activity behaviour, placed

ordinally on a conceptual ladder (precontemplation to maintenance) and were subsequently classified into the appropriate stage. This provided information regarding their initial stage of change (baseline stage of change at week one).

Participants set a six-week personal physical activity goal using the Goal Setting work sheet (Appendix D-1) where the overriding objective was simply to increase their current physical activity level. Participants tracked and recorded their physical activity by using the "Personal Activity Log"(Appendix D-2). On this form participants entered the amount of time they were active for each day of the week, providing a running tally of the cumulative amount of time spent participating in physical activity. At week three, participants compared this cumulative total to the mid-way goal they set at the beginning of the intervention and reported this score to their Team Captain. At the conclusion of the intervention participants reported their final cumulative physical activity total and their final goal to their Team Captain.

Concurrent to physical activity measurements, participants also completed a Stage of Change survey (Appendix D-3 to D-5) and returned it to their Team Captain. This survey examined participants' stages of change mid-way through the intervention (at week three) and at its conclusion (week six). The team captains collated and reported data (level of goal attainment and stage of change) at the beginning (week 1), middle (week 3) and conclusion (week 6) of the TCC. This data was maintained on the "Team Captain Summary data form" (Appendix D-9).

Participants qualified for incentives by reaching their mid-way physical activity goal and/or by obtaining their final physical activity goal. The team with the highest number of participants reaching their goals also qualified for incentives.

Participants in the control group did not participate in the intervention activities. Instead, this group provided information on a Physical Activity Survey about the stage of change with which they identified mostly and the average weekly time spent (in minutes) being active at three measurement points; week one, week three and week six (see Appendix D-6 to D-8).

Results

Overview

By the conclusion of the intervention the average amount of time spent participating in physical activity per week for the 82 participants in the intervention group had increased by approximately one hour and 24 minutes (week 1 M=56.549, SD=37.426; week 6 M=140.116, SD=114.815). This corresponds to an average increase in physical activity of 12 minutes for each day of the week during the course of the intervention. In contrast, the average amount of physical activity per week decreased by approximately seven minutes for the 27 employees in the control group over the same six-week period (week 1 M=215.074, SD=133.685; week 6 M= 208.296, SD=127.222). The statistical significance of these results is discussed in further detail later in this section.

Consistent with past research, the five stages of change were collapsed into the following three-stage model a priori: precontemplation/contemplation, preparation and action/maintenance (Buxton et al., 1996). A comparison of the intervention group's stage of change profile at week one and week six indicated that the percentage of participants in the later stages of the model (preparation and action/maintenance) increased from 77% at week one to 98% at week six. Minimal stage of change movement occurred for participants in the control group. At week one, 85% of the participants in the control group were in the later stages of change (preparation and action/maintenance) and at week six, 89% of participants were still in these stages.

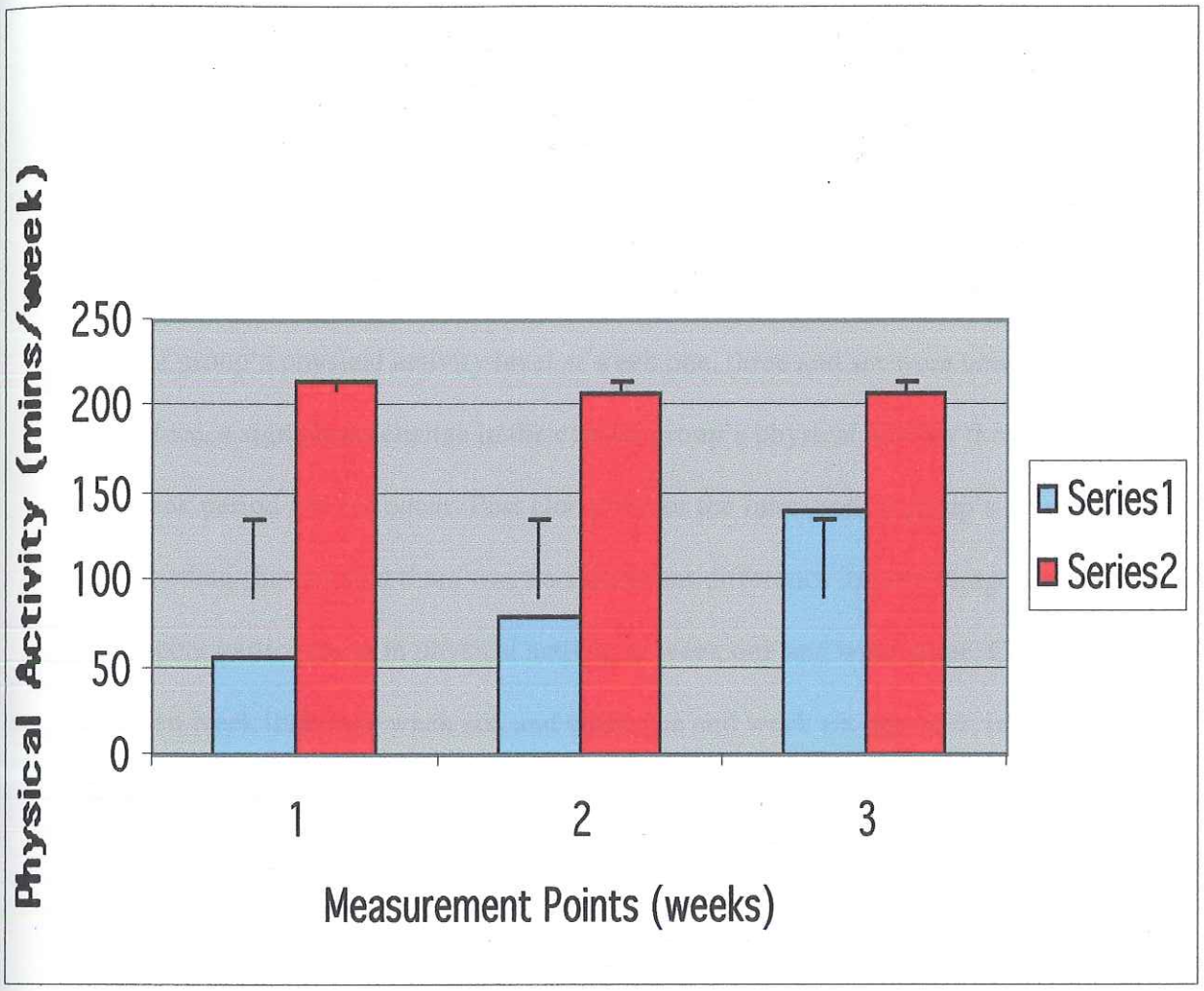
All complex analyses were performed using the SPSS version 10 for Windows statistical package (output appears in Appendix E). Evaluation of the necessary assumptions, using an alpha level of 0.001, indicated that both Box's Test of Equality of

Covariance Matrices and Mulchy's Test of Sphericity were significant ($p < 0.001$). Levene's Test of Equality of Error Variances was significant at week one and three of the intervention ($p<0.001$). By week six this test was no longer significant ($p>0.001$). Due to the violation of these assumptions it cannot be assumed that the pattern of intercorrelations among the levels of the repeated measure (time of test) were consistent from level to level of the between subjects factor (group). Nor can it be assumed that the variance of the population difference scores for the intervention group were the same as the variance of the population difference scores for the control group. Therefore, caution must be taken in determining the significance of the results as well as their subsequent interpretation. Consequently, Huyhn-Feldt values were used to determine the significance of main effects and accompany the report of all statistical results.

Split-plot Analysis of Variance: Physical Activity

Using an alpha level of 0.05, a split-plot analysis of variance (SPANOVA) was performed on the DV (time spent in minutes engaging in physical activity/week) at week one (pre-test), at week three (post-test 1) and at week six (post-test 2). The results of the SPANOVA indicated that the amount of physical activity/week differed significantly according to the point in time during the six-week period that it was measured ($F(1.349, 144.396) = 10.359$, $p< 0.000$). Tests of between-subjects effects showed that there was also a significant main effect of group ($F(1, 107) = 44.854$, $p<0.000$). In other words, the level of physical activity/week differed according to whether participants belonged to the intervention or control group with the latter group having more physical activity throughout the measurement period.

The group by time interaction was also significant ($F(1.349, 144.396) = 13.288$, $p<0.000$), suggesting that there were significant differences in physical activity as a combined result of both the group participants belonged to and the time of measurement. From the onset of the TCC to its conclusion, the overall physical activity level of the control group was higher than the intervention group, and remained relatively stable over the six-week period. The overall physical activity level of the intervention group increased from week one to week three, and significantly increased from week three to week six, although remained lower than the control group's physical activity level. The intervention and control group's pattern of physical activity over the six-week period is presented graphically for comparison (Figure 1).



Note: Series 1 = Intervention group's mean level of physical activity (mins/week)

Series 2 = Control group's mean level of physical activity (min/week)

Measure of variability = Error bars represent one standard variation from each mean level of physical activity reported

Figure 1. Comparison of the Intervention and Control Group Mean Level of Physical Activity at Three Measurement Points During the TCC; week one, week three and week six.

Post Hoc Analyses: Physical Activity

To examine the differences in physical activity between the control and intervention groups from week one to week six in finer detail, a Post Hoc analysis using Tukey's HSD and the Studentised Range Statistic (q) (Howell, 1997) was conducted by hand (see Appendix F). These tests revealed that all possible comparisons between the control group's physical activity level at week one, three and six were non significant. Therefore, a significant change in the control group's physical activity throughout the six-week period did not occur. Post Hoc tests for the intervention group's physical activity data showed that there was no significant difference in the average amount of time spent participating in physical activity at week one and week three. Comparisons between week three and week six, and week one and week six however, indicate that there was a significant difference in the time spent engaging in physical activity at these measurement points. All possible Post Hoc comparisons between the control group and the intervention group were significant with the control condition consistently recording higher activity levels than the intervention condition. This indicates that from the onset of the intervention (week one) and continuing for the full length of the intervention (week six), there was a significant difference in the average physical activity levels of the control group and the average physical activity levels of the intervention group.

Chi Square Analyses: Stage of Change Movement

The second set of analyses performed on the data investigated stage of change movement throughout the six-week period. A Chi Square analysis, performed manually (Hills, 1995), revealed a significant relationship between the point of time during the intervention and the stage of change profile of the TCC participants (see Appendix G).

An alpha level of 0.05 was used for all Chi Square analyses. The proportions of individuals in each stage of change category differed according to the point of time throughout the six-week physical activity intervention (week one, week three and week six) $\underline{X}^2$ (4, $\underline{N}$ = 246) = 25.342, $p<0.5$. The proportions of participants in each stage category throughout the TCC are presented in Table 2.

Table 2

Stage of Change Profile for TCC Participants

	Week		
Stage of Change	1	3	6
Precontemplation/ Contemplation	19	4	2
Preparation	47	51	50
Action/ Maintenance	16	27	30

Table two illustrates how participants in the TCC moved forward within the stage of change model during the physical activity intervention, so that significantly more participants identified with later stages of the model (action/maintenance) by the conclusion of the intervention (week 6).

A Chi Square analysis of the control group's stage of change data demonstrated a non significant relationship between time of measurement and the stage of change category $\underline{X}^2$ (4, $\underline{N}$ = 81) = 1.009, $\underline{p}$ >0.05. The result of this analysis indicates that the number of control group participants in each stage of change category did not differ significantly regardless of the time of measurement. Therefore, the analyses conducted suggest that there is no relationship between the time of test (week one, week three or week six) and the stage of change distribution for control participants.

Discussion

Overview

The physical activity intervention implemented in this study appeared to increase the physical activity levels of participating employees at the Bunbury Centrelink Call Centre during the six-week program. Management considered participation in the TCC program as an important measure to counterbalance the sedentary roles undertaken by staff, reduce stress and promote general wellbeing. Due to features of the design, the study also provided a theory-test for the TTM. This was achieved by concurrently measuring behaviour change (level of physical activity) and the stage of change movement of TCC participants. During the intervention, an increase in physical activity and corresponding forward movement within the model was observed, so that by the conclusion of the intervention TCC participants occupied later stages of change (as compared to their originating stage of change) and were demonstrating higher levels of physical activity (as compared to baseline physical activity levels).

Physical Activity

The first hypothesis of this study, that the TCC would increase physical activity for participating employees throughout the six-week intervention, but would have a negligible affect on control participants, was confirmed. Slight improvement in the intervention group's physical activity levels occurred from week one to week three but was statistically non-significant. From week three to week six of the intervention, the physical activity level of TCC participants significantly increased. By considering characteristics of individuals located at different points of the stage of change model, a potential explanation for the delayed improvement in physical activity level is provided.

At week one of the intervention, 19 TCC participants were classified as precontemplators/contemplators. According to the model, participants in these earliest stages of change engage in lower levels of physical activity as compared to participants in later stages of change such as action and maintenance (Marcus & Simkin, 1993). It is possible that these participants 'held back' other participants in the intervention group by reducing this group's overall physical activity during the first two weeks of the TCC. By week three of the intervention, only four participants were classified as precontemplators/contemplators and by week six this number was reduced to two participants. Thus, by week three, 15 participants (who began the intervention classified as precontemplators/contemplators) had increased their physical activity, and at the same time 'caught up' with participants in later stages of the model. Subsequently, increases in physical activity from week three onwards were significant. In conclusion, the delayed increase of physical activity participation for the intervention group is consistent with theory, as it corresponds with the stage of change movement from precontemplation/contemplation to preparation/action, highlighting the importance of this stage transition to increased physical activity.

Participants of the TCC used a variety of methods to increase their physical activity levels. One team constructed a hopscotch circuit on the floor of their work station and brought hula hoops into the office as a fun and novel way of increasing physical activity at work. A second team negotiated lower membership rates with the South West Sports Centre for Centrelink employees after signing up a minimum of ten co-workers. The leader of a third team sent daily e-mails motivating and encouraging team members to incorporate more physical activity into their time at work, as well as their everyday

lifestyle. From these examples it becomes apparent that some teams embraced the TCC more than others, and this was reflected by higher participation rates and greater levels of goal attainment. From informal discussion with participants, it appears that the influence of team leaders affected participation and goal attainment rates. Therefore, the role of an enthusiastic motivator or team leader in interventions such as the TCC would be both an interesting and important avenue for future physical activity research.

In contrast to the physical activity levels of the TCC participants, the average physical activity level of participants in the control group experienced little change, decreasing slightly. This slight decrease may have been due to seasonal change, as physical activity measurements were taken from July 1st to August 9th. The cold and wet weather during these months may have discouraged control participants from maintaining their regular physical activity patterns or from increasing their level of physical activity. It could be speculated that, if the weather was an influencing factor, there may have been a further *increase* in physical activity for TCC participants had the intervention not be implemented during winter. If future interventions are conducted within this organisation, researchers may wish to test the potential impact of seasonal change on physical activity by comparing the results of the present study with those of a physical activity intervention implemented during the warmer months.

Stage of Change

The study's second hypothesis, that an increase in physical activity for TCC participants would coincide with a change in their stage of change profile, was also confirmed. By the conclusion of the physical activity intervention, TCC participants identified with later stages of the model, demonstrating significant forward movement

within the model. Consistent with theory, increased physical activity levels accompanied the forward stage of change transitions of TCC participants. In comparison, the dispersion of control participants within the stage of change model remained relatively stable, with no significant change in this profile occurring throughout the six-week period. Furthermore, there were minimal changes in the physical activity levels of control participants over the six weeks. Therefore, consistent with predictions based on the TTM, stage of change profiles for the control group did not alter because there were no changes in the target behaviour (physical activity).

Implications for Theory

Support for these hypotheses suggests preliminary support both for the efficacy of workplace physical activity interventions for increasing employee physical activity participation and the validity of the TTM in accounting for the behaviour change that occurs when people incorporate a heightened level of physical activity within their lifestyle. The observed increase in physical activity for TCC participants, paralleled by forward stage of change movement, suggests that the stages of change are useful descriptors of the behaviour change process. The explanatory power of the transtheoretical model appears to have been demonstrated, as the TTM potentially accounts for a characteristic of the data that was not anticipated at the study's outset. Application of the TTM would suggest that the precontemplators/contemplator's lower level of baseline physical activity potentially 'dragged' the overall level of physical activity for the intervention group downwards. It was not until these participants had moved forward into the preparation and action/maintenance stages that an overall improvement in the intervention group's physical activity was observed (week three

onwards). This possible explanation of the intervention group's delayed physical activity improvement illustrates the TTM's ability to account for variations in the uptake of increased physical activity.

Strengths of the Study

Two outcomes of the physical activity intervention that are considered to be strengths of the study, was the relatively high participation rate (54%) and the success of women (reflected by high participation and low attrition rates) in the TCC.

Participation in the TCC

To improve the health of vulnerable employees and to minimise the biasing effects of self-selection and high attrition rates associated with many intervention programs, special emphasis was placed on fostering high participation rates in this study through the provision of information regarding the intervention, a supportive workplace environment, and reliance on organisational cohesion. This emphasis resulted in a participation rate 10% higher than rates reported elsewhere in the literature (Blake et al., 1996). Previous physical activity research suggests that workplaces in the public sector (e.g., health services, education and government organisations like the workplace in this study) are more likely to participate in physical activity interventions (Thompson et al., 1997). This is not surprising given the mandate of these workplaces to provide healthy environments for employees (Thompson et al., 1997). Although these workplaces support physical activity intervention in theory, in practice employees of such workplaces operate in high-pressure environments, leaving less time or inclination to complete surveys and participate in intervention activities. Furthermore, there are often many bureaucratic layers to negotiate in order to successfully implement a physical activity intervention

(Thompson et al., 1997). In light of these difficulties commonly encountered when attempting to implement physical activity interventions in government organisations, the participation rate of 54% achieved in this study (in comparison to other reported figures ranging from 20 to 40%; Blake et al., 1996) appears to be one of its strengths.

The Success of Women in the TCC

The participation of women in the TCC, and the achievement of their physical activity goals needs to be recognised, as the majority of research documents the success of men in physical activity interventions (as measured by greater participation and lower rates of attrition) and the underachievement of women in these same programs (Marks & Rippe, 1997). Marcus and her colleagues (1994b) suggest that the multiple demands of full-time employment, child-care and household responsibilities may interfere with many women's ability to make physical activity a priority. Moreover, the evidence suggests that lack of time is a significant barrier among women who desire to begin or increase regular physical activity, resulting in lower participation and higher drop out rates in physical activity interventions. In contrast to these findings, 85% of participants in this study (across both the intervention and control groups) were female. However, they were still slightly under-represented given the overall gender division of employees in the organisation. Women demonstrated high rates of participation and many reached or exceeded their physical activity goals. Given the increasing number of women in the work force and the success of women in the TCC, workplace physical activity interventions may be an effective strategy for increasing physical activity levels and overcoming the barriers to participation many women encounter (Marcus et al., 1994b).

Limitations of the Study

The TCC appears to have influenced the physical activity of participating employees during the intervention period. However, a number of factors relating to the study's design warrant consideration, in particular the impact of self-selection effects and the chosen method of physical activity measurement.

Self-selection

The physical activity patterns of the intervention group and the control group differed throughout the six-week period of the study. During the TCC, the intervention group increased their level of participation from just under an hour of physical activity per week at week one, to an average of 2 hours and 20 minutes by week six. Participants in the control group maintained an average of three and a half hours per week of physical activity over the six-week period. It is possible that that the control group's physical activity levels did not increase over the six weeks because they were not exposed to the intervention. Alternatively, it is possible that the control group's physical activity levels did not increase because they were already demonstrating high levels of physical activity and the scope for increase was more limited for this group (ceiling effects). Regardless of the reason, or combination of reasons, in comparison to the intervention group, the control group's level of physical activity was extremely high. Furthermore, as Post Hoc comparisons conducted between the control group and the intervention group' s physical activity levels at week one were significant, showing that the two groups differed significantly in the average amount of time spent being physically active *prior* to the commencement of the intervention (baseline/ week one) with the control group being

more active. An explanation for this difference is the self-selection of participants (as a result of voluntary participation) to the control and intervention groups.

It is possible that the self-selection of control participants resulted in individuals already demonstrating high levels of physical activity volunteering to document their physical activity patterns, whereas individuals participating in lower levels of physical activity declined to be involved in the program. This differential rate of participation in a physical activity program by individuals in lower versus higher stages of change is predicted by the TTM and is consistent with Prochaska and Velicer's (1997) suggestion that individuals in the precontemplation stage particularly, choose not to think about or discuss their high-risk behaviours (eg. a sedentary lifestyle). On the other hand, it is possible that TCC participants with low baseline physical activity levels may have been motivated to increase this level of physical activity in response to the intervention. If the intervention did in fact prompt precontemplators/contemplators to participate in the TCC, this would account for the wider range, but significantly lower rate of physical activity participation observed for the intervention group. Nevertheless, self-selection affected the representativeness of the control group and consequently limits the comparability of the two groups.

In order to benefit from a workplace physical activity intervention, employees need to participate in the program's activities. Since most workplace physical activity interventions are voluntary, the issue of participation is of the utmost importance (Heaney & Goetzel, 1997). Evaluations that focus only on changes among participants ignore the fact that the program may not attract the participation of large numbers of employees nor the participation of employees who exhibit risk factors, and are in most need of assistance

(Heaney & Goetzel, 1997). In voluntary physical activity interventions it is necessary to remain cautious of self-selection effects, as there may be systematic differences between participants and non-participants. The physical activity research shows that participants in workplace interventions tend to be healthier, better paid, more educated and motivated to change their health habits than non-participants (Stokols et al., 1996). Other factors that have been associated with non-participation include age, gender, interest, cost, convenience, type of physical activity, and employee workload (Blake et al., 1996). Thus, self-selection of participants to physical activity interventions occurs for a number of reasons and results in a disproportionate number of lower risk persons, those who are younger, are non-smokers, or are of higher socioeconomic status (Blake et al., 1996). This creates an ethical dilemma as those individuals most in need of intervention (typically precontemplators) are denied the benefits of participation.

Implications of Self-selection for Practice

To reduce the impact of both ceiling effects and self-selection a control group with a greater number of participants should be employed and, whenever possible, the number of participants in the control and intervention groups should equal or closely approximate one another. It was difficult to achieve experimental groups of similar size in this study due to its applied nature. In future studies, a greater sample size and random assignment of participants to research conditions may allow for a more even dispersion of participants in the various stages of change and differing levels of physical activity at baseline. However, it is necessary to recognise that the ethics of selecting only organisations that provide convenient or ideal experimental conditions is questionable.

Instead, the most ethical practice may be to concentrate efforts on fostering high levels of participation within the chosen organisation across all levels of the intervention.

If choosing to implement a physical activity intervention based on the TTM it may be beneficial to distribute educational materials relating to the importance of physical activity for personal wellbeing to all employees regardless of their decision to participate. The TTM predicts that precontemplators in particular will decline to participate in workplace physical activity interventions. As such, action-oriented workplace physical activity programs may not be the most appropriate strategy of intervention for this group. Therefore, educational materials would function as a form of "passive" intervention for those individuals choosing not to be involved. According to the research of Marcus and her colleagues (1992) the provision of information may be the most effective mode of intervention because precontemplators use consciousness raising more frequently than other processes when considering behaviour change (refer to Table 1, p. 8). Consciousness raising refers to efforts by the individual to seek out new information in order to gain an understanding of the problem behaviour (eg. a sedentary lifestyle). The ideal response to information materials would be an increase in awareness of the benefits of physical activity and of the health risks associated with a sedentary lifestyle, prompting individuals (precontemplators) to *contemplate* an increase in physical activity behaviours (Marcus et al., 1992; Prochaska & Velicer, 1997).

Measurement of Physical Activity

A second factor to be considered when interpreting the results of this study is that the data collected were presented in terms of self-reported stages of change and physical activity levels (time spent in minutes engaging in physical activity) and these may be

subject to bias and error. Individuals may consider themselves to be physically active despite failing to meet formal criteria (Steptoe et al., 2001). This may result in some unspecified amount of misclassification as to the respondent's actual stage of change. Workplace-based interventions must rely on self-report data to a large extent since there is frequently no direct contact between participants and the intervention agent (Laforge et al., 1999). Furthermore, the accuracy of self -report data has been extensively investigated in the area of smoking, where it was found to be accurate. Research into other problem areas, including increasing physical activity levels for health benefits, is more limited (Laforge et al., 1999). However, the available validity evidence from studies of numerous health risk factors strongly supports the utility of employing a self-report measure of stage of change for this behaviour.

The measurement of physical activity is also complicated by variations in type, intensity, frequency, duration and intermittency (Sallis & Hovell, 1990). Donovan and his colleagues (1998) suggest using the term 'physical activity' instead of 'exercise' for overcoming the perception that exercise equates only to vigorous and intense activity. This perception may be the reason for only moderate reliability levels in survey research because ideas or perceptions of what constitutes 'exercise' may differ according to contextual cues. Some individuals may view exercise as vigorous, aerobic activity and clearly fitness oriented, while others may view exercise (within a general health orientation) as to include moderate activities like brisk walking (Donovan et al., 1998). Research has shown that vigorous and moderate activity are not highly correlated, possibly representing two unique components of physical activity (Marcus & Simkin, 1993). In this study a detailed description of what constitutes physical activity appeared

on all forms given to participants, as clearly, the more explicit the definition of physical activity is, the more accurate the data will be (Reed et al., 1997). Despite this safeguard, a limitation of the chosen measurement method was that it primarily measured duration but not intensity.

Implications of Physical Activity Measurement for Practice

To overcome the measurement problem highlighted above, a more extensive and sensitive survey procedure incorporating measures of duration and intensity could be employed in ongoing physical activity research, however the time constraints and pressu workplaces are continually under ə be considered. Using objective mea ə corroborate self-reported physical activity levels (eg. use of external observers, physiological assessments such as body mass index (BMI), cholesterol levels or measures of cardiorespiratory fitness) contributes to a robust research design (Blake et al., 1996). Such measures were beyond the scope of this study and not without their own limitations. Such measures are invasive, time-consuming and expensive, with few combining practicality of use with high validity. Furthermore, these measures may be influenced by factors other than physical activity, including diet and lifestyle. Whenever feasible, future studies utilising the TTM should be carried out using unobtrusive (e.g., use of a workplace physical activity facility, collaborative report) or objective (e.g. activity monitor) measures of physical activity participation (Armstrong et al., 1993). Although subjective in nature, the inclusion of a qualitative evaluation method may aid in identifying the strengths and weaknesses of the TCC from employees' perspectives so that future physical activity interventions may be modified and enhanced (Heaney & Goetzel, 1997).

Sustainability

This study was limited by the short-term nature of the six-week physical activity intervention. A follow-up to the physical activity intervention was not included in the present study because the literature suggests that a minimum of six months must transpire before a valid measure of physical activity adherence may be taken (Marcus et al., 1996). Time constraints therefore prevent follow-up measures being included in the current design. Although one should not expect medium or long-term changes to result from a six-week intervention, Cole and his colleagues (1998, p.618) suggest that from an evaluation perspective, the best course is to measure immediate changes or "surrogates" of longer, more stable changes (Cole et al., 1998, p.618). Although not a formal part of the current study, members of the research team and Centrelink management have discussed the prospect of a follow up to the current intervention at six months. The follow-up physical activity intervention may wish to incorporate some form of cost-benefit data. Improvements in overall levels of physical activity may be compared with reductions in absenteeism and accidents at work, both of which have been linked to increased levels of physical activity in the workplace (Blake et al., 1996). These measures may indicate that the TCC successfully influenced positive behaviour changes, and as a result, management may be more likely to provide ongoing support for wellness programs.

To ensure ongoing support for workplace physical activity interventions, the challenge is to identify high impact roles in organisational settings that have the capacity to influence the health and safety of large numbers of employees (Stokols, Allen & Bellingham, 1996). Thus, successful workplace health promotion programs, such as the

TCC, require the support of senior management, so that they can become part of the underlying fabric and culture of the organisation (Heaney & Goetzel, 1997). Research in this area suggests that program effects are more likely to be maintained if the workplace continues to support and reinforce health behaviours (Heaney & Goetzel, 1997). For this reason, it is hoped that the TCC program presented in this study is the first step in an ongoing intervention process to promote the wellbeing of Bunbury Centrelink Call Centre employees through increased physical activity.

Using knowledge acquired from this study, the Bunbury Centrelink Call Centre is in a position to tailor future efforts at increasing physical activity by employing stage-matched intervention methods. Research suggests that efforts to promote physical activity are typically more effective when tailored to a specific audience (Rosen, 2000). This is because target populations can be conceptualised as involving a heterogeneous mixture of individuals with different degrees of readiness to change. Understanding the distribution of the population along the stages of change not only provides estimates of the intention to adopt health promoting behaviours, but also enables stage-matched strategies to be developed for the entire population, not just those ready to change (Laforge et al., 1999). Assessment of the individual's readiness to change can provide additional information about the entire population's potential receptiveness for specific health promotion interventions. Furthermore, stage distribution patterns can provide critical information for longitudinal comparisons to determine the impact of policy changes, which is important form the organisation's point of view (Stokols et al., 1996).

Conclusion

Researchers currently understand more about factors linked to illness, disease and 'health-risking' behaviours than about preventative health behaviours like physical activity participation (DiClemente et al., 1992). The results of this study are important since critical application of the transtheoretical model contributes to the body of knowledge regarding health promotional behaviours, demonstrating the value of the model within a health promotion and illness prevention context (DiClemente et al., 1992). This study demonstrated that the TCC, a workplace physical activity intervention, influenced the physical activity behaviours of participants. Furthermore, the change in physical activity behaviours for participating employees may be described in theoretical terms, using the transtheoretical model, to enhance understanding of the behaviour change process within a physical activity context.

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Appendix A

Stages of Change for Physical Activity (Leonard, 2000)

Precontemplation

Action is not intended in the foreseeable future, generally measured as the next six months.

Example

"I don't regularly participate in physical activity, and I do not intend to start in the near future."

Contemplation

Individuals in this stage are intending to begin participation in physical activity in the next six months.

Example

"I don't regularly participate in physical activity but I have been thinking of starting."

Preparation

Individuals in this stage are intending to take action in the immediate future, usually measured as the next month. These individuals have a plan of action, such as joining a gym or buying a bike.

Example

"I am trying to participate in regular physical activity but do so infrequently."

Action

Individuals in this stage have made specific overt modifications in their lifestyle within the past 6 months, such as riding a bike daily to work.

Example

"I have been moderately physically active for at least 30 minutes, five times a week, or vigorously active for at least 20 minutes a day, three times a week, for the last 1-6 months."

Maintenance

Individuals in this stage are less tempted to relapse and are increasingly confident that they can continue their positive changes in physical activity participation.

Example

"I have been moderately physically active five or more times a week for at least 30 minutes a day, or vigorously active for 20 minutes a day, three times a week, for 7 months or more."

Appendix B

Bunbury Centrelink Call Centre Manager's Letter of Consent

Centrelink

Please Quote: PAIP
Telephone: [redacted]
Fax: [redacted]

Justine Goldspink
Honours Student
Edith Cowan University
South West Campus
Robertson Drive
Bunbury 6230

9 April 2002

Dear Justine,

Thank you for your presentation on the Physical Activity Intervention Program.

I am pleased to advise that our strategic team have given consideration to your proposal and find it will be of great benefit to our organisation in assisting in the reduction of stress and counterbalance the sedentary nature of the roles undertaken by our staff.

As such, I give approval for the project and understand and agree that the data collected will be used for research purposes.

You have the full commitment of the management team at Bunbury call centre and we will actively assist you to implement and manage the project.

I wish you success in this venture and look forward to reaping the benefits such a program can offer to our organisation.

Yours sincerely

[redacted]

Ron McLachlan
Call Centre Manager
Centrelink Call

Appendix C

Informed Consent for Take Charge Challenge Participants

INFORMED CONSENT

The physical activity intervention you are about to participate in is designed to help workplaces take action in getting individuals to set personal physical activity goals that benefit not only the individual but the organisation as a whole.

In this six week intervention you will be required to set personal goals for regular activity, ranging from moderate/vigorous activities like gardening and playing with children, to more intense ones like running and swimming. You record daily physical activity in 10-minute blocks of time, with the goal of being active for at least 30 minutes most days. It is hoped that this intervention will provide the impetus to either adopt a physical activity program, increase current physical activity levels, or to maintain adequate physical activity levels.

The intervention is being implemented by Justine Goldspink, honours student in Psychology and supervised by Genevieve Stone, Psychology lecturer and Physical Activity Coordinator for the South West Population Health Unit. This intervention program conforms to guidelines produced by the Edith Cowan University Committee for the Conduct of Ethical Research. The Faculty of Community Services, Education and Social Sciences Ethics Committee has approved the research. Data obtained from this study will remain the property of Edith Cowan University

Any information that you provide will be held in strict confidence. At no time will your name be reported along with your responses. At the conclusion of the study, a report of the results will be available upon request.

Please understand that your participation in this intervention is totally voluntary and you are free to withdraw at any time during the study, and to remove any data that you may have contributed. Any questions concerning this intervention may be directed to the Head of School, Dr Craig Speelman (9400 5724) or to Justine Goldspink [redacted] or e-mail jgoldspi@student.ecu.edu.au).

I (the participant) have read the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising that I may withdraw at any time. I agree that research data gathered for the study may be published, provided I am not identifiable. I also agree that the data I provide may be used for ongoing, follow-up research regarding physical activity interventions in the workplace.

Participant_____

Date_____

Student_____

Date_____

Informed Consent for Control Group Participants

INFORMED CONSENT

The physical activity intervention you are invited to participate in (to take place in six months time) is designed to help workplaces take action in getting individuals to set personal physical activity goals that benefit not only the individual but the organisation as a whole. Prior to the intervention some information regarding current physical activity level is required.

Obtaining the necessary information will require participants to complete three short (one page) surveys over a six-week period. You may complete the surveys and provide information even if you do not wish to participate in the proposed intervention. Furthermore, completing the surveys will not mean that you are obligated to participate in the proposed physical activity intervention. Any information you provide will be held in strict confidence. At no time will your name be reported along with your responses. At the conclusion of the study, a report of the results will be available upon request.

This data will be collected by Justine Goldspink, honours student in Psychology and supervised by Genevieve Stone, Psychology lecturer and Physical Activity Coordinator for the South West Population Health Unit. The intervention program conforms to the guidelines produced by the Edith Cowan University Committee for the Conduct of Ethical Research. The Faculty of Community Services, Education and Social Sciences Ethics Committee has approved the research. Data obtained from this study will remain the property of Edith Cowan University.

Please understand that providing this information is totally voluntary and you are free to withdraw at any time during the study, and to remove any data that you may have contributed. It is hoped that the information collected will enhance the implementation of the proposed physical activity intervention, thus maximising the potential benefits for participating employees.

Any questions concerning this intervention may be directed to the Head of School, Dr Craig Speelman (9400 5724) or Justine Goldspink [redacted] or e-mail jgoldspi@student.ecu.edu.au.).

I (the participant) have read the information above and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realising that I may withdraw at any time. I agree that research data gathered for the study may be published, provided I am not identifiable. I also agree that the data I provide may be used for ongoing, follow-up research regarding physical activity interventions in the workplace.

Participant _____

Date _____

Student_____

Date _____

Appendix D

Take Charge Challenge Forms and Materials (Leonard, 2000)

Goal Setting Worksheet

This simple worksheet can help you to set your personal point goal for the Take Charge Challenge. As you complete the worksheet below, consider how much physical activity you have in your daily life now and how much you think you will have at the end of the 6 weeks. Be sure to set a personal goal that is reasonable and achievable in the 6- week program.

Goal setting and record keeping are useful and necessary in changing and maintaining new behaviours. Challenge yourself enough so that you will notice positive changes, but not so much that it is impossible to accomplish your goal. Allow for brief times when you may not be as active as you'd like due to illness, work or personal time conflicts, or other unexpected events. Plan for success on the front end.

Over the 6 weeks of the Take Charge Challenge…

1. How many days per week do you expect to engage in moderate/vigorous physical activity? _____days.

2. How many minuets of moderate/vigorous physical activity do you expect to complete, on average, on the days that you are active? _____ minutes.

3. Multiply the number in Question 1 by you response in Question 2.
This provides your weekly goal in minutes_____

4. Divide your answer in Question 3 by 10 minutes to get your point total for the week
_____ weekly points.

5. How many of the 6 weeks do you expect to achieve your weekly goal?
_____weeks.

6. Multiply your weekly points (Answer to Q4) by the number of weeks in Question 5. This provides your final point goal total (Week 6).
_____POINT TOTAL.

7. Divide your answer in Question 6 by 2 to give your midway (Week 3) goal total.
_____ Mid-way POINT TOTAL.

Please report the mid-way and final point goal totals to your Team Captain before 10.00am on the 5th of July. If you meet or exceed these goals throughout the six weeks you are eligible for a prize!

Good luck with the Take Charge Challenge!

Personal Activity Log

Please fill out this form each day that you participate in physical activity over the next 6 weeks.

Participant Name_____

Team Captain_____

Record your minutes of physical activity each day.

P= points (10 minutes of moderate physical activity = 1 POINT)

Total Point goal that you set for the 6 weeks_____

Week	Saturday	Sunday	Monday	Tuesday	Weds.	Thurs.	Friday
1							
2							
3							
4							
5							
6							

Total minutes of physical activity accumulated for Week 1_____

Total minutes of physical activity accumulated for Week 2 _____

Total minutes of physical activity accumulated for Week 3 _____

Total minutes of physical activity accumulated for Week 4_____

Total minutes of physical activity accumulated for Week 5_____

Total minutes of physical activity accumulated for Week 6_____

Grand total of minutes of physical activity accumulated up to Week 3 (mid-way)_____

Grand Total of minutes of physical activity accumulated (up to Week 6)
_____

Report Week 3 and Week 6 grand totals to your Team Captain by 10.00am on Friday the 19/07/02 and 09/08/02

If these totals meet or exceed your set goals you are eligible for a prize!

Take Charge Challenge Registration and Survey

Name: _____

Team Captain: _____

Point goal (from goal-setting worksheet)_____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last seven days (week one of the TCC) _____ minutes.

Mid-way Take Charge Challenge Survey

Name: _____

Team Captain: _____

Mid-way point goal (from goal-setting worksheet)_____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last seven days (week three of the TCC) _____ minutes.

Final Take Charge Challenge Survey

Name: _____

Team Captain: _____

Final point goal (from goal-setting worksheet)_____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last seven days (week six of the TCC) _____ minutes.

Physical Activity Survey- Week 1

Name: _____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last week _____ minutes.

Physical Activity Survey- Week 3

Name: _____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last week _____ minutes.

Physical Activity Survey- Week 6

Name: _____

Please read the six statements below. Circle the number of the one statement that best describes your current level of physical activity.

'Vigorous' physical activity includes activities like jogging, running, cycling, aerobics, swimming, tennis and squash. Count any activity that makes you work as hard as jogging and lasts at least 20 minutes at a time. These types of activities usually increase your heart rate, make you sweat and make you feel out of breath.

'Moderate' exercise includes activities such as brisk walking, gardening, dancing, playing with children or hard work around the house. Count any activity that makes you work as hard as brisk walking and lasts at least 5-10 minutes at a time.

Current Physical Activity Status

1. **I don't exercise or walk regularly now, and I do not intend to start in the near future.**
2. **I do not exercise or walk regularly, but I have been thinking of starting.**
3. **I am trying to start to exercise or walk or I exercise or walk infrequently.**
4. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for the last 1-6 months.**
5. **I have been doing 30 minutes of moderate physical activity 5 or more times a week, or 20 minutes of vigorous activity at least 3 times a week, for 7 months or longer.**

For the seven day week just gone, please indicate the amount of time you spent participating in moderate physical activity (tally the amount of time spent each day ie. 20 minutes on Monday, 10 minutes on Tuesday, none on Wednesday, 35 minutes on Thursday etc.)

Total time spent (in minutes) participating in moderate physical activity during the last week _____ minutes.

Take Charge Team Captain Summary Report

Team Name: _____

Team Captain' s Name: _____

As Team captain you have special duties. Please collect the Take Charge Challenge Survey Forms from the members of your team before the Friday of Week 1, Week 3 and Week 6 of the Wellness Program. These Survey Forms will help you to fill out the columns asking what number each participant circled on their survey. The Survey Forms will be collected from you once you have filled out the necessary columns of your Team Summary Report.

By collecting each team member's Goal Setting Worksheet you will have the information needed to fill out the columns representing midway and final point goals. At the end of Week 3 and Week 6 (you will be given two copies of the same form-fill out both) you will need to find out which team members actually met their goals. Hand one copy of the form in on Friday 19/07/02 before 10.00 am. Hold on to the second copy and fill in the additional information for Week 6. Hand this second copy in on Friday 09/08/02 before 10.00 am. Team members who reached or exceeded their mid-way and final physical activity goals are eligible for prizes! There is also a team prize for the highest team goal attainment.

Thank you.

	Name	No. circled Week 1	Mid-way goal	Mid-way points	No. circled Week 3	Final goal	Final points	No. circled Week 6
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								

Appendix E

Raw Data and SPSS Output: Physical Activity

	subject	group	w1stage	w1physa	w3stage	w3physa	w6stage	w6physa
1	1	1	3	44.00	3	370.00	3	450.00
2	2	1	3	180.00	3	175.00	3	180.00
3	3	1	3	300.00	3	225.00	3	150.00
4	4	1	3	420.00	3	420.00	3	420.00
5	5	1	3	360.00	3	380.00	3	420.00
6	6	1	3	180.00	3	180.00	3	180.00
7	7	1	2	100.00	2	97.00	3	180.00
8	8	1	1	360.00	2	160.00	2	200.00
9	9	1	2	130.00	2	120.00	2	126.00
10	10	1	3	300.00	3	297.00	3	300.00
11	11	1	1	60.00	1	195.00	1	330.00
12	12	1	3	380.00	3	380.00	3	370.00
13	13	1	2	90.00	2	84.00	2	92.00
14	14	1	1	5.00	2	10.00	1	5.00
15	15	1	2	120.00	2	40.00	2	40.00
16	16	1	1	30.00	1	26.00	1	32.00
17	17	1	3	270.00	3	200.00	3	235.00
18	18	1	3	480.00	3	480.00	3	180.00
19	19	1	2	150.00	3	210.00	3	180.00
20	20	1	2	78.00	2	80.00	3	79.00
21	21	1	2	215.00	2	220.00	2	120.00
22	22	1	2	195.00	2	195.00	2	215.00
23	23	1	2	280.00	2	120.00	2	120.00
24	24	1	3	300.00	3	300.00	3	300.00
25	25	1	3	420.00	3	400.00	3	420.00
26	26	1	3	240.00	3	180.00	2	180.00
27	27	1	2	120.00	2	70.00	2	120.00
28	28	2	2	126.00	2	132.00	2	454.00
29	29	2	2	115.00	2	124.00	2	124.00
30	30	2	1	72.00	2	80.00	2	84.00
31	31	2	1	63.00	2	89.00	2	183.00
32	32	2	2	89.00	2	157.00	2	367.00
33	33	2	3	126.00	3	140.00	3	292.00
34	34	2	3	120.00	3	126.00	3	261.00
35	35	2	2	22.50	2	30.00	2	36.00
36	36	2	1	54.00	1	44.00	2	108.00
37	37	2	2	36.00	2	34.00	2	38.00
38	38	2	2	54.00	3	64.00	3	65.00
39	39	2	1	27.00	2	93.00	2	135.00
40	40	2	1	36.00	2	48.00	2	140.00

	subject	group	w1stage	w1physa	w3stage	w3physa	w6stage	w6physa
41	41	2	1	9.00	2	27.00	2	36.00
42	42	2	2	63.00	3	155.00	3	305.00
43	43	2	1	20.00	2	27.00	2	29.50
44	44	2	2	72.00	2	85.00	2	167.00
45	45	2	2	101.00	2	112.00	2	115.00
46	46	2	2	77.00	2	80.00	2	83.00
47	47	2	2	20.00	2	57.00	2	100.00
48	48	2	1	30.00	2	35.00	2	43.00
49	49	2	3	63.00	2	114.00	3	126.00
50	50	2	3	202.00	3	87.00	3	167.00
51	51	2	2	48.00	3	53.00	3	120.00
52	52	2	3	126.00	3	171.50	3	342.00
53	53	2	2	29.00	2	33.00	2	37.00
54	54	2	2	36.00	2	52.00	2	119.00
55	55	2	2	45.00	2	45.00	2	45.00
56	56	2	2	108.00	3	156.00	2	216.00
57	57	2	2	58.00	2	64.00	2	68.00
58	58	2	2	29.00	2	37.00	2	40.00
59	59	2	3	140.00	3	146.00	3	150.00
60	60	2	3	72.00	3	179.00	3	375.00
61	61	2	2	80.00	2	112.50	2	210.00
62	62	2	3	90.00	3	326.00	3	572.00
63	63	2	2	38.00	2	14.00	2	26.00
64	64	2	2	12.00	2	42.00	2	112.00
65	65	2	2	72.00	3	99.00	3	99.00
66	66	2	2	27.00	3	27.00	3	36.00
67	67	2	3	67.50	3	116.00	3	239.00
68	68	2	3	30.00	3	46.00	3	60.00
69	69	2	3	126.00	3	126.00	3	270.00
70	70	2	2	27.00	2	56.00	2	87.00
71	71	2	1	58.00	2	87.50	2	219.50
72	72	2	2	48.00	2	67.00	2	153.00
73	73	2	2	18.00	2	52.00	2	60.00
74	74	2	2	40.50	3	65.00	3	149.00
75	75	2	2	48.00	2	48.00	2	48.00
76	76	2	2	54.00	2	46.00	3	102.00
77	77	2	2	54.00	3	87.00	3	272.50
78	78	2	3	90.00	3	141.00	3	400.00
79	79	2	1	5.00	1	11.00	1	19.00
80	80	2	3	108.00	3	223.00	3	235.00

	subject	group	w1stage	w1physa	w3stage	w3physa	w6stage	w6physa
81	81	2	1	29.00	2	34.00	2	40.00
82	82	2	2	54.00	3	73.00	3	126.00
83	83	2	2	36.00	2	38.00	2	42.00
84	84	2	3	90.00	3	99.00	3	197.00
85	85	2	2	54.00	2	54.00	2	54.00
86	86	2	2	60.00	2	63.50	3	70.00
87	87	2	1	45.00	2	35.00	2	40.00
88	88	2	2	60.00	2	67.00	1	129.00
89	89	2	1	7.00	2	10.00	2	19.00
90	90	2	3	27.00	3	42.00	3	45.00
91	91	2	2	89.00	2	144.00	2	288.00
92	92	2	1	10.00	2	13.00	2	50.00
93	93	2	2	48.00	2	53.00	2	60.00
94	94	2	3	105.00	3	103.00	3	210.00
95	95	2	2	20.00	2	27.00	2	63.00
96	96	2	1	35.00	2	65.00	2	106.00
97	97	2	2	40.00	2	45.00	2	90.00
98	98	2	2	60.00	3	63.00	2	130.00
99	99	2	2	24.00	2	72.00	2	165.00
100	100	2	2	112.00	2	151.00	3	411.00
101	101	2	2	19.00	2	37.00	3	45.00
102	102	2	1	18.00	2	18.00	2	36.00
103	103	2	1	22.50	1	31.00	2	49.00
104	104	2	2	45.00	2	124.00	2	270.00
105	105	2	1	36.00	2	99.00	2	72.00
106	106	2	1	27.00	1	27.00	2	54.00
107	107	2	2	34.00	3	90.00	3	100.00
108	108	2	2	33.00	3	66.00	3	99.00
109	109	2	2	16.00	2	46.00	2	90.00

Variable Key

Group; 1 = control group, 2 = intervention group

Stage of Change (w1stage, w3stage, w6stage); 1 = Precontemplation/Contemplation, 2 = Preparation, 3 = Action/Maintenance

Physical Activity (w1physa, w3physa, w6physa); minutes per week spent engaging in physical activity.

Case Processing Summary

	Group	Cases			
		Missing		Total	
		N	Percent	N	Percent
Physical activity particpation in minutes-week 1	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%
Physical activity participation in minutes-week 3	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%
Physical activity participation in minutes-week 6	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%

Descriptives

	Group			Statistic	Std. Error
Physical activity particpation in minutes-week 1	control group	Mean		215.0741	25.7276
		95% Confidence Interval for Mean	Lower Bound	162.1903	
			Upper Bound	267.9579	
		5% Trimmed Mean		212.5309	
		Median		195.0000	
		Variance		17871.533	
		Std. Deviation		133.6845	
		Minimum		5.00	
		Maximum		480.00	
		Range		475.00	
		Interquartile Range		200.0000	
		Skewness		.271	.448
		Kurtosis		-.979	.872
	intervention group	Mean		56.5488	4.1330
		95% Confidence Interval for Mean	Lower Bound	48.3255	
			Upper Bound	64.7721	
		5% Trimmed Mean		54.1762	
		Median		48.0000	
		Variance		1400.670	
		Std. Deviation		37.4255	
		Minimum		5.00	
		Maximum		202.00	
		Range		197.00	
		Interquartile Range		44.7500	
		Skewness		1.192	.266
		Kurtosis		1.699	.526
Physical activity participation in minutes-week 3	control group	Mean		207.9259	25.1081
		95% Confidence Interval for Mean	Lower Bound	156.3154	
			Upper Bound	259.5364	
		5% Trimmed Mean		204.4403	
		Median		195.0000	
		Variance		17021.302	
		Std. Deviation		130.4657	
		Minimum		10.00	
		Maximum		480.00	
		Range		470.00	
		Interquartile Range		203.0000	
		Skewness		.461	.448
		Kurtosis		-.702	.872
	intervention group	Mean		78.7561	5.8975

Descriptives

	Group			Statistic	Std. Error
Physical activity participation in minutes-week 3	intervention group	95% Confidence Interval for Mean	Lower Bound	67.0219	
			Upper Bound	90.4903	
		5% Trimmed Mean		74.4309	
		Median		64.5000	
		Variance		2852.014	
		Std. Deviation		53.4042	
		Minimum		10.00	
		Maximum		326.00	
		Range		316.00	
		Interquartile Range		71.1250	
		Skewness		1.661	.266
		Kurtosis		4.673	.526
Physical activity participation in minutes-week 6	control group	Mean		208.2963	24.4839
		95% Confidence Interval for Mean	Lower Bound	157.9689	
			Upper Bound	258.6237	
		5% Trimmed Mean		206.2058	
		Median		180.0000	
		Variance		16185.447	
		Std. Deviation		127.2220	
		Minimum		5.00	
		Maximum		450.00	
		Range		445.00	
		Interquartile Range		180.0000	
		Skewness		.501	.448
		Kurtosis		-.667	.872
	intervention group	Mean		140.1159	12.6792
		95% Confidence Interval for Mean	Lower Bound	114.8883	
			Upper Bound	165.3434	
		5% Trimmed Mean		128.9688	
		Median		104.0000	
		Variance		13182.440	
		Std. Deviation		114.8148	
		Minimum		19.00	
		Maximum		572.00	
		Range		553.00	
		Interquartile Range		150.5000	
		Skewness		1.475	.266
		Kurtosis		2.070	.526

Tests of Normality

		Kolmogorov-Smirnov[a]		
	Group	Statistic	df	Sig.
Physical activity particpation in minutes-week 1	control group	.108	27	.200*
	intervention group	.127	82	.002
Physical activity participation in minutes-week 3	control group	.152	27	.113
	intervention group	.148	82	.000
Physical activity participation in	control group	.181	27	.024
	intervention group	.169	82	.000

		Shapiro-Wilk		
	Group	Statistic	df	Sig.
Physical activity particpation in minutes-week 1	control group	.959	27	.424
	intervention group			
Physical activity participation in minutes-week 3	control group	.945	27	.228
	intervention group			
Physical activity participation in	control group	.930	27	.079
	intervention group			

*. This is a lower bound of the true significance

a. Lilliefors Significance Correction

Group

Case Processing Summary

		Cases	
		Valid	
	Group	N	Percent
Week 1 stage of change	control group	27	100.0%
	intervention group	82	100.0%
Week 3 stage of change	control group	27	100.0%
	intervention group	82	100.0%
Week 6 stage of change	control group	27	100.0%
	intervention group	82	100.0%

Case Processing Summary

		Cases			
		Missing		Total	
	Group	N	Percent	N	Percent
Week 1 stage of change	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%
Week 3 stage of change	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%
Week 6 stage of change	control group	0	.0%	27	100.0%
	intervention group	0	.0%	82	100.0%

Descriptives

	Group			Statistic
Week 1 stage of change	control group	Mean		2.33
		95% Confidence Interval for Mean	Lower Bound	2.04
			Upper Bound	2.62
		5% Trimmed Mean		2.37
		Median		2.00
		Variance		.538
		Std. Deviation		.73
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		1.00
		Skewness		-.631
		Kurtosis		-.817
	intervention group	Mean		1.96
		95% Confidence Interval for Mean	Lower Bound	1.82
			Upper Bound	2.11
		5% Trimmed Mean		1.96
		Median		2.00
		Variance		.431
		Std. Deviation		.66
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		.00
		Skewness		.037
		Kurtosis		-.618
Week 3 stage of change	control group	Mean		2.44
		95% Confidence Interval for Mean	Lower Bound	2.19
			Upper Bound	2.70
		5% Trimmed Mean		2.49
		Median		3.00
		Variance		.410
		Std. Deviation		.64
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		1.00
		Skewness		-.726
		Kurtosis		-.366
	intervention group	Mean		2.28
		95% Confidence Interval for Mean	Lower Bound	2.16
			Upper Bound	2.40
		5% Trimmed Mean		2.31
		Median		2.00
		Variance		.303
		Std. Deviation		.55
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		1.00
		Skewness		.040
		Kurtosis		-.465

Descriptives

	Group			Statistic
Week 6 stage of change	control group	Mean		2.44
		95% Confidence Interval for Mean	Lower Bound	2.17
			Upper Bound	2.72
		5% Trimmed Mean		2.49
		Median		3.00
		Variance		.487
		Std. Deviation		.70
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		1.00
		Skewness		-.887
		Kurtosis		-.350
	intervention group	Mean		2.34
		95% Confidence Interval for Mean	Lower Bound	2.23
			Upper Bound	2.46
		5% Trimmed Mean		2.35
		Median		2.00
		Variance		.277
		Std. Deviation		.53
		Minimum		1
		Maximum		3
		Range		2
		Interquartile Range		1.00
		Skewness		.152
		Kurtosis		-.897

Descriptives

	Group			Std. Error
Week 1 stage of change	control group	Mean		.14
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.448
		Kurtosis		.872
	intervention group	Mean		7.25E-02
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.266
		Kurtosis		.526
Week 3 stage of change	control group	Mean		.12
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.448
		Kurtosis		.872
	intervention group	Mean		6.08E-02
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.266
		Kurtosis		.526

Descriptives

	Group			Std. Error
Week 6 stage of change	control group	Mean		.13
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.448
		Kurtosis		.872
	intervention group	Mean		5.81E-02
		95% Confidence Interval for Mean	Lower Bound	
			Upper Bound	
		5% Trimmed Mean		
		Median		
		Variance		
		Std. Deviation		
		Minimum		
		Maximum		
		Range		
		Interquartile Range		
		Skewness		.266
		Kurtosis		.526

Tests of Normality

		Kolmogorov-Smirnov[a]		
	Group	Statistic	df	Sig.
Week 1 stage of change	control group	.300	27	.000
	intervention group	.291	82	.000
Week 3 stage of change	control group	.326	27	.000
	intervention group	.366	82	.000
Week 6 stage of change	control group	.343	27	.000
	intervention group	.376	82	.000

General Linear Model

Within-Subjects Factors

Measure: MEASURE_1

TIME	Dependent Variable
1	W1PHYSAC
2	W3PHYSAC
3	W6PHYSAC

Between-Subjects Factors

		Value Label	N
Group	1	control group	27
	2	intervention group	82

Descriptive Statistics

	Group	Mean	Std. Deviation	N
Physical activity particpation in minutes-week 1	control group	215.0741	133.6845	27
	intervention group	56.5488	37.4255	82
	Total	95.8165	100.3954	109
Physical activity participation in minutes-week 3	control group	207.9259	130.4657	27
	intervention group	78.7561	53.4042	82
	Total	110.7523	96.8231	109
Physical activity participation in minutes-week 6	control group	208.2963	127.2220	27
	intervention group	140.1159	114.8148	82
	Total	157.0046	121.0686	109

Box's Test of Equality of Covariance Matrices[a]

Box's M	149.121
F	23.727
df1	6
df2	14377.093
Sig.	.000

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept+GROUP
Within Subjects Design: TIME

Multivariate Tests[c]

Effect		Value	F	Hypothesis df	Error df	Sig.
TIME	Pillai's Trace	.118	7.094[b]	2.000	106.000	.001
	Wilks' Lambda	.882	7.094[b]	2.000	106.000	.001
	Hotelling's Trace	.134	7.094[b]	2.000	106.000	.001
	Roy's Largest Root	.134	7.094[b]	2.000	106.000	.001
TIME * GROUP	Pillai's Trace	.128	7.806[b]	2.000	106.000	.001
	Wilks' Lambda	.872	7.806[b]	2.000	106.000	.001
	Hotelling's Trace	.147	7.806[b]	2.000	106.000	.001
	Roy's Largest Root	.147	7.806[b]	2.000	106.000	.001

Multivariate Tests[c]

Effect		Eta Squared	Noncent. Parameter	Observed Power[a]
TIME	Pillai's Trace	.118	14.187	.924
	Wilks' Lambda	.118	14.187	.924
	Hotelling's Trace	.118	14.187	.924
	Roy's Largest Root	.118	14.187	.924
TIME * GROUP	Pillai's Trace	.128	15.612	.946
	Wilks' Lambda	.128	15.612	.946
	Hotelling's Trace	.128	15.612	.946
	Roy's Largest Root	.128	15.612	.946

a. Computed using alpha = .05

b. Exact statistic

c.
Design: Intercept+GROUP
Within Subjects Design: TIME

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.
TIME	.492	75.086	2	.000

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

Mauchly's Test of Sphericity[b]

Measure: MEASURE_1

Within Subjects Effect	Epsilon[a]		
	Greenhouse -Geisser	Huynh-Feldt	Lower-bound
TIME	.663	.675	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed the Tests of Within-Subjects Effects table.

b.
Design: Intercept+GROUP
Within Subjects Design: TIME

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Sphericity Assumed	67259.444	2	33629.722	10.359	.000
	Greenhouse-Geisser	67259.444	1.327	50698.400	10.359	.001
	Huynh-Feldt	67259.444	1.349	49840.423	10.359	.000
	Lower-bound	67259.444	1.000	67259.444	10.359	.002
TIME * GROUP	Sphericity Assumed	86282.631	2	43141.315	13.288	.000
	Greenhouse-Geisser	86282.631	1.327	65037.578	13.288	.000
	Huynh-Feldt	86282.631	1.349	63936.937	13.288	.000
	Lower-bound	86282.631	1.000	86282.631	13.288	.000
Error(TIME)	Sphericity Assumed	694758.621	214	3246.536		
	Greenhouse-Geisser	694758.621	141.952	4894.306		
	Huynh-Feldt	694758.621	144.396	4811.479		
	Lower-bound	694758.621	107.000	6493.071		

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Eta Squared	Noncent. Parameter	Observed Power[a]
TIME	Sphericity Assumed	.088	20.717	.987
	Greenhouse-Geisser	.088	13.742	.944
	Huynh-Feldt	.088	13.979	.947
	Lower-bound	.088	10.359	.891
TIME * GROUP	Sphericity Assumed	.110	26.577	.998
	Greenhouse-Geisser	.110	17.629	.981
	Huynh-Feldt	.110	17.933	.982
	Lower-bound	.110	13.288	.951
Error(TIME)	Sphericity Assumed			
	Greenhouse-Geisser			
	Huynh-Feldt			
	Lower-bound			

a. Computed using alpha = .05

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	TIME	Type III Sum of Squares	df	Mean Square	F	Sig.
TIME	Linear	59885.611	1	59885.611	10.959	.001
	Quadratic	7373.833	1	7373.833	7.169	.009
TIME * GROUP	Linear	82894.923	1	82894.923	15.170	.000
	Quadratic	3387.708	1	3387.708	3.294	.072
Error(TIME)	Linear	584709.024	107	5464.570		
	Quadratic	.110049.598	107	1028.501		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	TIME	Eta Squared	Noncent. Parameter	Observed Power[a]
TIME	Linear	.093	10.959	.907
	Quadratic	.063	7.169	.756
TIME * GROUP	Linear	.124	15.170	.971
	Quadratic	.030	3.294	.436
Error(TIME)	Linear			
	Quadratic			

a. Computed using alpha = .05

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
Physical activity particpation in minutes-week 1	94.894	1	107	.000
Physical activity participation in minutes-week 3	34.121	1	107	.000
Physical activity participation in minutes-week 6	.726	1	107	.396

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a.
Design: Intercept+GROUP
Within Subjects Design: TIME

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Intercept	5566387.132	1	5566387.132	291.174	.000	.731
GROUP	857484.349	1	857484.349	44.854	.000	.295
Error	2045521.788	107	19117.026			

Tests of Between-Subjects Effects

Measure: MEASURE_1
Transformed Variable: Average

Source	Noncent. Parameter	Observed Power[a]
Intercept	291.174	1.000
GROUP	44.854	1.000
Error		

a. Computed using alpha = .05

Estimated Marginal Means

1. Grand Mean

Measure: MEASURE_1

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
151.120	8.856	133.563	168.676

2. Group

Estimates

Measure: MEASURE_1

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
control group	210.432	15.363	179.977	240.887
intervention group	91.807	8.815	74.331	109.282

Pairwise Comparisons

Measure: MEASURE_1

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[a]
control group	intervention group	118.625*	17.712	.000
intervention group	control group	-118.625*	17.712	.000

Based on estimated marginal means

Pairwise Comparisons

Measure: MEASURE_1

(I) Group	(J) Group	95% Confidence Interval for Difference[a]	
		Lower Bound	Upper Bound
control group	intervention group	83.513	153.738
intervention group	control group	-153.738	-83.513

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.	Eta Squared
Contrast	285828.12	1	285828.116	44.854	.000	.295
Error	681840.60	107	6372.342			

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

Univariate Tests

Measure: MEASURE_1

	Noncent. Parameter	Observed Power[a]
Contrast	44.854	1.000
Error		

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha = .05

3. TIME

Estimates

Measure: MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	135.811	8.155	119.646	151.977
2	143.341	8.802	125.892	160.790
3	174.206	13.086	148.266	200.147

Pairwise Comparisons

Measure: MEASURE_1

(I) TIME	(J) TIME	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1	2	-7.530	6.216	.685	-22.648	7.589
	3	-38.395*	11.598	.004	-66.604	-10.186
2	1	7.530	6.216	.685	-7.589	22.648
	3	-30.865*	8.161	.001	-50.713	-11.017
3	1	38.395*	11.598	.004	10.186	66.604
	2	30.865*	8.161	.001	11.017	50.713

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

a. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Eta Squared
Pillai's trace	.118	7.094[b]	2.000	106.000	.001	.118
Wilks' lambda	.882	7.094[b]	2.000	106.000	.001	.118
Hotelling's trace	.134	7.094[b]	2.000	106.000	.001	.118
Roy's largest root	.134	7.094[b]	2.000	106.000	.001	.118

Each F tests the multivariate effect of TIME. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

Multivariate Tests

	Noncent. Parameter	Observed Power[a]
Pillai's trace	14.187	.924
Wilks' lambda	14.187	.924
Hotelling's trace	14.187	.924
Roy's largest root	14.187	.924

Each F tests the multivariate effect of TIME. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Computed using alpha = .05

b. Exact statistic

4. Group * TIME

Measure: MEASURE_1

Group	TIME	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
control group	1	215.074	14.146	187.031	243.117
	2	207.926	15.269	177.656	238.195
	3	208.296	22.699	163.297	253.295
intervention group	1	56.549	8.117	40.457	72.640
	2	78.756	8.762	61.387	96.125
	3	140.116	13.025	114.295	165.937

Appendix F

Tukey's Post Hoc Tests: Physical Activity

See Howell (1997, p.377) for the Post Hoc Formula employed to evaluate the differences in physical activity between the control and intervention groups at week one, week three and week six.

Post Hoc Formula

$$q = \frac{\bar{X}_i - \bar{X}_j}{\sqrt{\frac{MS_{error}}{n}}}$$

Note: MS_{error} (Huynh-Feldt) = 4811.479

MS_{error} df = 144.396

Time of Test df = 1.349

Harmonic mean = 40.624

Harmonic Mean Formula (Howell, 1997, p.222)

$$\tilde{n} = \frac{K}{1/n_A + 1/n_B + 1/n_K}$$

Note: the harmonic mean is calculated when the number of cases is not the same for both samples.

Ordered Means

Control group's physical activity- week 1= 215.074

Control group's physical activity- week 6= 208.296

Control group's physical activity - week 3= 207.926

Intervention group's physical activity - week 6 = 140.116

Intervention group's physical activity- week 3= 78.756

Intervention group's physical activity- week 1 = 56.549

1. Comparison: control group's physical activity- week one, versus control group's physical activity- week six (No. steps = 2).

$$q = \frac{215.074 - 208.296}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{6.78}{\sqrt{10.88}}$$

$q = 0.623$

From tables (Howell, 1997, p.680-681), $q_{crit} = 2.77$

$q_{obs} < q_{crit}$ therefore comparison is non-significant.

There is no significant difference between the control group's levels of physical activity at week one compared to week six.

2. Comparison: control group's physical activity - week one, versus control group's physical activity - week three (No. steps= 3).

$$q = \frac{215.074 - 207.926}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{7.148}{10.883}$$

$q = 0.657$

From tables, $q_{crit} = 3.31$

$q_{obs} < q_{crit}$, therefore comparison is non-significant.

There is no significant difference between the control group's physical activity levels at week one compared to week three.

3. Comparison: control group's physical activity - week one, versus the intervention group's physical activity - week six (No. steps=4).

$$q = \frac{215.074 - 140.116}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{74.958}{10.883}$$

$q = 6.888$

From tables, $q_{crit} = 3.63$

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's levels of physical activity at week one compared to the intervention group's physical activity at week six.

4. Comparison: control group's physical activity - week one, versus the intervention group's physical activity - week three (No. steps=5).

$$q = \frac{215.074 - 78.756}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{136.318}{10.883}$$

$$q = 12.526$$

From tables, $q_{crit} = 3.86$

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week one compared to the intervention group's physical activity at week three.

5. Comparison: control group's physical activity- week one, versus the intervention group's physical activity -week one (No. steps = six).

$$q = \frac{215.074 - 56.549}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{158.525}{10.883}$$

$$q = 14.566$$

From tables, q_{crit}= 4.03

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week one compared to the intervention group's physical activity at week one.

6. Comparison: control group's physical activity - week six, versus physical activity- week three (No. steps is 2).

$$q = \frac{208.296 - 207.926}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{0.37}{\sqrt{10.833}}$$

q= 0.034

From tables, q_{crit}= 2.77

$q_{obs} < q_{crit}$, therefore comparison is non-significant.

There is no significant difference between the control group's physical activity levels at week three as compared to physical activity levels at week six.

7. Comparison: control group's physical activity- week six, versus the intervention group's physical activity- week six (No. steps =3).

$$q = \frac{208.2963 - 140.116}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{68.180}{\sqrt{10.883}}$$

q= 6.265

From tables, q_{crit}=3.31

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week six and the intervention group's physical activity at week six.

8. Comparison: control group's physical activity- week six, versus the intervention group's physical activity- week three (No. steps = 4).

q= 208.296-78.756

$$\sqrt{\frac{4811.479}{40.624}}$$

q= 129.540

10.883

q= 11.903

From tables, q_{crit}= 3.63

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week six and the intervention group's physical activity at week three.

9. Comparison: control group's physical activity- week six, versus the intervention group's physical activity - week one (No. steps = 5).

q= 208.296-56.549

$$\sqrt{\frac{4811.479}{40.624}}$$

q= 151.747

10.883

q =13.944

From tables, q_{crit}= 3.86

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week six and the intervention group's physical activity at week one.

10. Comparison: control group's physical activity - week three, versus the intervention group's physical activity- week six (No. steps= 2).

$$q = \frac{207.926 - 140.116}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{67.810}{\sqrt{10.883}}$$

q= 6.230

From tables, q_{crit} = 2.77

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week three and the intervention group's physical activity at week six.

11. Comparison: control group's physical activity- week three, versus the intervention group's physical activity- week three (No. steps= 3).

$$q = \frac{207.926 - 78.756}{\sqrt{\frac{4811.479}{40.624}}}$$

$q = \frac{129.1699}{10.883}$

$q = 11.869$

From tables, $q_{crit} = 3.31$

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the control group's physical activity levels at week three and the intervention group's physical activity at week three.

12. Comparison: control group's physical activity- week three, versus the intervention group's physical activity - week one.

$q = \frac{207.926-56.549}{\sqrt{\frac{4811.479}{40.624}}}$

$q = \frac{151.377}{10.883}$

$q = 13.909$

From tables, $q_{crit} = 3.63$

$q_{obs} > q_{crit}$, therefore comparison is significant

There is a significant difference between the control group's physical activity levels at week three and the intervention group's physical activity at week one.

13. Comparison: Intervention group's physical activity - week six, versus the intervention group's physical activity -week three (No. steps = 2).

$$q = \frac{140.116 - 78.756}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{61.36}{\sqrt{10.883}}$$

$q = 5.638$

From tables, $q_{crit} = 2.77$

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the intervention group's physical activity levels at week 3 as compared to week six.

14. Comparison: Intervention group's physical activity- week six, versus physical activity- week one (No. steps = 3).

$$q = \frac{140.116 - 56.549}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{61.36}{\sqrt{10.883}}$$

$q = 7.679$

From tables, $q_{crit} = 3.31$

$q_{obs} > q_{crit}$, therefore comparison is significant.

There is a significant difference between the intervention group's physical activity levels at week one as compared to week six.

15. Comparison: Intervention group's physical activity- week three, versus physical activity -week one (No. steps= 2).

$$q = \frac{78.756 - 56.549}{\sqrt{\frac{4811.479}{40.624}}}$$

$$q = \frac{22.207}{\sqrt{10.883}}$$

$q = 2.041$

$q_{obs} < q_{crit}$, therefore comparison is non-significant.

There is no significant difference between the intervention group's physical activity levels at week one as compared to week three.

Appendix G

Chi Square Analyses: Stage of Change Movement

Intervention Group

Week	precontemplation/ contemplation	preparation	action	row*f*
1	8.333	49.333	24.333	82
3	8.333	49.333	24.333	82
6	8.333	49.333	24.333	82
column*f*	25	148	73	246

$$E = \frac{f_{row} f_{col}}{N}$$

Chi Square Formula (Hills, 1995,p.109)

$$\chi^2 = \frac{\sum (O-E)^2}{E}$$

Cell	Observed frequency (O)	Expected Frequency (E)	$O-E$	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Week 1 PreC/Contemp.	19	8.333	10.667	113.778	13.653
Week 1 Preparation	47	49.333	-2.333	5.444	0.1104
Week 1 Action/Main.	16	24.333	-8.333	69.444	2.854
Week 3 PreC/Contemp.	4	8.333	-4.333	18.777	2.253
Week 3 Preparation	51	49.333	1.666	2.777	0.056
Week 3 Action/Main.	27	24.333	2.666	7.111	0.292
Week 6 PreC/Contemp.	2	8.333	-6.333	40.111	4.813
Week 6 Preparation	50	49.333	0.666	0.444	0.001
Week 6 Action/Main.	30	24.333	5.666	32.111	1.320
$\sum$	246	246			$X^2 = 25.352$

df= $(r-1)(c-1)$

$= 4$

Critical $X^2 = 9.490$

Observed $X^2 = 25.352$

H_o: There is no relationship between the week of the intervention and the stage of change distribution of intervention participants.

H_1: There is a relationship between week of the intervention and the stage of change distribution of intervention participants.

Retain H_o if observed $X^2 <$ critical X^2

Reject H_o if observed $X^2 \geq$ critical X^2

Observed X^2, 25.352> Critical X^2, 9.490

Therefore, reject H_o, and accept H_1, there is a relationship between the week of the intervention and the stage of change distribution of intervention participants.

Control Group

Week	precontemplation/ contemplation	preparation	action	row*f*
1	3	10	14	27
3	3	10	14	27
6	3	10	14	27
column*f*	9	30	42	81

Cell	Observed frequency (*O*)	Expected Frequency (*E*)	*O-E*	$(O-E)^2$	$\frac{(O-E)^2}{E}$
Week 1 PreC/Contemp.	4	3	1	1	0.333
Week 1 Preparation	10	10	0	0	0
Week 1 Action/Main.	13	14	-1	1	0.071
Week 3 PreC/Contemp.	2	3	-1	1	0.333
Week 3 Preparation	11	10	1	1	0.100
Week 3 Action/Main.	14	14	0	0	0
Week 6 PreC/Contemp.	3	3	0	0	0
Week 6 Preparation	9	10	-1	1	0.100
Week 6 Action/Main.	15	14	1	1	0.071
$\sum$	81	81			$X^2 = 1.009$

df=4

Critical $X^2 = 9.490$

Observed $X^2 = 1.009$

H_o: There is no relationship between the time of test (week one, three or six) and the stage of change distribution of control participants.

H_1: There is a relationship between the time of test (week one, three or six) and the stage of change distribution of control participants.

Retain H_o if observed $X^2 <$ critical X^2

Reject H_o if observed $X^2 \geq$ critical X^2

Observed X^2, 1.009< Critical X^2, 9.490

Therefore, retain H_o, there is no relationship between the time of test (week one, three or six) and the stage of change distribution of control participants.