The Effects of Individualized Exercise Programming on Muscular Fitness, Functional Mobility, and Subjective Well-Being in Older Persons

by

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We accept this thesis as conforming
to the required standard

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ABSTRACT

This 16 week study assessed whether an individualized, comprehensive, and progressive exercise program can have a positive effect on the health condition of older persons. Eleven volunteers (7 men & 4 women) ranging between the ages of 60 to 82 years participated in the study. Each of these subjects were given an individualized exercise program to complete and was continuously monitored over the course of the study. Three different types of single case designs were incorporated in this study to observe changes in muscular fitness, functional mobility, and subjective well-being these included ABAB (self-paced walk), changing criterion (1RM strength testing, 50% of 1RM endurance testing, sit-&-reach flexibility testing), and probes (weighted stair-climb, subjective exercise experience scale, & the satisfaction with life scale). The effects of the training program generally indicated improvements in muscular strength, muscular endurance, and stair ascension pace across all participants. Modest improvements were noted in the flexibility results and although the participants demonstrated minimal changes in gait pace from the self-paced walk, other improvements were observed in body posture and carriage. There was limited support that indicated resistance training enhanced subjective well-being. The majority of participants had a higher degree of feeling states for subjective well-being and life satisfaction prior to program implementation, which remained unchanged over the course of the study. The study has demonstrated that

this type of exercise program can have a positive effect on the health condition of older persons. An individualized, comprehensive, and progressive program consisting of resistance training, flexibility, and cardiorespiratory exercises within a well supervised setting is recommended.

Key Words: aging, muscular fitness, functional mobility, subjective well-being, life satisfaction

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Introduction

Background

Impairments to muscular strength, mobility, balance, and endurance have been reported to be one of the biggest threats concerning the functional health and psychological well-being of older persons (Ory, Schechtman, Miller, Hadley, Fiatarone, Province, Arfken, Morgan, Weiss, Kaplan, & the FICSIT group, 1993). Earlier reports have suggested that an association exits between reduced physical function and an increased susceptibility to disability resulting in a reduction in functional independence (Phillips & Haskell, 1995). These changes to functional independence have resulted in the need to address issues such as the psychological well-being of the older person and how to offset the need for long-term care. It is increasingly more important in an aging society to understand the contributions exercise may make towards maintaining functional health, improving over all feelings of well-being, and perhaps the postponement of chronic disease (Spirduso, 1994).

A number of factors reported to contribute to the decline of functional ability in older persons include: musculoskeletal changes, under nutrition, accumulation of chronic diseases, effects of aging, some medications, and physical inactivity (Fiatarone, O'Neill, Doyle, Clements, Roberts, Kehayias, Lipsitz, & Evans, 1993; Rogers & Evans, 1993). In a review by Rogers and Evans (1993), maximum force production was reported to decrease in individuals by approximately 24% - 36% between the ages of 50 and 70 years.

Muscle strength decreases by about 15% per decade over the sixth and seventh decade, with an approximate decrease of 30% per decade thereafter (Rogers & Evans, 1993). In further discussion, Rogers and Evans (1993) reported that this decrease in muscle strength with aging may be due to a loss of muscle mass and/or alterations in the muscles' capacity to generate force. Additionally, the authors explained that a decrease of approximately 10% in muscle mass may be the major factor in age-related reduction in muscle strength, rather than the deterioration in the contractile capacity of muscles. With reduced force capacity the aged muscle will decrease in the capacity to resist fatigue, resulting in the reduction of muscular endurance (Rogers & Evans, 1993).

Exercise has been found to produce substantial improvements in functional ability essential for postponing physical deterioration and maintaining independence in older adults (Per-Olof Åstrand, 1992). Previous research has found a relationship between impaired functional mobility and the loss of muscle strength and mass (Buckwalter, 1997; Fiatarone, O'Neill, Doyle Ryan, Clements, Solares, Nelson, Roberts, Kehayias, & Evans, 1994; Himann, Cunningham, Rechnitzer, & Paterson, 1988). This decline in muscular strength and as a result decrease in functional mobility has been reported to be largely due to physical inactivity (Rooks, Ransil, & Hayes, 1997; Nichols, Hitzelberger, Sherman, & Patterson, 1995; Rogers & Evans, 1993).

The term "muscular fitness" describes the integrated status of muscular strength, muscular endurance and flexibility (American College of Sports Medicine (ACSM), 1995; Phillips & Haskell, 1995). In the older person, fitness

through resistance training appears not only to be beneficial in producing positive skeletal muscle changes (Rogers & Evans, 1993), but may also help reduce the risk of falls, allow for further increases in strength, contribute to the reversal of age-related loss of lean muscle mass, and may possibly result in other metabolic adaptations (Hagberg, 1994).

There is an abundance of evidence in the research literature that indicates the adaptability of older persons to exercise programs for muscular fitness (Brooks & Faulkner, 1994; Drought, 1994; Jones, Rikli, Benedict, & Williams, 1994). Exercise programs for the older individual using resistance training of moderate to high intensity levels has consistently demonstrated results indicating marked increases in muscular fitness (Ades et al., 1996; Jones et al., 1994; Pyka, Lindenberger, Charette, & Marcus, 1994; Brehm, 1993). Increases in muscular fitness through formalized exercise prescription have been shown to counteract the effects of muscular weakness and physical frailty (Nichols et al., 1995; Fiatarone et al., 1994; Charette, McEvoy, Pyka, Snow-Harter, Guido, Wiswell, & Marcus, 1991).

Exercise programs directed towards muscular fitness development appear to help improve and/or maintain posture, and prevent or reduce low back pain (Spirduso, 1995). Nichols et al., (1995) involved older adults in a resistance training program to study the effects on muscular strength and functional abilities. They found that the resistance training program improved the subjects' mobility and balance by 11% and 26% respectively, and strength gains ranged from 9% to 55%.

Himann, et al. (1988) found that after about the age of 63 years, females showed a 12.4% per decade decrease and males showed a 16.1% per decade decrease in normal walking speed. Ades et al. (1996), however found that a resistance training program for subjects with an average age of 70.4 years resulted in increases in walking time to exhaustion of 38% and strength gains of approximately 29% over a three month period. Positive changes were noted in muscle strength and functional mobility with regards to gait velocity (Fiatarone et al., 1994; Judge, Underwood, & Gennosa, 1993; Hunter, Treuth, Weinsier, Kekes-Szabo, Kell, Roth, & Nicholson, 1995; Ades, Ballor, Ashikaga, Utton, & Nair, 1996; Sauvage, Myklebust, Crow-Pan, Novak, Millington, Hoffman, Hartz, & Rudman, 1992) and stair climb (Nichols et al., 1995; Rooks et al., 1997). Fiatarone, Marks, Ryan, Meredith, Lipsitz, and Evans, (1990) involved a group of elderly persons, average age of 87.9, in an 8 week high-intensity strength training program. Increases in lower-extremity strength were found to range from 61% to 374%.

Joint mobility, along with muscular strength and muscular endurance, is an important health consideration for the older person in maintaining muscular fitness. Reduced flexibility about the major joints of the body may be the combined results of "age itself, trauma from mechanical stress, disuse, and diseases such as arthritis," of which hypokinesis or disuse could lead to muscle shortening and changes in connective tissue (Raab, Agre, McAdam, & Smith, 1988). With reduced flexibility the muscles that cross the joints will shorten, thus further affecting movement and potentially contributing to

injury to the joint or the muscles crossing that joint in the form of muscle strains, tendon or ligament damage or perhaps detachment (Spirduso, 1995). The Framingham Disability study reported that community-dwelling persons older than 70 years of age seemed to have considerable mobility and work limitations (Ades et al., 1996). The lack of flexibility associated with dysfunctional performance in daily activities may potentially be considered a major cause of disability and discomfort in the elderly (Phillips & Haskell, 1995). It would seem that personal independence may be influenced by the older person's ability to maintain muscular fitness and joint mobility. Voorrips, Lemmink, van Heuvelen, Bult, and van Staveren, (1993), and Cunningham, Paterson, Himann, and Rechnitzer (1993) found that elderly individuals who participated more regularly in physical activity demonstrated better results on tests of flexibility of the hip and spine than those considered less active. Rider and Daly (1991) examined the extent to which spinal mobility could be improved in a population of older adults participating in a 10 week flexibility training program. These authors suggested that through participation in regular flexibility training improvement in spinal mobility could be demonstrated. Additionally, they found that locomotor forms of exercise such as walking, jogging, dancing and other such movement forms were insufficient stimuli by themselves to show positive results. Morey, Pieper, Sullivan, Crowley, Cowper, and Robbins (1996) also concluded from their study of long term performance trends that

older individuals given sufficient exercise stimulus could achieve improvements in flexibility.

The decline in muscular strength associated with physical frailty, reduced functional status, and impaired mobility in the older person potentially encourages an environment where the individual's independence and psychological well-being may be jeopardized (Ory et al., 1993). The ability of an older person to cope with the various tasks and demands of daily independent life requires some degree of muscular fitness and psychological health. How an individual perceives him/herself to be able to "hold one's own" within their environment may become a continual challenge in maintaining personal independence.

Psychological well-being relates to subjective internal states such as how one feels both physically and emotionally, and is therefore, considered more difficult to define. It has been suggested that well-being is characterized as having both positive and negative emotional and affective states (McAuley, 1994). Caspersen, Powell, and Merritt (1994) has defined well-being as a composite of psychological well-being, emotional well-being, self-concept, and global perceptions. Included within these components are body energy (resistance to fatigue), positive affect (feelings of pleasure and interest), sense of mastery and control (feelings of current and future events are positively influenced), and life satisfaction (general feeling of finding life meaningful, feeling of success in goal achievement or positive self-image). How the older person views the importance of their perceived health status and confidence

in their ability to have control over their lives seems to, "have a direct bearing on the likelihood that they will take action to maintain health and prevent disease" (Spirduso, 1995, p. 307).

The association between well-being and exercise remains unclear (McAuley & Rudolph, 1995). "The degree to which physical activity influences psychological well-being may depend on the type of activity implemented" (Mihalko & McAuley, 1996, p. 57). A number of studies related to physical activity, the elderly, and psychological well-being included some type of exercise program (mainly aerobic in nature), or the use of a recall method for past activities of which few included muscular strength training as the choice of exercise (McAuley & Rudolph, 1995). In their review of the literature, McAuley and Rudolph (1995), found programs lasting less than 10 weeks to have less effect on psychological well-being than those which were extended over a longer period of time. This would suggest that not only the type of exercise but also the amount of time involved in physical activity may have an important influence on an older person's well-being.

Mihalko and McAuley (1996) examined the effects of upper body high-intensity strength training on muscular strength and subjective well-being in elderly nursing home residents. The authors concluded that eight weeks of training was able to produce noted increases in upper body strength, and that there was a positive trend for the effect of strength training on subjective well-being.

An individual's belief in his/her capability to successfully perform a specific task may be influenced by how difficult the activity is perceived to be, the potential of transfer to other activities, and a sense of mastery (Bandura, 1986). Should the level of task difficulty be perceived to be too great then there is less likelihood that the activity will be attempted. A sense of belief in the ability of self may extend into other situations which would apply not only to similar activities but also to very different physical tasks. This results in a sense of mastery in which repeated successes enhances self-motivation, and those with strengthened expectations will persevere in coping efforts despite potential threatening situations (Bandura, 1986). Perceived belief in self is influenced by the experience of seeing others of the same circumstance perform threatening activities without observing harmful consequences. Through verbal persuasion and positive feedback individuals may be convinced they can be successful in performing specific activities (Bandura, 1977). Nichols, Omizo, Peterson, and Nelson (1993) reported overall program adherence to be 83% and monthly attendance averaged 86% over a 24 week program of supervised heavy-resistance training for active older women. This holds positive overtones because adherence to a regular physical activity program has been reported to be essential for optimal functioning of the aging body (Åstrand, 1994). Perhaps, through individualizing exercise programs and regularly providing constructive feedback, perceived abilities may be enhanced which in turn may result in an increased adherence rate for maintenance of a healthy and active independent life.

McAuley, Courneya, and Lettunich (1991) reported significant gains in perceived capabilities in response to both acute and long-term exposure to exercise. Individuals who were found to be more efficacious have also been reported to experience significantly more positive well-being and less psychological distress both during and after exercise (McAuley & Rudolph, 1995). Belief in self has been reported as a "significant predictor of exercise maintenance" for ones' perceived abilities may affect adherence to an active lifestyle (McAuley, Lox, & Duncan, 1993, p. P223; McAuley & Courneya, 1992).

Muscular fitness, functional mobility, and subjective well-being all play a role in an older individuals ability to maintain an independent and healthy lifestyle. Past research has demonstrated that with specific amounts of exercise stimulus, improvements in performance can be anticipated. Therefore, an assessment of the overall effect of a comprehensive and progressive exercise program suited to individual condition would merit consideration.

A more comprehensive treatment of the Literature may be found in Appendix A.

Purpose

The primary purpose of conducting this study was to observe the individual changes in performance of older persons, 60 - 82 years of age, when integrated into a comprehensive and progressive exercise program. The combined components of muscular fitness, functional mobility, and subjective well-being were used to determine the success of the program on an individual basis.

Research Question

1. In what ways can the introduction of a comprehensive individualized exercise program be used to show evidence of overall improvement in health as defined through components of muscular fitness, functional mobility, and subjective well-being?

Significance of the Study

Older persons come from varied backgrounds and therefore, will age at different rates and in different ways (Spirduso, 1995). By implementing a comprehensive and progressive exercise program tailored to individual condition, each individual would be provided with the opportunity to optimize improvements while working within a safe environment. Observation of individual performance in this kind of program may be beneficial in understanding how to improve and/or maintain health and prolong independence.

Methodology

Setting

The study was conducted at the University of Victoria's Gordon Head Complex, located adjacent to the main campus grounds.

Participants

Participants were volunteers who responded to an advertisement in the local news media. All respondents agreed to commit to a 16 week program which was conducted three times weekly. The study began with 13 participants, two of whom had to discontinue the program, one for personal reasons and the other due to the exacerbation of a pre-existing knee condition. Eleven subjects, four females and seven males, ranging in age from 61 to 82 years completed the program. Prior to the start of the program each participant provided a signed physician referral, an informed consent waiver, and a client profile (see Appendix B). Restrictions for participation in the program included inability to obtain medical approval, inability to comply with the intervention, or inability to transport self to and from exercise or testing sessions. The accumulated health demographics and waiver forms for each participant were stored in a locked file on the premises. Confidentiality was maintained as well as the rights and privacy of the participants in accordance with the guidelines set out by the University of Victoria's Human Ethics Research Committee.

Support Team

In the administration of this study the researcher utilized a support team of four registered nurses, five research assistants, and 20 Kinesiology student volunteers. The research support team was trained and guided by the researcher prior to start-up. The four nurses monitored each participant's blood pressure and heart rate. Two nurses were present for each program session. The five research assistant's monitored and recorded at each lap of the self-paced walk, the lap time, the heart rate, and the perceived exertion. Two research assistants were present for each program session. The 20 Kinesiology students were trained to assist with the evaluations and monitor each individual participant at each of the 12 muscular fitness exercise stations. A minimum of five students were present for each program session.

Exercise Program Outline

The exercise program was implemented in two phases: (a) the baseline, and (b) the intervention. The exercise program duration for this study consisted of three two hour sessions per week over a 16 week period. The first 3 weeks, the baseline phase, was utilized for evaluation with each session lasting 30 minutes. For the remaining 13 weeks, the intervention phase, each session was divided into 30 minutes of evaluation followed by 90 minutes of prescribed exercise. There was a minimum of 48 hours between each training session. Throughout the study all exercise sessions and evaluations were supervised by qualified exercise personnel.

Baseline Phase

The baseline phase extended over a three week period. This phase was utilized to ensure stability of performance prior to beginning the intervention phase. Stability was assumed when there was minimal fluctuation in the participant's performance and the absence of systematic or consistent increases or decreases in results. At each session of the baseline phase the participants were observed while performing a series of evaluations. These measures included (a) resting blood pressure (rBP) and resting heart rate (rHR), (b) self-paced walk (SPW), (c) post SPW blood pressure (pBP) and post SPW heart rate (pHR), (d) weighted stair climb (WSC), (e) sit-&-reach (S&R), (f) biceps curl maximum (BCmax) and biceps curl endurance (BCend), (g) leg extension maximum (LEmax) and leg extension endurance (LEend), and (h) Subjective exercise experience scale (SEES). The schedule for the evaluations for the baseline phase was as outlined in Figure 1.

Intervention Phase

At each session of the intervention phase the participants were observed while performing a series of evaluations prior to their exercise program. These measures included (a) resting blood pressure (rBP) and resting heart rate (rHR), (b) self-paced walk (SPW), (c) post SPW blood pressure (pBP) and post SPW heart rate (pHR), (d) weighted stair climb (WSC), (e) sit-&-reach (S&R), (f) biceps curl maximum (BCmax) and biceps curl endurance (BCend), (g) leg extension maximum (LEmax) and leg extension endurance (LEend), (h) Subjective exercise experience scale (SEES),

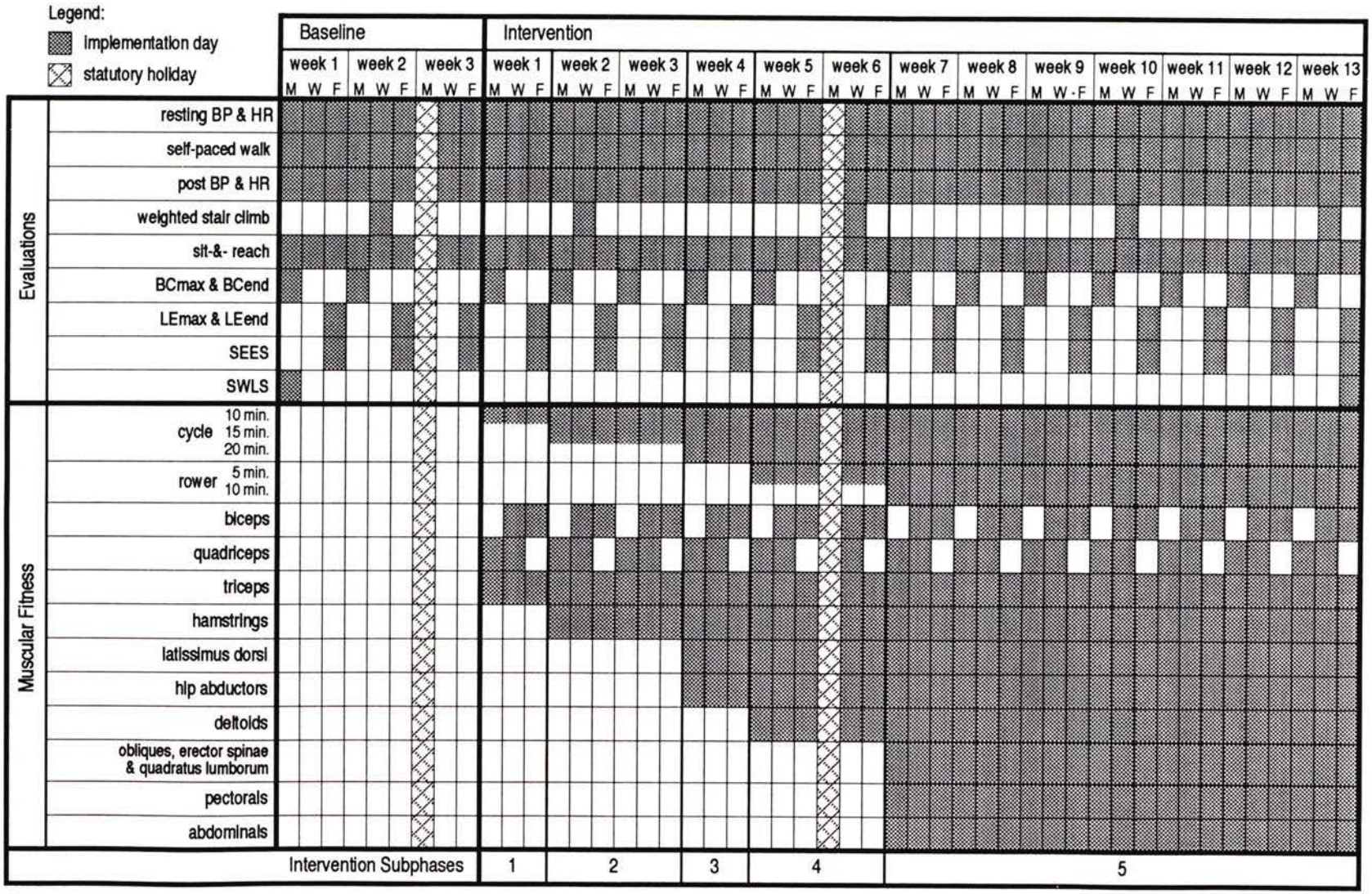

Figure 1. Evaluations, Muscular Fitness, and Intervention Subphase schedule.

and (i) Satisfaction with life scale (SWLS). The schedule for the evaluations and the muscular fitness exercise programming for the intervention phase was as outlined in Figure 1.

The resistance work load for each exercise was modified, over the course of the intervention, as the participant found the intensity of the exercise to be "light" (Likert scale; 1 - very light, 2 - light, 3 - somewhat heavy, 4 - heavy, 5 - very heavy) over the last three or four repetitions of the first set. The resistance exercises were organized so that the participants would perform three sets of ten repetitions. There were 3 - 4 participants who required an adjustment to their program such that they performed two sets of ten repetitions for each exercise rather than three sets of ten repetitions. These modifications were made due to expressed concerns for irregular heart rates and blood pressure, time constraints, or reported increased feelings of exhaustion later on the same day as the exercise session. A total of 12 exercise stations were utilized as indicated in Figure 1.

Procedures

A pilot study was completed prior to the program start up. This pilot study was organized to help determine the measures that would best show results for an overall view of an individual's physical health. The chosen measures were divided into muscular fitness, functional mobility, and subjective well-being. Muscular fitness evaluated changes in upper (biceps) and lower (quadriceps group) body muscular strength and muscular

endurance, and flexibility about the hip joint. The preliminary study evaluated the test-retest reliability of the tester on the components of muscular strength and endurance which indicated a 90% consistency (see Appendix C). Functional mobility was measured by changes in gait pace in the self-paced walk test and ascension pace in the weighted stair climb. Subjective well-being included measures of feeling states of positive well-being, psychological distress, fatigue and life satisfaction. Additionally, the pilot was useful in establishing the progression of the exercise program and the order that the exercises were introduced.

An orientation meeting was held at which the participants were introduced to the study, oriented to the facility, and familiarized with the exercise and testing equipment that would be used throughout the program. At this same meeting the participants completed a client profile, an informed consent waiver, and the Satisfaction With Life Scale (SWLS). A physician referral form was sent with each participant to be completed by his/her personal physician. This completed form was returned prior to the start of the program.

Muscular Fitness

Muscular Strength. Muscular strength (procedures noted in Appendix C) was assessed on two muscle groups, the biceps and quadriceps. Muscular strength was evaluated by using a one maximum voluntary repetition (1RM) which has been established as a safe form of assessment for the elderly (Shaw et al., 1995). In the initial baseline evaluation, the amount of weight lifted on

the first trial was arbitrarily chosen by the researcher. Determinants for the initial weight included age/gender, the appearance of muscle mass, and the daily activity schedule in which the muscle groups to be tested were utilized. For the first trial of each testing session thereafter, the resistance weight started at 50% of the maximal weight lifted the week before. Using a 5-point Likert scale (see Appendix C), ranging from 1 (very light) to 5 (very heavy) each participant was asked to determine his or her readiness to increase the weight for the next trial. The intensity for the bicep curl was increased by 15 pounds if the response to the scale was 'very light'; increased by 10 pounds if the response was 'light'; increased by 5 pounds if the response was 'somewhat heavy' to 'heavy'; and increased by 2.5 pounds if the response was 'very heavy'. The intensity for the leg extension was arbitrarily increased by 20 pounds if the response to the scale was 'very light'; increased by 15 pounds if the response was 'light'; increased by 10 pounds if the response was 'somewhat heavy' to 'heavy'; and increased by 5 pounds if the response was 'very heavy' and if the participant chose to try one more trial. The test was stopped when (a) the participant stated they could not lift any more weight, (b) full flexion or extension was unable to be achieved, or (c) there was incorrect technique execution over two consecutive repetitions. A 90 second rest period was allowed between each trial with a 5 minute recovery between the muscular maximum and the muscular endurance evaluations. Maximal strength testing was performed once a week for each muscle group, one muscle group at the beginning of the week; the other at the end of the week.

Muscular Endurance. The muscular endurance evaluation (procedures noted in Appendix D) was performed to volitional fatigue with the weight set at 50% of the 1RM, as was determined on the first session of the study. The repetitions were performed to a set cadence of 50 beats per minute. The two major muscle groups evaluated were the biceps and the quadriceps. The test was stopped when (a) the participant expressed volitional fatigue, (b) full flexion or extension was unable to be achieved, (c) there was incorrect technique execution over two consecutive trials, or (d) the participant was unable to keep the cadence over two consecutive trials. Muscular endurance testing was performed once a week, one muscle group at the beginning of the week and the other at the end of the week.

Flexibility. The flexibility (procedures noted in Appendix D) measure was recorded in centimeters and utilized the Sit-and-Reach flexometer (modified Wells & Dillion) protocol approved by The Canadian Society for Exercise Physiology (CSEP). The participant performed two trials at each session. These results were then averaged to determine a weekly result. The test was stopped when (a) knees bent up, (b) arms were unevenly stretched forward, or (c) a jerking motion was used to achieve extra distance.

Functional Mobility

Cardiovascular. The cardiovascular assessments (procedures noted in Appendix D) included measures of Blood Pressure (BP, mmHg), Heart Rate (HR, bpm) and Weight (WT, kg). The resting BP and HR were taken at the beginning of each session over the course of the program. The participants

sat for a period of five minutes before a reading was taken for the resting BP and HR. This measure was taken prior to the self-paced walk test. The recovery BP was taken once at two minutes and once again at three and one half minutes after the completion of the self-paced walk. The recovery HR was taken at four minutes after the walk. The HR and BP measures were taken only as a safety check as a number of the participants were reported to be hypertensive.

Self-Paced Walk. The self-paced walk test (procedures noted in Appendix D) was employed to observe changes in gait pace that may occur over the course of the program. The participants were asked to travel around a 180 meter (590 feet) corridor within the training facility, at zero percent grade, for five laps. During week five of the intervention phase of this study, the walk test was moved to a large gymnasium where each lap was 100 meters (328 feet) and nine laps were then completed. The first lap was used as a "warm-up" where the participants were asked to travel at a slow to moderate pace. For the remaining laps the participants were asked to travel as fast as they could. Heart Rate and Rate of Perceived Exertion (RPE) were recorded on each lap of the corridor walk and every odd numbered lap for the walk in the gymnasium. The RPE was used for all participants (Borg, 1973). All participants had been provided with an explanation and practice time, during the group orientation meeting, in the use of the RPE scale. The Self-Paced walk test was performed by each participant at each session over the course of

the program. The Self-Paced Walk was used to observe whether an increase in walk pace would occur with increased lower limb strength.

Weighted Stair-Climb. The weighted stair-climb (procedures noted in Appendix D) was performed five times over the course of the program. Performed midweek, so as not to interfere with the muscular maximum and muscular endurance evaluations, participants completed the weighted stair-climb once during the baseline phase and at four evenly distributed sessions over the intervention phase. Each participant was weighed on the first day of the program to determine 25% of their pre-program body weight. This amount was carried in a back pack up a flight of 22 stairs. The time taken to ascend the stairs was recorded. Only one timed trial was performed for this test. The weighted stair-climb was used to determine whether a relationship could be found between changes in ascension pace and changes in lower limb strength.

Subjective Well-Being

Subjective Exercise Experience Scale (SEES). The assessment of "feeling states" resulting from stimulus properties of the exercise environment were measured with the Subjective Exercise Experiences Scale (SEES). This 12 item three-dimensional scale assessed the responses of positive well-being (PWB), psychological distress (PD), and fatigue arising as a result of exercise participation. As discussed by McAuley and Courneya (1994) it was expected that the PWB and the PD dimensions would be inversely and moderately correlated, and that the fatigue dimension might be found to be useful in

measuring subjective responses to perhaps dose responses, exercise-rehabilitative settings and possibly a component of exercise prescription. The SEES questionnaire has a reported internal consistency exceeding .70 with validity demonstrated across a number of populations, including older persons (McAuley & Courneya, 1994). The procedures utilized were as outlined in Appendix D, and the SEES form may be referenced in McAuley and Courneya (1994). Using a 7-point Likert scale, ranging from 1 (not at all) to 7 (very much so) the participants were asked to indicate how strongly they experienced each "feeling state" during exercise over the preceding week. This form was completed weekly by each participant with the dimension scores arrived at by summing the items of each subscale. Responses were directed to (a) "positive well-being" with feeling states of great, positive, strong, and terrific; (b) "psychological distress" with feeling states of awful, crummy, discouraged, and miserable; and (c) "fatigued" with feeling states of drained, exhausted, fatigued, and tired.

Satisfaction With Life Scale. Life satisfaction was assessed using the Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The procedures are as outlined in Appendix D. The scale was reported by Diener et al. (1985). This self-report scale assesses an individual's global judgment of life satisfaction by weighing the importance of the life domains with his or her own values and standards (Diener et al., 1985; Mihalko & McAuley, 1996). As discussed by Diener et al. (1985) the SWLS was reported to be a valid and reliable measure of life satisfaction with a coefficient alpha of

.87 and a two month retest temporal stability correlation coefficient of .82. The internal consistency of this scale has been reported to have a coefficient alpha exceeding .70 (Diener et al., 1985). This five item scale has participants rate the extent to which they agree with each item. A 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was completed by each participant once prior to program start-up and again at program completion. The averaged scores from the questionnaire could range from a total of 5 (low satisfaction) to 35 (high satisfaction). Responses were directed to (a) in most ways my life is close to my ideal; (b) the conditions of my life are excellent; (c) I am satisfied with my life; (d) so far I have gotten the important things I want in life; (e) if I could live my life over, I would change almost nothing. Both the SEES and the SWLS questionnaires have been reported to possess favorable psychometric properties and are considered to be easily administered (McAuley & Courneya, 1994; Diener et al., 1985).

Design and Analysis

Single-case design methodology provided the researcher and the support team the opportunity to observe the effects of the intervention on individual performance in greater detail with a smaller number of participants. A control group is not required for single case design methods. This type of design incorporates basic features: (a) Continuously assess performance before, during and after the intervention has been applied, (b) Evaluate individuals or groups of individuals rather than group averages,

and (c) Infer from graphed data the effectiveness of the intervention (Mckenzie, 1992).

In this study, each individual was observed to determine if the effect of a comprehensive and progressive exercise program could demonstrate an "overall" change in physical health. Three different types of single case designs were incorporated in this study to observe changes in muscular fitness, functional mobility, and subjective well-being: ABAB, changing criterion, and probes.

The ABAB design was used to evaluate the self-paced walk. The baseline and intervention phases were as follows: (a) baseline 1, weeks 1 to 3; (b) intervention 1, weeks 4 to 7; (c) baseline 2, weeks 9 to 11; and (d) intervention 2, weeks 12 to 16. The changing criterion design was used for all the muscular fitness evaluations, which had exercises gradually introduced over the intervention phase. The intervention was divided into 5 subphases as illustrated in Figure 1. The duration of each subphase was as follows: (a) subphase 1 lasted three days, (b) subphase 2 had a duration of six days, (c) subphase 3 was three days in length, (d) subphase 4 was implemented for five days, and (e) subphase 5 continued for 21 days. The magnitude was shifted by introducing exercises consecutively for different muscle groups over the course of the intervention; however, due to the age of the sample of participants, magnitude shifts were adjusted based on the individual's performance rather than being varied systematically.

Three different types of probes were used over the course of this study to observe performance. First, probes were taken at five different times to measure performance during the weighted stair-climb. Second, 16 probes were taken using the subjective exercise experience scale (SEES) to describe the participants responses to their state of well-being, psychological distress, and fatigue, as a result of their participation in this study. Lastly, probes (the satisfaction with life scale, SWLS) were gathered twice, once at the study start-up and again at the completion of the study, to evaluate the participant's subjective responses to life satisfaction. The use of probes provided the opportunity to observe "the generality of behavior across responses and situation" on selected occasions over the course of the study (Kazdin, 1982).

Observations and Interpretations

Before reporting the results of all of the participants, it may be important to review commonalities observed over the course of the program. Prior to this study none of the participants had engaged in any resistance training for at least one year; some had never participated in resistance training. The participants reported established exercise habits before the program to consist mainly of walking, self prescribed home exercise programs, and gardening. Two participants continued to be active in their respective sport of interest (jogging and tennis) throughout the study. The familiarization period for the exercise equipment and techniques varied with each participant. Most of the participants seemed to adapt to his/her exercise prescription without difficulty, however some individuals took several sessions to become comfortable.

All participants appeared to be self-motivated as demonstrated by their expressed interest in the study and a common desire to improve or maintain their physical condition. Other motivational aspects which may have affected individual performance was the sense of community which developed between the participants, the research support team, and other persons outside the study who utilized the weight room facility during the same hours.

Over the intervention phase each participant's performance was continually monitored and the researcher modified individual exercise prescription as needed. These modifications included changes to program

intensity and duration. Muscular adaptation to exercise requires time and repetitive performance, so improvement may not necessarily be expected the first week the intervention was introduced.

Reported and observed external influences were chronologically tabled with the corresponding evaluation(s) dates to determine whether these influences may have had any affect on the evaluation results. Two of the more common external influences identified were: (a) Dehydration, where the participant had consumed less than 1 litre of water (Shephard, 1997; recommends at rest, 2 litres of water daily for the older individual) the previous 24 hours prior to the evaluation; (b) Poor sleep patterns, involved either broken sleep or less than 4 hours of sleep the night before the evaluation. There were no reported changes to prescription medication for any of the participants throughout the 16 week training program.

Each individual case study includes an introduction to the participant, the evaluation results, a summary, and corresponding table and figures. Because no norms could be located for muscular strength, muscular endurance, and flexibility for this age group each individual was evaluated within his/her own abilities and circumstance. The only comparison made was for the sit-and-reach evaluation for those individuals between the ages of 60 and 69 years. Norms for this age group, established by the Canadian Society for Exercise Physiology (CSEP, 1996) for the flexibility evaluation, were divided up into "health benefit zones" by age and gender. This allowed for comparisons for some of the participants.

Participant P01

Participant P01 a 61 year old semi-retired male with a family history of heart conditions, was diagnosed to have degeneration of the spine at levels L_5 - S_1 as well as mild hyperlipidemia. At the time of this study these conditions required no medication or treatment. Still employed, this participant frequently performed work involving heavy lifting. Other activities included limited walking and dancing occasionally on weekends.

This participant seemed frustrated by the amount of time required to complete his program. His exercise program was modified to accommodate his busy schedule. These modifications included a decrease in time spent on the cardiorespiratory component and an alternation of exercises. The adherence rate of this subject to this study was 96%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 1, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P01 are shown in Figure 1.1. His baseline resistance weight lifted in 1RM was 60 and 70 pounds, establishing a mean of 65 pounds. Familiarization with the exercise equipment may have been an influencing factor in this variance in baseline results. His intervention results started at 70 pounds and varied up to 95 pounds with a mean of 82.08 pounds, a 26% increase from the baseline mean.

The results for the BCend evaluation for participant P01 are shown in

Figure 1.2. The resistance weight was set at 30 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results established a mean of 19 repetitions. His intervention results varied between 18 to 27 completed repetitions with a mean of 22.33 repetitions, an 18% increase from the baseline mean.

The results for the LEmax evaluation for participant P01 are shown in Figure 1.3. His baseline resistance weight lifted in 1RM ranged from 120 to 125 pounds with a mean of 121.7 pounds. His intervention results ranged from 140 to 185 pounds with a mean of 167.92 pounds, a 38% increase from the baseline mean.

The results for the LEend evaluation for participant P01 are shown in Figure 1.4. The resistance weight assigned to this participant was 60 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results varied between 21 to 17 repetitions with a mean of 19 repetitions. His intervention results varied between 20 to 24 repetitions with a mean of 21.5 repetitions, a 13% increase from the baseline mean.

The results for the flexibility evaluation for participant P01 are shown in Figure 1.5. His baseline results ranged from 10.25 to 11.25 centimeters with a mean of 10.75 centimeters. His intervention results ranged from 8.42 to 13.17 centimeters with a mean of 10.92 centimeters, a 2% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P01 are shown in Figure 1.6. His baseline 1 results ranged from 7.90 to 8.08 minutes with a mean of 7.96 minutes. His intervention 1 results were from 7.90 to 7.74 minutes with a mean of 7.81 minutes, a 2% increase in gait velocity from the baseline 1 mean. His baseline 2 results were from 9.05 to 8.88 minutes with a mean of 8.97 minutes. His intervention 2 results ranged from 8.95 to 8.36 minutes with a mean of 8.71 minutes, a 3% increase in gait velocity from the baseline 2 mean, and is consistent with Intervention 1.

The results for the weighted stair-climb evaluation for participant P01 are shown in Figure 1.7. His baseline ascension pace was established at 9.13 seconds. His intervention results varied between 10.64 to 8.45 seconds with a mean of 9.43 seconds, a 3% decrease in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for positive well-being, psychological distress, and fatigue are defined in the 7-point subjective exercise experience scale (SEES); see Appendix E, Figure E1.8.

The responses regarding positive well-being from the SEES questionnaire for participant P01 are shown in Figure 1.8. His baseline results ranged from 5 to 6 with a mean of 5. His intervention results varied between 6 and 7 with a mean 7.

The responses regarding psychological distress from the SEES

questionnaire for participant P01 are shown in Figure 1.9. His baseline results remained constant, establishing a mean of 1. His intervention results varied between 1 and 3 with a mean of 2.

The responses regarding fatigue from the SEES questionnaire for participant P01 are shown in Figure 1.10. His baseline results remained constant, establishing a mean of 2. His intervention results varied between 3 and 6 with a mean 5.

The degree of feeling states for life satisfaction are as defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 26/35 (74%). His post-study SWLS questionnaire responses yielded a score of 25/35 (71%).

Summary

Even though participant P01 had several days when he reported he had flu symptoms and additional work related heavy lifting, he managed to show improvements in muscular strength and, for the most part, muscular endurance. To what degree the external influences affected these evaluation results, or his performance in general, was difficult to determine. Although the evaluations and the exercises for flexibility seemed difficult for him to perform, the results indicated a modest trend of improvement. It may be that there was a limitation imposed by a pre-existing spine condition, which may have affected flexibility performance. At the end of week 4 it was discovered that this participant was not performing the flexibility component of the exercise prescription. From weeks 5 to 13 additional flexibility exercises were

prescribed for the days he did not attend the program. This participant's flexibility results were "in need of improvement" according to the age and gender norms published by the Canadian Society for Exercise Physiology (CSEP).

This participant's results for the self-paced walk and the weighted stair-climb remained relatively unchanged. There were, however, other visually observed improvements such as body posture and carriage. It may be that this participant was already performing at optimal level as he was still quite active with work which required him to transport heavy items up and down flights of stairs.

This individual's SEES results all appeared to indicate changes in the degree of feeling states for positive well-being, psychological distress, and fatigue. This was supported by this participant's remarks of having "feeling of more energy and a noted increase in well-being." His SWLS responses indicated a minimal change in the degree of feeling states for life satisfaction. This participant appeared to be quite content with his life.

Table 1

P01: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
2	M	dehydrated
3	F	discomfort in knees
4	MWF	discomfort in knees, work related stress
5	MWF	work related stress
6	MWF	heavy lifting domestic appliances
7	F	missed session because of flu
8	MWF	recovering from flu
9	MWF	dehydrated, poor sleep patterns
12	MWF	dehydrated, heavy lifting at work
13	MWF	heavy lifting at work

Note. No external influences were recorded on the intervention weeks not indicated.

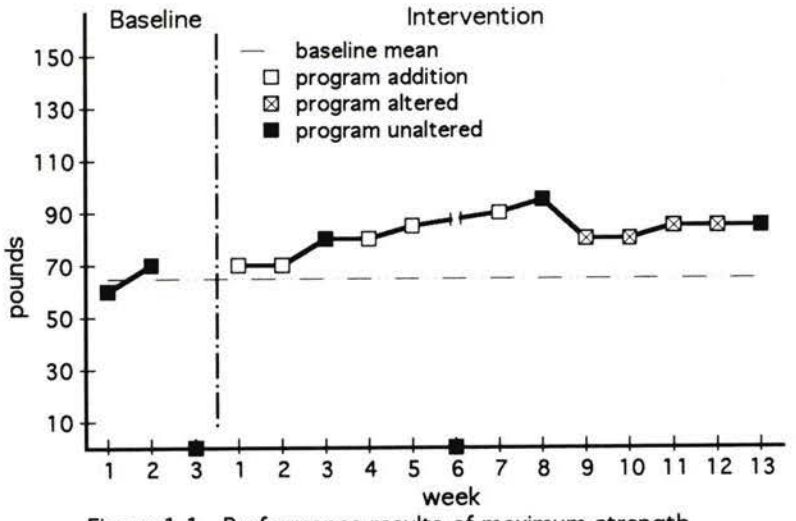

Figure 1.1. Performance results of maximum strength for Biceps Curl.

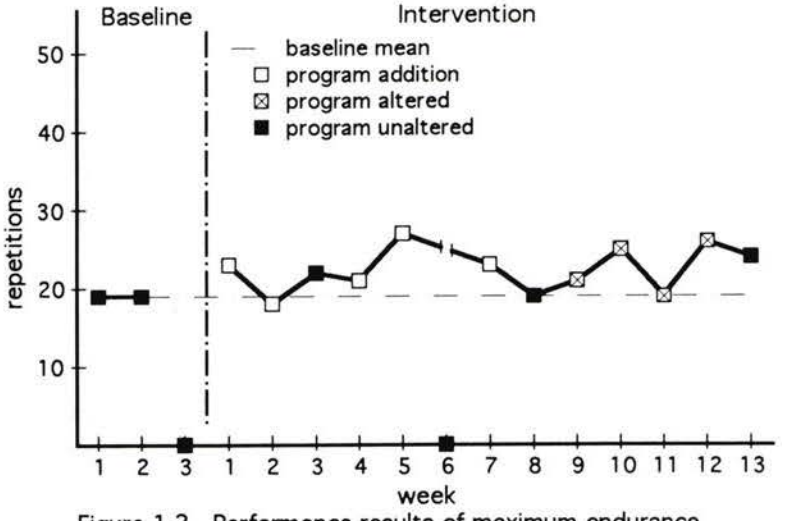

Figure 1.2. Performance results of maximum endurance for Biceps Curl.

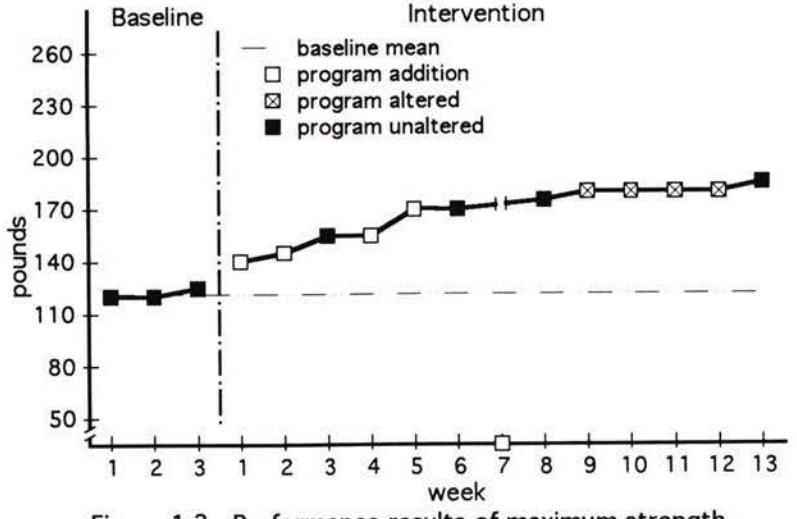

Figure 1.3. Performance results of maximum strength for Leg Extension.

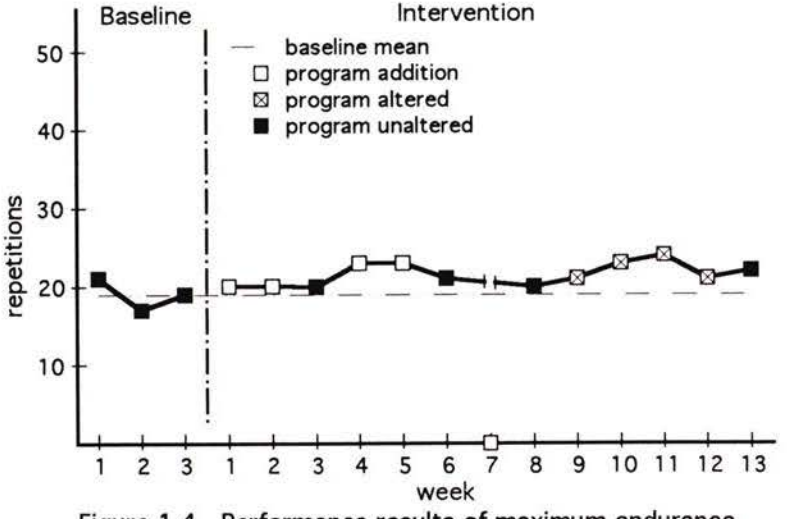

Figure 1.4. Performance results of maximum endurance for Leg Extension.

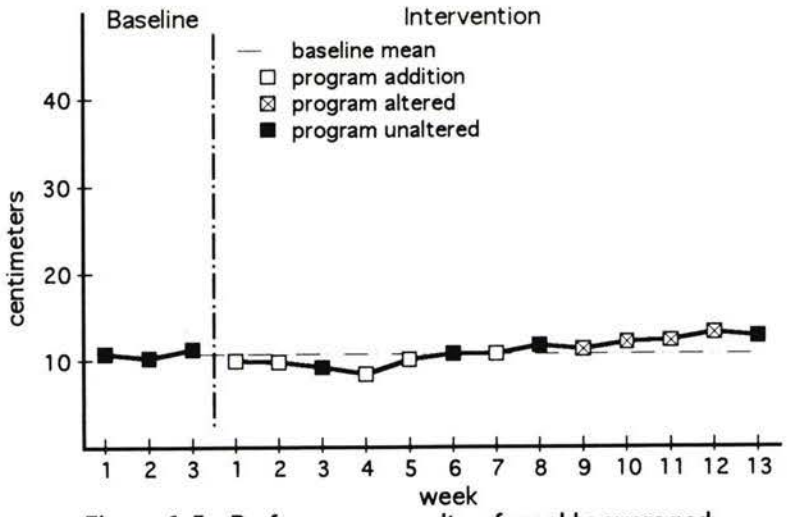

Figure 1.5. Performance results of weekly averaged trials for Flexibility.

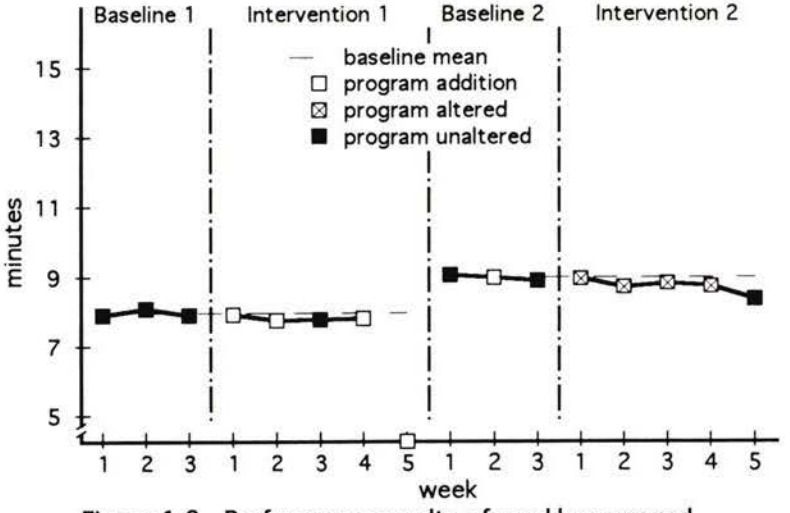

Figure 1.6. Performance results of weekly averaged trials for the Self-Paced Walk.

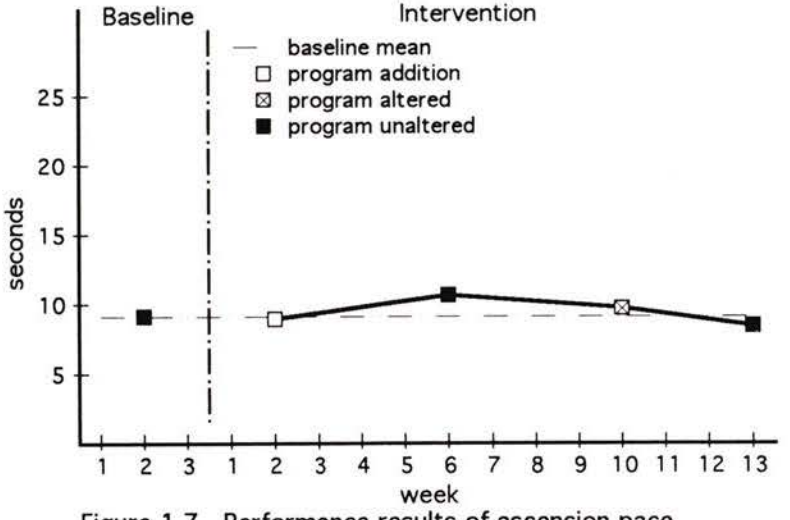

Figure 1.7. Performance results of ascension pace for the Weighted Stair Climb.

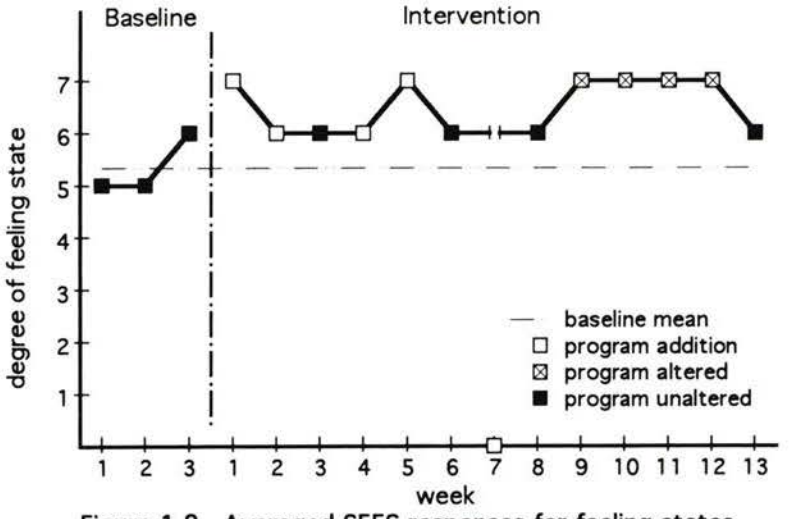

Figure 1.8. Averaged SEES responses for feeling states of Positive Well-Being.

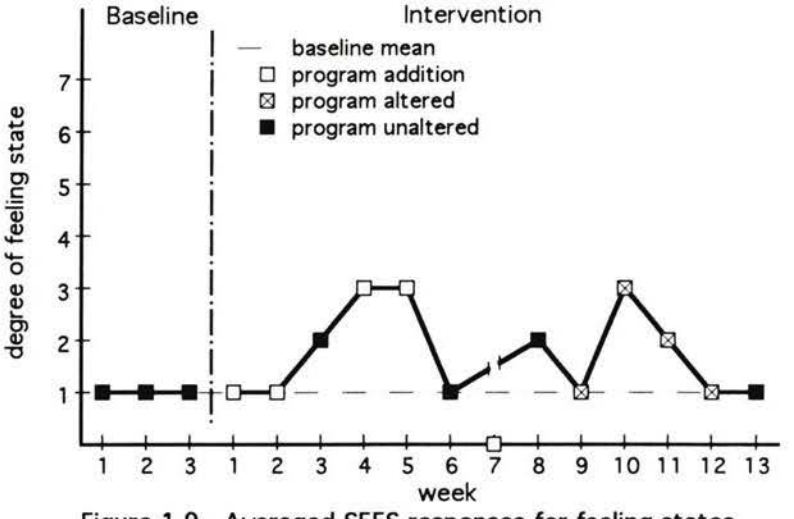

Figure 1.9. Averaged SEES responses for feeling states of Psychological Distress.

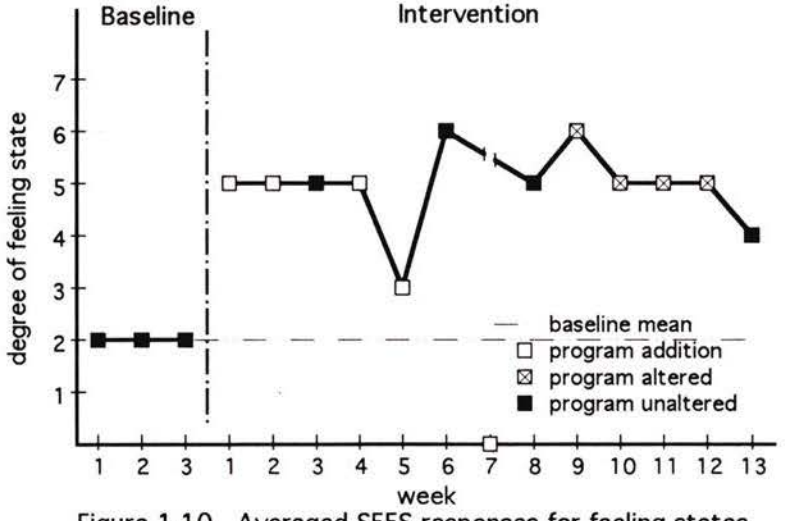

Figure 1.10. Averaged SEES responses for feeling states of Fatigue.

Participant P02

Participant P02 a 63 year old retired female was a healthy person who required no prescribed medication. At the time of the study she reported being very active in her garden and was the main caregiver for her mother. Over the course of the program this participant was very busy repainting the inside of her home and an exterior picket fence. She was very dedicated to an active lifestyle which included jogging for about 60 minutes prior to most of the exercise sessions. Other activities included dancing occasionally on weekends.

Due to increased activity involved in the painting of her home this participant reported finding herself to be quite exhausted by mid afternoon, therefore modifications to her exercise program were made at week 10 of the intervention. This participant's adherence rate to the program was 98%. The external influences reported and observed during the intervention phase, see Table 2, may have had an effect on performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P02 are shown in Figure 2.1. Her baseline resistance weight lifted in 1RM were 20 and 30 pounds with a mean of 25 pounds. Familiarization with the exercise equipment may have been an influencing factor in this variance in baseline results. Her intervention results started at 25 pounds and varied up to 35 pounds with a mean of 32.5 pounds, a 30% increase from the baseline mean.

The results for the BCend evaluation for participant P02 are shown in

Figure 2.2. The resistance weight was set at 10 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results were 18 and 20 with a mean of 19 repetitions. Her intervention results were from 20 to 43 repetitions with a mean of 31.33 repetitions, a 65% increase from the baseline mean.

The results for the LEmax evaluation for participant P02 are shown in Figure 2.3. Her baseline resistance weight lifted in 1RM ranged between 50 to 60 pounds with a mean of 55 pounds. Her intervention results uniformly increased from 50 to 70 pounds with a mean of 63.46 pounds, a 15% increase from the baseline mean.

The results for the LEend evaluation for participant P02 are shown in Figure 2.4. The resistance weight assigned to this participant was 27.5 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results were from 19 to 20 repetitions with a mean of 19.33 repetitions. Her intervention results ranged from 20 to 28 repetitions with a mean of 23.54 repetitions, a 22% increase from the baseline mean.

The results for the flexibility evaluation for participant P02 are shown in Figure 2.5. Her baseline results ranged from 28.08 to 29.38 centimeters with a mean of 28.71 centimeters. Her intervention results varied between 27.88 to 32.42 centimeters with a mean of 30.96 centimeters, an 8% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P02 are

shown in Figure 2.6. Her baseline 1 results were from 7.98 to 7.32 minutes with a mean of 7.61 minutes. Her intervention 1 results varied between 7.40 to 7.63 minutes with a mean of 7.52 minutes, a 1% increase in gait velocity from the baseline 1 mean. Her baseline 2 results ranged from 8.36 to 8.29 minutes with a mean of 8.33 minutes. Her intervention 2 results varied between 8.43 to 8.62 minutes with a mean of 8.53 minutes, a 2% decrease in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P02 are shown in Figure 2.7. Her baseline ascension pace was established at 15.38 seconds. Her intervention results ranged from starting at 12.75 to 10.67 seconds with a mean of 11.63 seconds, a 24% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E2.8.

The responses regarding positive well-being from the SEES questionnaire for participant P02 are shown in Figure 2.8. Her baseline results varied between 7 and 5 with a mean of 6. Her intervention results varied between 7 and 5 with a mean 6.

The responses regarding psychological distress from the SEES questionnaire for participant P02 are shown in Figure 2.9. Her baseline results remained constant, establishing a mean of 1. Her intervention results

remained constant, establishing a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P02 are shown in Figure 2.10. Her baseline results varied between 1 and 2, establishing a mean of 1. Her intervention results varied between 1 and 4 with a mean 3.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). Her pre-study SWLS questionnaire responses yielded a score of 19/35 (54%). Her post-study SWLS questionnaire responses yielded a score of 26/35 (74%).

Summary

Over the program intervention participant P02 demonstrated improvements in both muscular strength and muscular endurance. These improvements may in part be attributed to other physical activities performed over the intervention period which included home painting and jogging. Her muscular strength evaluation results appeared to have reached an optimal level over the last 5 weeks of the intervention. This may suggest that no additional increases in strength could be expected or that perhaps a plateau had been reached in muscular adaptation. This participant's observations regarding muscular strength included "I feel stronger and my body is firmer." Her flexibility results indicated a uniform modest trend of improvement. These results were noted as "good" in the age and gender norms published by the Canadian Society for Exercise Physiology (CSEP).

This participant's intervention results for the self-paced walk indicated

1% and 2% changes in gait pace. Perhaps this participant was already walking at an optimal level, therefore little if any improvement may have been expected. Other visually observed improvements in the self-paced walk included body posture and carriage. At the onset of the study this participant, who jogged frequently, indicated that walking felt awkward and restrictive; and by the study completion she felt more "confident in walking." The weighted stair-climb intervention results indicated improvement in ascension pace.

This individual's SEES results indicated no change in the degree of feeling states for positive well-being and psychological distress. This participant appeared generally in high spirits at all times. Elevated feeling states of fatigue were noted over the course of the intervention. Although additional physical activities may have been a factor in these feeling states of fatigue, this participant appeared to work hard at the exercise program she was given. The exercise program required modification to some of the intensity levels of a few exercises so as to better suit the participant's reported energy levels, as she found doing both the jogging and the exercise program on the same day very tiring. The SWLS responses indicated a very positive change in the degree of feeling states for life satisfaction.

Table 2

P02: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
5	M	food poisoning on weekend
7	W	poor sleep
8	M	poor sleep, dehydrated
9	MWF	poor sleep, family matters

Note. No external influences were recorded on the intervention weeks not indicated.

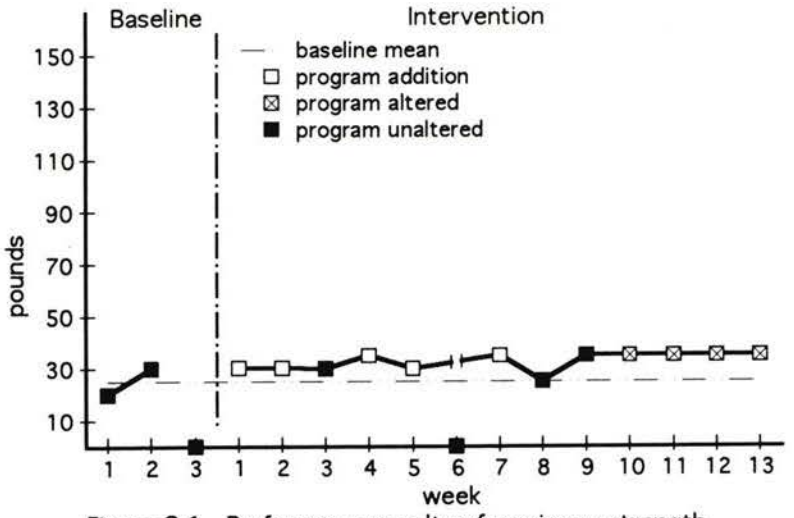

Figure 2.1. Performance results of maximum strength for Biceps Curl.

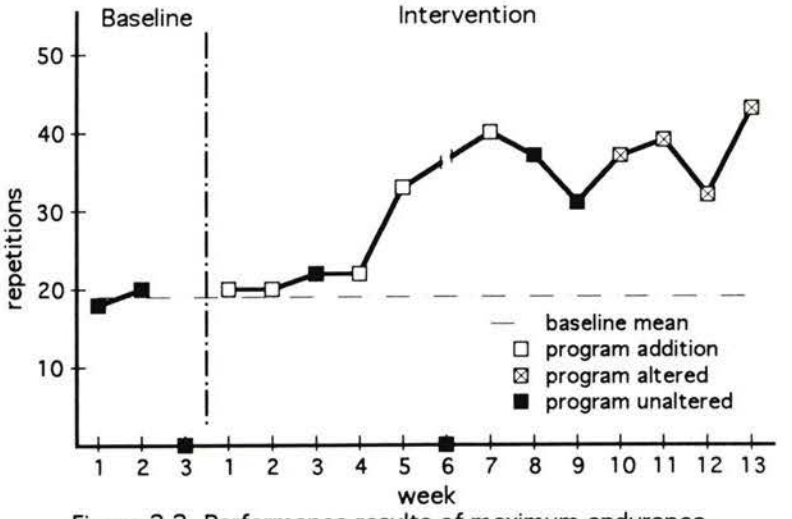

Figure 2.2 Performance results of maximum endurance for Biceps Curl.

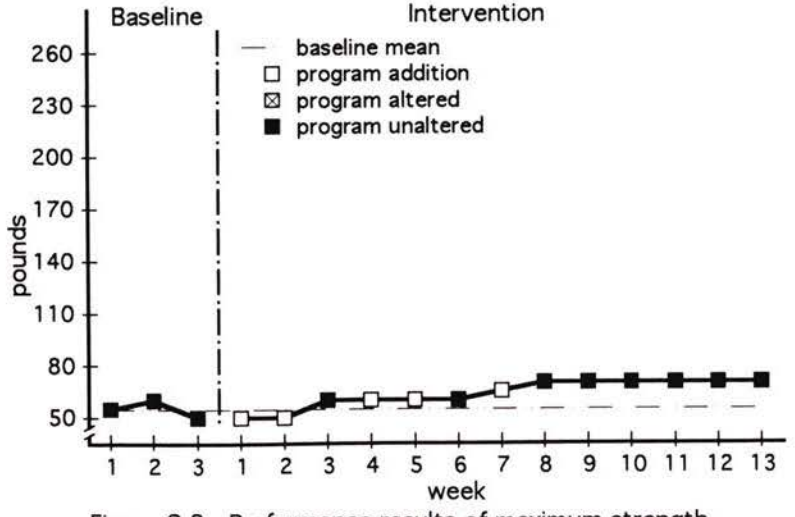

Figure 2.3. Performance results of maximum strength for Leg Extension.

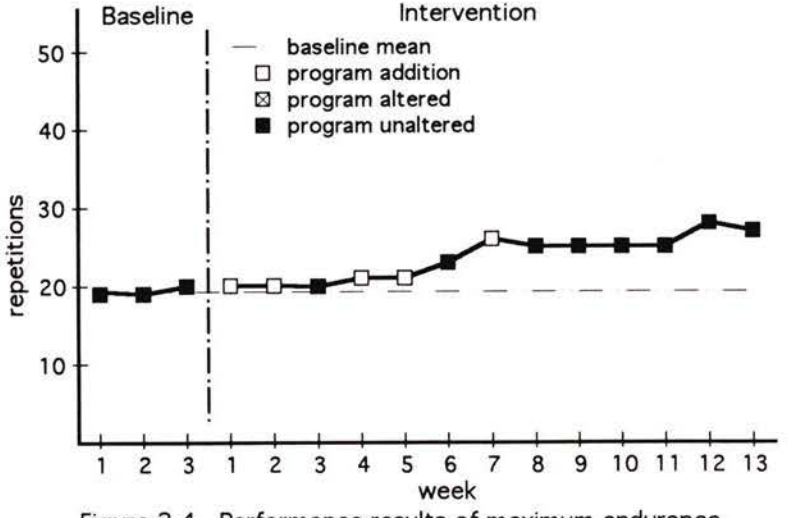

Figure 2.4. Performance results of maximum endurance for Leg Extension.

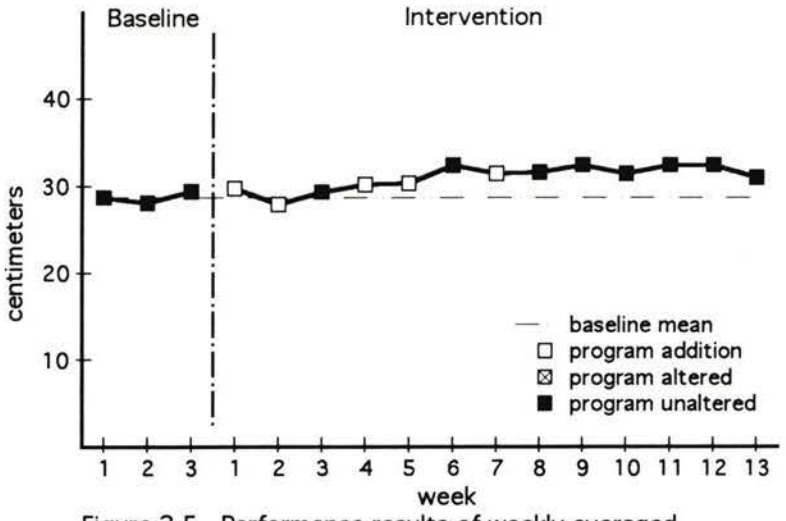

Figure 2.5. Performance results of weekly averaged trials for Flexibility.

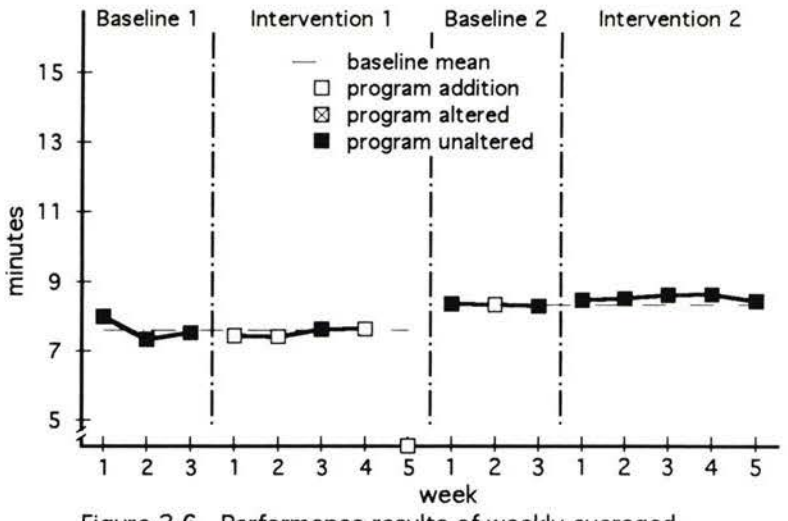

Figure 2.6. Performance results of weekly averaged trials for the Self-Paced Walk.

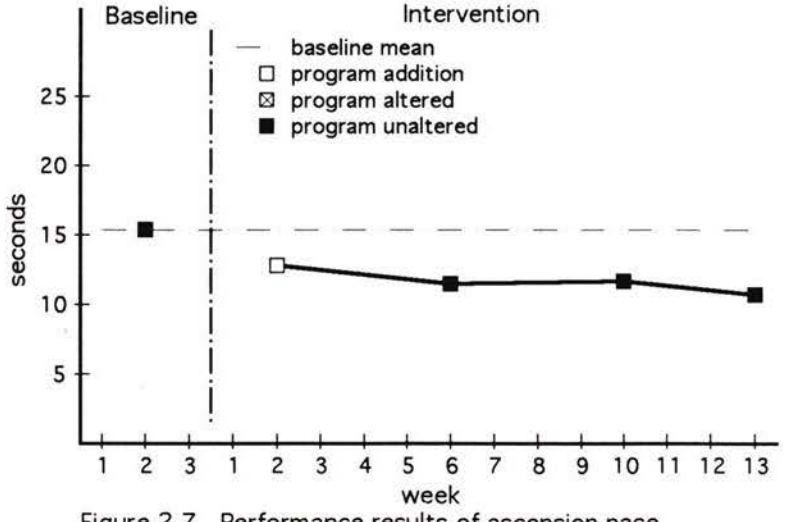

Figure 2.7. Performance results of ascension pace for the Weighted Stair Climb.

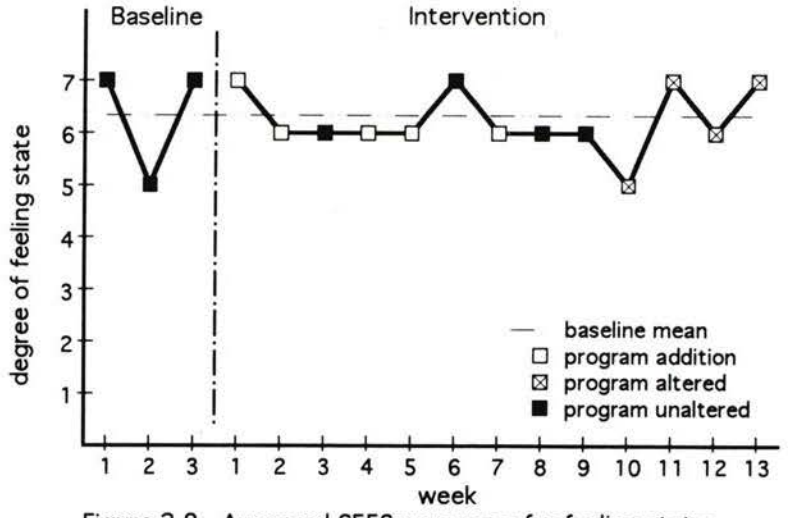

Figure 2.8. Averaged SEES responses for feeling states of Positive Well-Being.

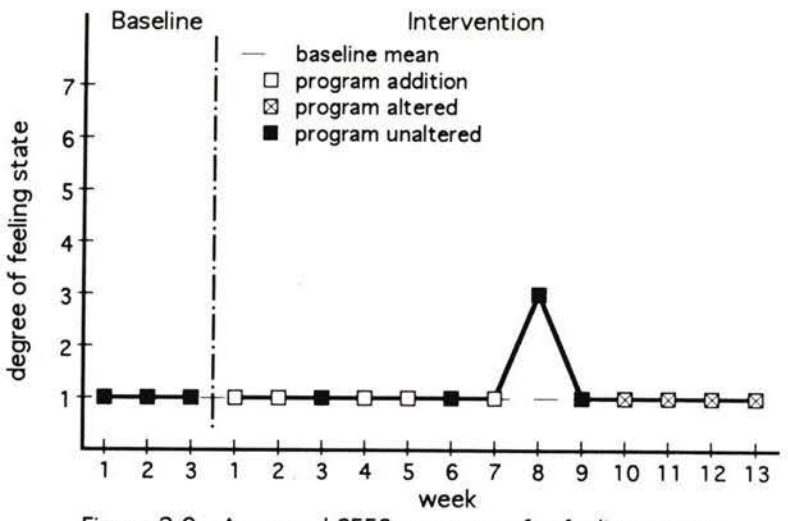

Figure 2.9. Averaged SEES responses for feeling states of Psychological Distress.

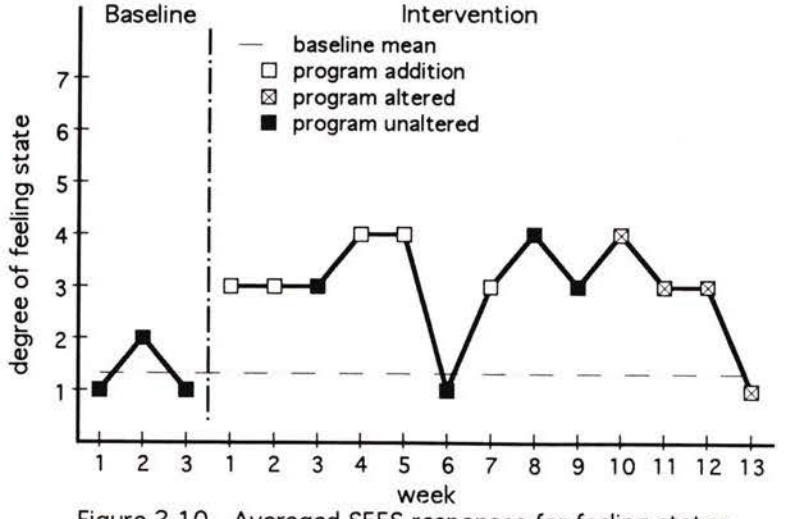

Figure 2.10. Averaged SEES responses for feeling states of Fatigue.

Participant P03

Participant P03, a 63 year old retired male was diagnosed with hypertension and an orthopedic condition, where the cartilage from one knee had been removed. At the time of this study these conditions were medically controlled with ASA and Sectral. His activities included gardening and walking one half to three hours approximately three times per week. This participant's adherence rate to the program was 96%.

During the baseline phase he received bruises in the legs from one of the exercise machines, which may have been exacerbated by his prescribed medication. Recovery from this condition was relatively quick. The combination and frequency of external influences reported and observed during the intervention phase, see Table 3, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P03 are shown in Figure 3.1. His baseline resistance weight lifted in 1RM were 85 and 90 pounds with a mean of 87.5 pounds. His intervention results increased steadily from 85 to 150 pounds with a mean of 120 pounds, a 37% increase from the baseline mean.

The results for the BCend evaluation for participant P03 are shown in Figure 3.2. The resistance weight was set at 42.5 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 25 and 24 with mean of 24.5 repetitions. His intervention results increased relatively

steadily from 21 to 47 repetitions with a mean of 34.1 repetitions, a 39% increase from the baseline mean.

The results for the LEmax evaluation for participant P03 are shown in Figure 3.3. His baseline resistance weight lifted in 1RM ranged from 220 to 170 pounds with a mean of 203.3 pounds. His intervention results uniformly increased from 200 to 255 pounds over weeks 1 through 8 and then remained constant to completion, establishing a mean of 239.6 pounds, an 18% increase from the baseline mean.

The results for the LEend evaluation for participant P03 are shown in Figure 3.4. The resistance weight assigned to this participant was 110 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results remained constant, establishing a mean of 18 repetitions. His intervention results varied between 21 and 31 repetitions with a mean of 26.8 repetitions, a 49% increase from the baseline mean.

The results for the flexibility evaluation for participant P03 are shown in Figure 3.5. His baseline results ranged from 31.5 to 28.92 centimeters with a mean of 29.81 centimeters. His intervention results varied between 28.38 to 32 centimeters with a mean of 29.83 centimeters, a 0% change from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P03 are shown in Figure 3.6. His baseline 1 results ranged from 8.27 to 7.43 minutes with a mean of 7.73 minutes. His intervention 1 results ranged from 7.39 to

6.93 minutes with a mean of 7.13 minutes, an 8% increase in gait velocity from the baseline 1 mean. His baseline 2 results ranged from 8.05 to 7.85 minutes with a mean of 7.95 minutes. His intervention 2 results ranged from 7.83 to 7.52 minutes with a mean of 7.71 minutes, a 3% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P03 are shown in Figure 3.7. His baseline ascension pace was established at 7.17 seconds. His intervention results were from 6.71 to 6.41 seconds with a mean of 6.58 seconds, a 8% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for positive well-being, psychological distress, and fatigue are as defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E3.8.

The responses regarding the positive well-being from the SEES questionnaire for participant P03 are shown in Figure 3.8. His baseline results remained constant, establishing a mean of 3. His intervention results varied between 3 and 7 with a mean 6.

The responses regarding psychological distress from the SEES questionnaire for participant P03 are shown in Figure 3.9. His baseline results were 2 and 3 with a mean of 2. His intervention results ranged from 2 to 1 with a mean of 1.

The responses regarding fatigue from the SEES questionnaire for

participant P03 are shown in Figure 3.10. His baseline results remained constant, establishing a mean of 3. His intervention results varied between 2 and 5 with a mean 4.

The degree of feeling states for life satisfaction are as defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 32/35 (91%). His post-study SWLS questionnaire responses yielded a score of 30/35 (86%).

Summary

Notable improvements were observed in participant P03's muscular strength and muscular endurance. Retired for one year, this participant commented on an increased awareness of the amount of deterioration that can occur over time. Flexibility results indicated no change over the intervention. This participant's flexibility results were noted as "very good" in the age and gender norms published by the Canadian Society for Exercise Physiology (CSEP).

The results for the self-paced walk and the weighted stair-climb both indicated a modest improvement. Again, little improvement may have been expected as the participant frequently walked and was accustomed to carrying heavier loads up several flights of stairs. Other visually observed improvements in this participant over the intervention phase was body posture. This was supported by a comment from the participant indicating he had noticed that his "posture was much improved." The SEES results all appeared to demonstrate changes in degree of feeling states for positive well-

being, psychological distress, and fatigue. This was corroborated by personal remarks that he was "happier for the return to better shape" and that he "felt stronger and more alert." There was minimal change in the degree of feeling state for life satisfaction as a result of participation in the exercise program; this participant gave the impression that he was quite content with his life.

Table 3

P03: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1 & 2	MWF	bruised legs, dehydrated
4	M	poor sleep
7	M	increased garden activity and hiking over the weekend
8 to 11	MF	dehydrated, poor sleep
12	M	increased carpentry work over the weekend

Note. No external influences were recorded on the intervention weeks not indicated.

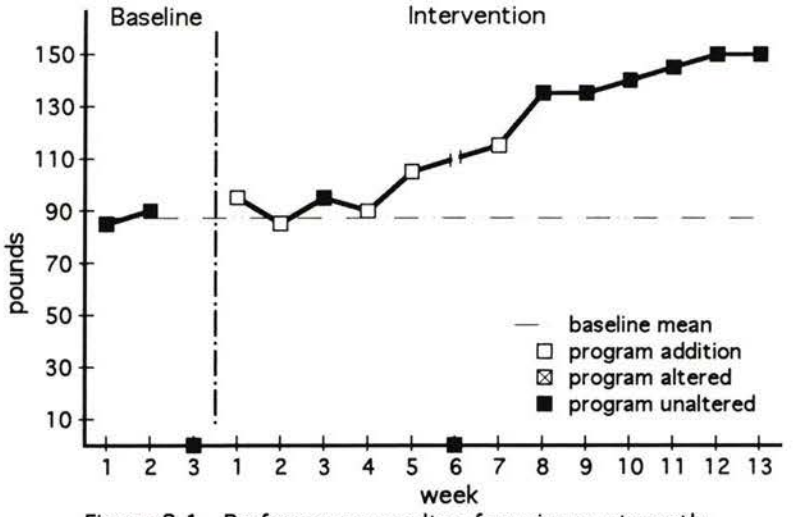

Figure 3.1. Performance results of maximum strength for Biceps Curl.

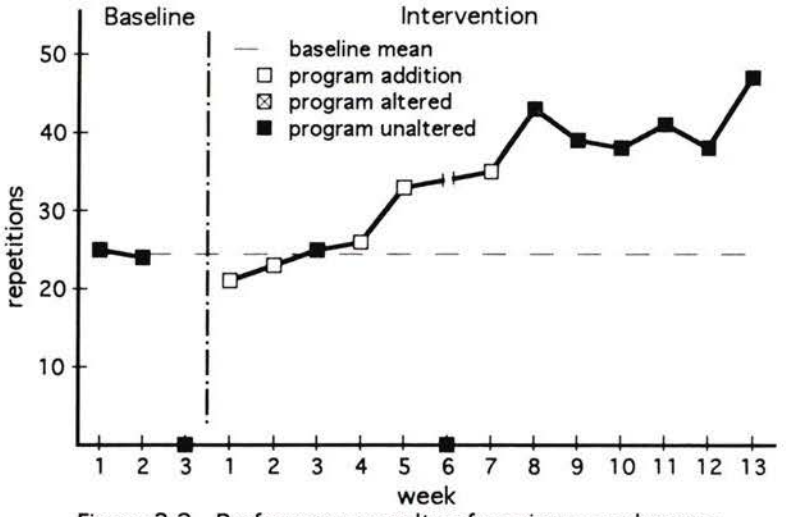

Figure 3.2. Performance results of maximum endurance for Biceps Curl.

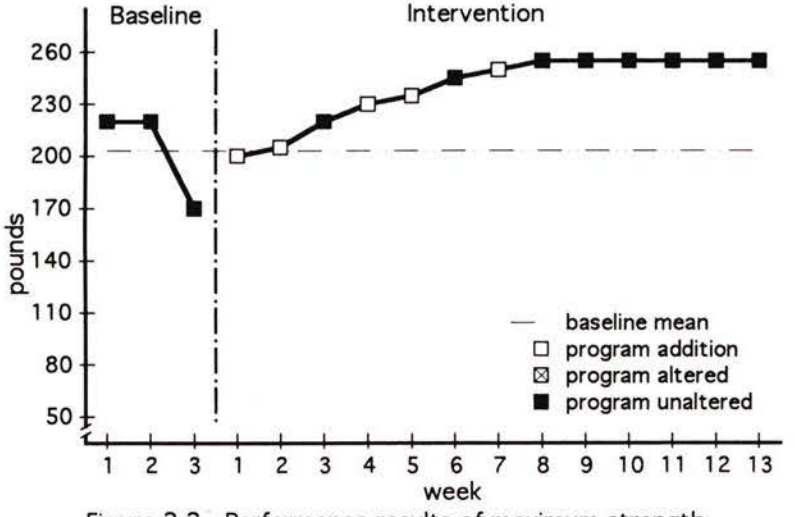

Figure 3.3. Performance results of maximum strength for Leg Extension.

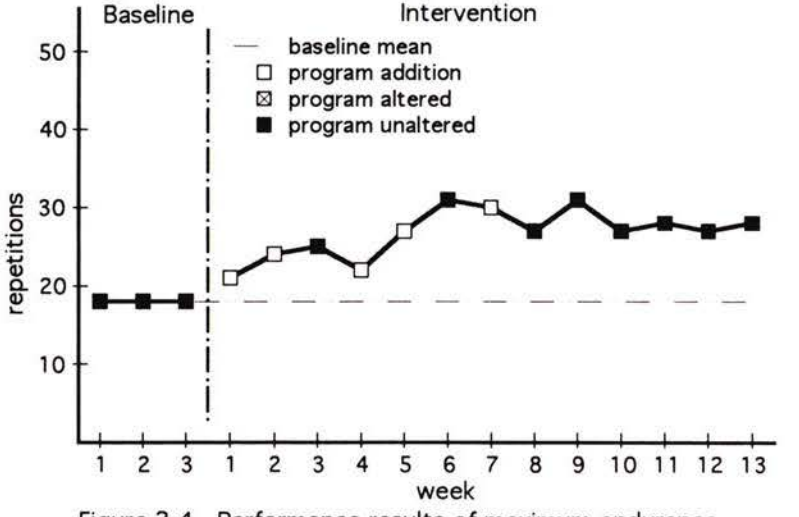

Figure 3.4. Performance results of maximum endurance for Leg Extension.

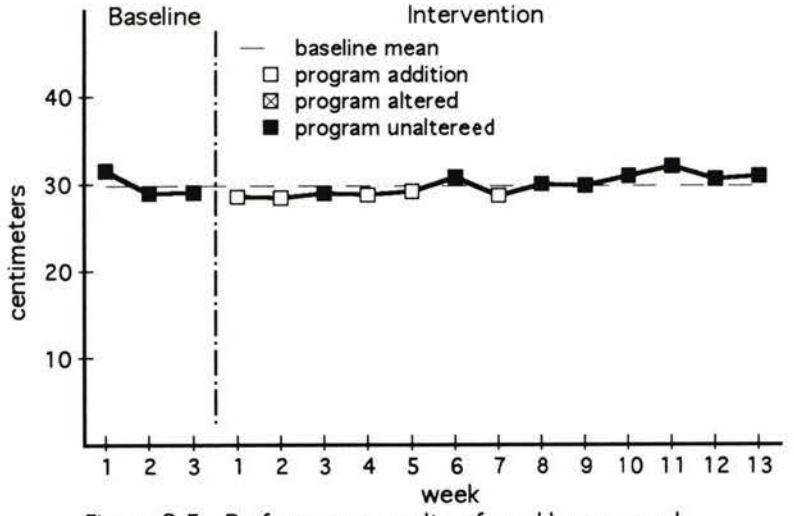

Figure 3.5. Performance results of weekly averaged trials for Flexibility.

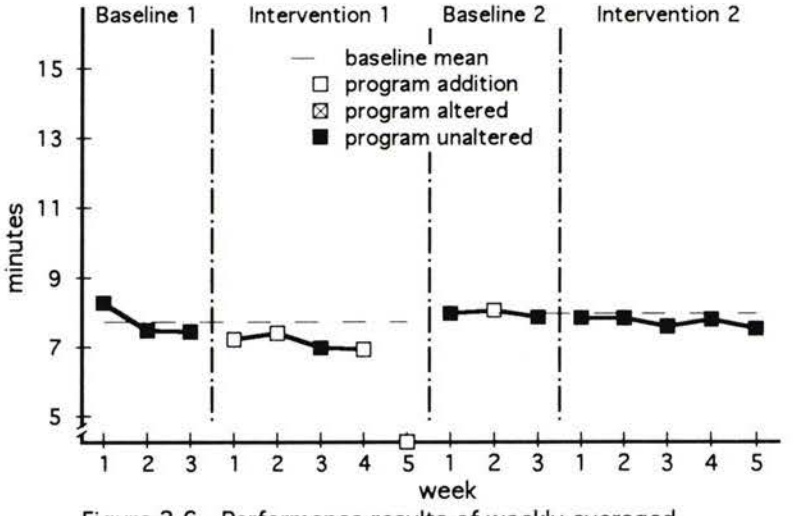

Figure 3.6. Performance results of weekly averaged trials for the Self-Paced Walk.

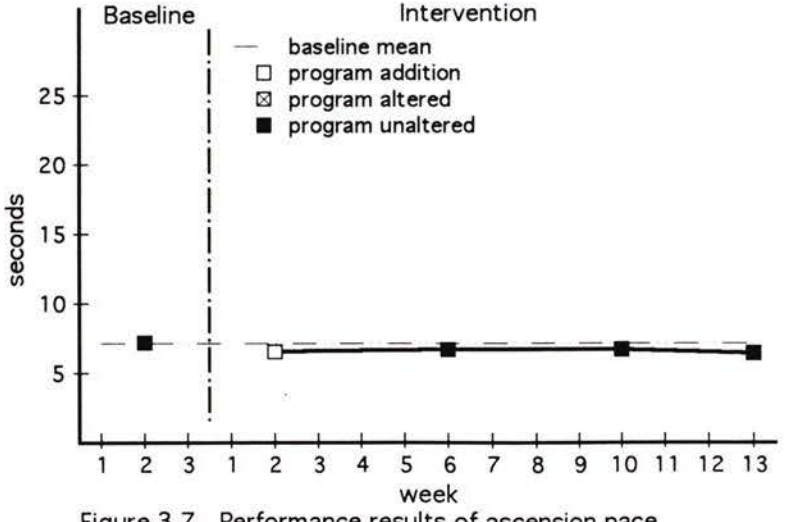

Figure 3.7. Performance results of ascension pace for the Weighted Stair Climb.

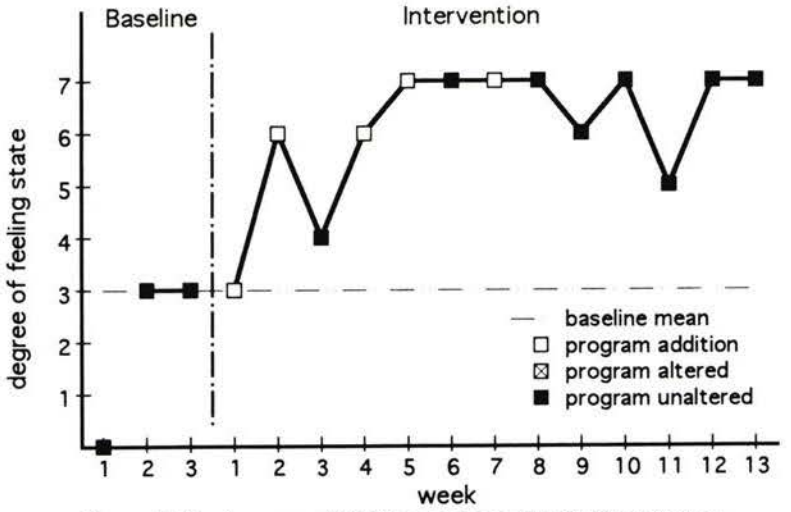

Figure 3.8. Averaged SEES responses for feeling states of Positive Well-Being.

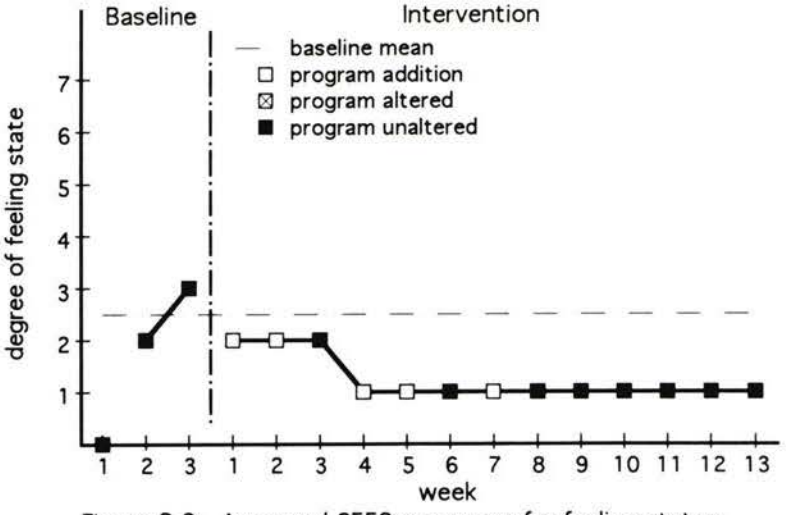

Figure 3.9. Averaged SEES responses for feeling states of Psychological Distress.

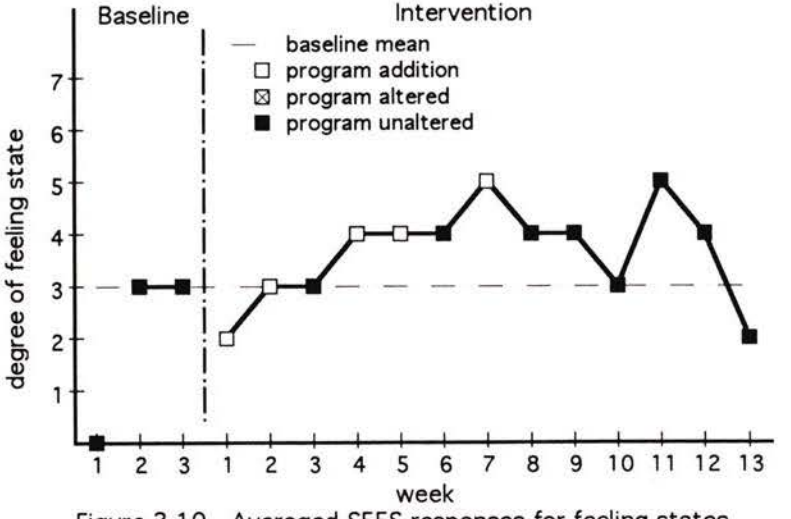

Figure 3.10. Averaged SEES responses for feeling states of Fatigue.

Participant P04

Participant P04 a 64 year old retired male who at the time of this study was considered medically healthy. He indicated spending a great deal of time preparing a new one acre garden which included placing numerous large rocks, pick-axe work, and shoveling soil over the duration of the study. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 4, may have had an effect on the performance results throughout this phase. This participant's adherence rate to the program was 96%.

Muscular Fitness Results

The results for the BCmax evaluation for participant P04 are shown in Figure 4.1. His baseline resistance weight lifted in 1RM were 50 and 65 pounds with a mean of 57.5 pounds. Familiarization with the exercise equipment may have been an influencing factor in this variance in the baseline results. His intervention results ranged from 55 to 90 pounds with a mean of 73.3 pounds, a 27% increase from the baseline mean.

The results for the BCend evaluation for participant P04 are shown in Figure 4.2. The resistance weight was set at 25 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 26 and 29 repetitions with a mean of 27.5 repetitions. His intervention results varied between 22 and 40 repetitions with a mean of 31.3 repetitions, a 14% increase from the baseline mean.

The results for the LEmax evaluation for participant P04 are shown in

Figure 4.3. His baseline resistance weight lifted in 1RM ranged from 120 to 130 pounds with a mean of 126.7 pounds. His intervention results uniformly increased from 130 to 180 pounds with a mean of 161.2 pounds, a 27% increase from the baseline mean.

The results for the LEend evaluation for participant P04 are shown in Figure 4.4. The resistance weight assigned to this participant was 60 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results ranged from 20 to 31 repetitions with a mean of 25.67 repetitions. It was difficult to determine why there was such a baseline trend. The results from week one of the LEend were not included because of an inaccuracy in the count. His intervention results varied between 27 and 36 repetitions with a mean of 33.5 repetitions, a 31% increase from the baseline mean.

The results for the flexibility evaluation for participant P04 are shown in Figure 4.5. His baseline results varied between 19.08 and 15.75 centimeters with a mean of 17.44 centimeters. His intervention results ranged from 17 to 23 centimeters with a mean of 19.5 centimeters, a 12% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P04 are shown in Figure 4.6. His baseline 1 results ranged from 7.74 to 7.16 minutes with a mean of 7.42 minutes. His intervention 1 results ranged from 6.92 to 6.75 minutes with a mean of 6.36 minutes, an 8% increase in gait velocity from the baseline 1 mean. His baseline 2 results ranged from 8.12 to 7.55

minutes with a mean of 7.77 minutes. His intervention 2 results ranged from 7.67 to 7.47 minutes with a mean of 7.60 minutes, a 2% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P04 are shown in Figure 4.7. His baseline ascension pace was established at 12.61 seconds. His intervention results varied between 12.82 and 8.82 seconds with a mean of 10.4 seconds, an 18% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for positive well-being, psychological distress, and fatigue are as defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E4.8.

The responses regarding positive well-being from the SEES questionnaire for participant P04 are shown in Figure 4.8. His baseline results remained constant establishing a mean of 6. His intervention results varied between 6 and 7 with a mean 6.

The responses regarding psychological distress from the SEES questionnaire for participant P04 are shown in Figure 4.9. His baseline results remained constant establishing a mean of 1. His intervention results also remained constant establishing a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P04 are shown in Figure 4.10. His baseline results ranged from 2 to 4 with a mean of 3. Although it is difficult to determine why there was this

baseline trend, this participant did indicate that he was working in his rock garden with a pick-axe. His intervention results varied between 2 and 5 with a mean 4.

The degree of feeling states for life satisfaction are as defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 31/35 (89%). His post-study SWLS questionnaire responses yielded a score of 31/35 (89%).

Summary

Even though participant P04 indicated that he worked constantly in his rock garden over the course of the study he managed to show improvements in his muscular strength and muscular endurance. To what degree the external influences affected his muscular performance was difficult to determine. This participant did comment that lifting and moving rocks in his garden had become progressively easier and that he also noticed a decrease in muscle strains in comparison to past years. His flexibility results indicated a continual trend of improvement and were considered "fair" in the age and gender norms published by the Canadian Society for Exercise Physiology (CSEP).

Modest positive changes were noted for the self-paced walk, it may be possible that this participant was traveling at a near optimal level. Visual observation noted that he walked freely with good posture and carriage. His weighted stair-climb results may indicate an intervention effect with a noted increase in the ascension pace; and although it may be a factor, the effect of

rock gardening on these results was difficult to determine. The SEES results indicated no change in the degree of feeling states for positive well-being and psychological distress; he always appeared to be in a very positive frame of mind. There was no change in his feeling state for life satisfaction as a result of participation in the exercise program; he always seemed to be in a happy-go-lucky state.

Table 4

P04: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1 to 13	MWF	worked garden, moving large rocks, and pick-axe work
2	F	fell; bruised ribs and inflammation of the knees resulted
4	M	chest discomfort from fall
9 & 10	MF	poor sleep
10	W	poor sleep, breaking in new shoes

Note. No external influences were recorded on the intervention weeks not indicated.

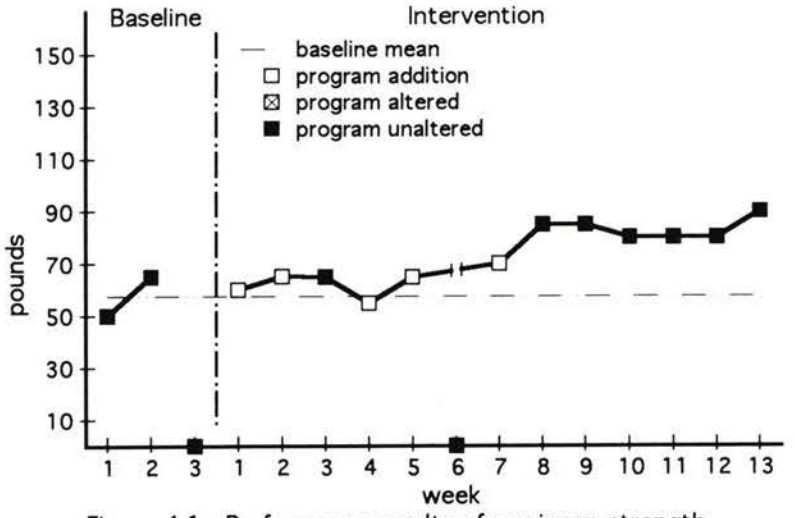

Figure 4.1. Performance results of maximum strength for Biceps Curl.

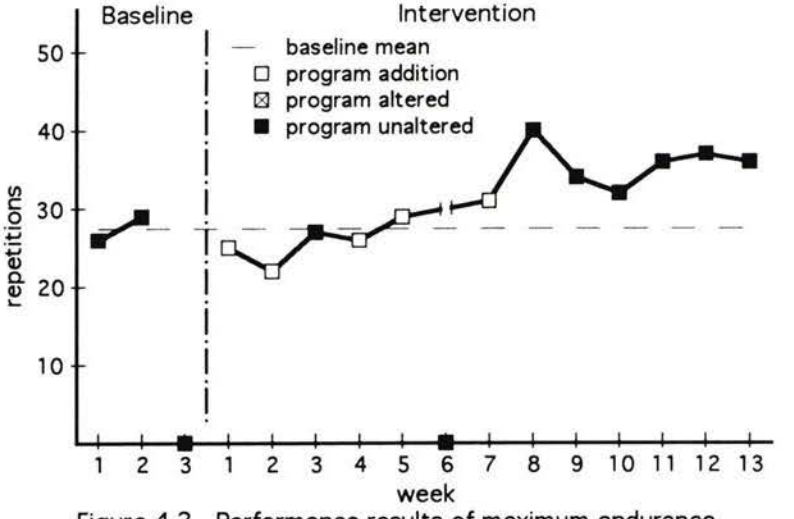

Figure 4.2. Performance results of maximum endurance for Biceps Curl.

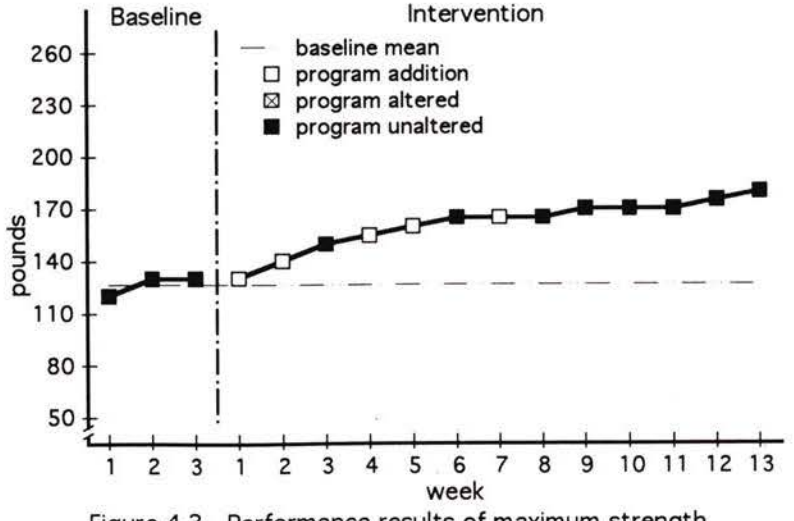

Figure 4.3. Performance results of maximum strength for Leg Extension.

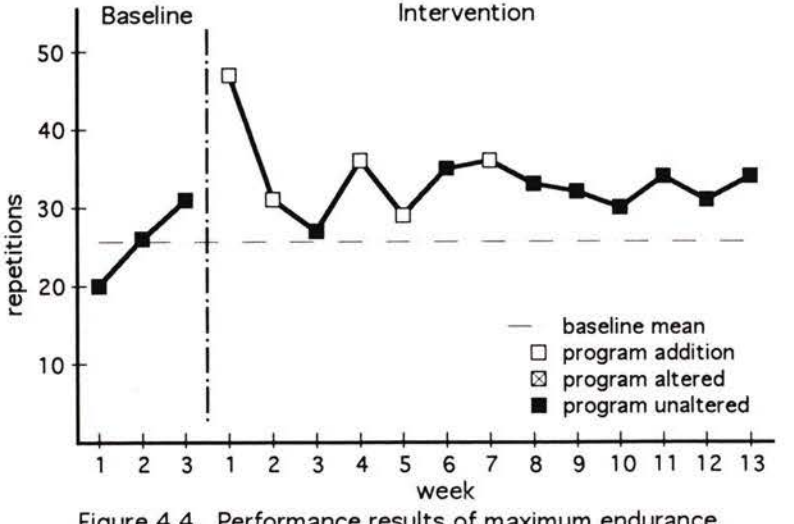

Figure 4.4. Performance results of maximum endurance for Leg Extension.

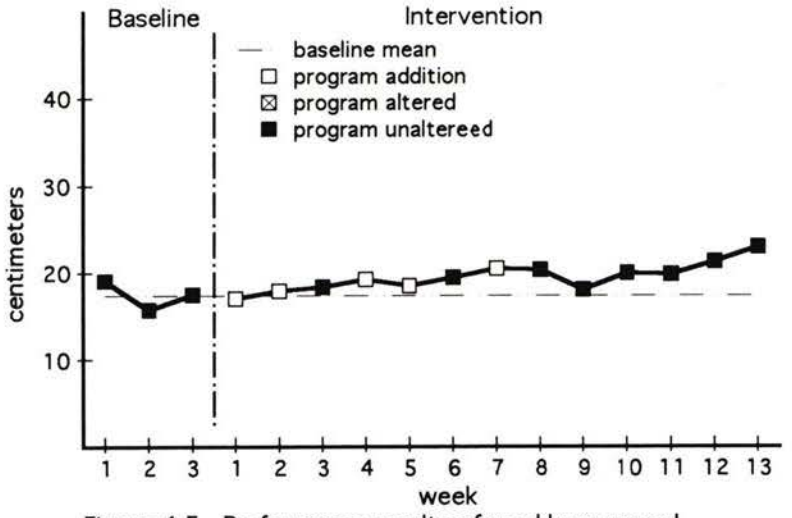

Figure 4.5. Performance results of weekly averaged trials for Flexibility.

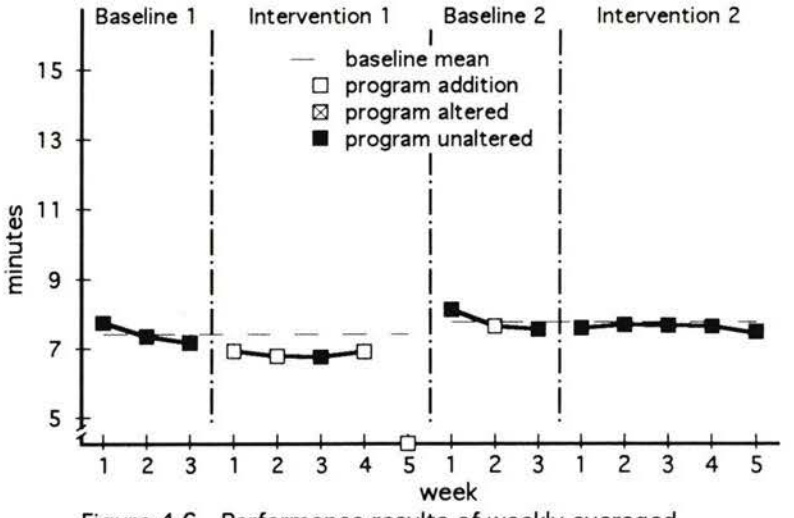

Figure 4.6. Performance results of weekly averaged trials for the Self-Paced Walk.

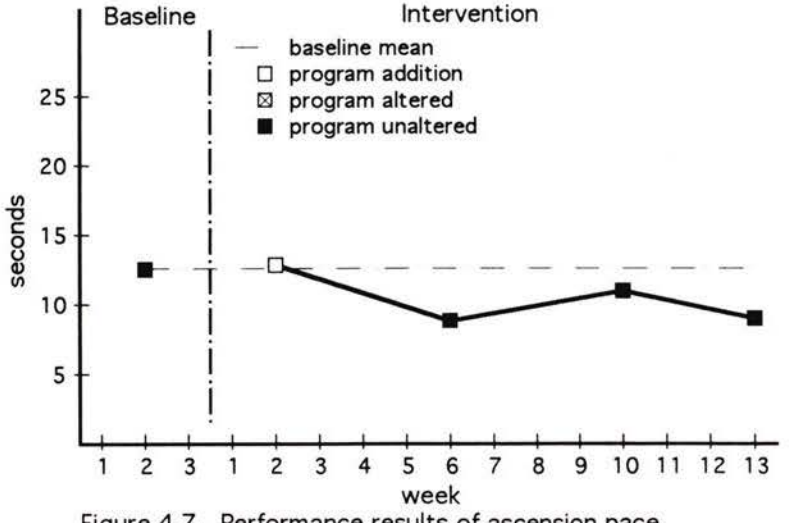

Figure 4.7. Performance results of ascension pace for the Weighted Stair Climb.

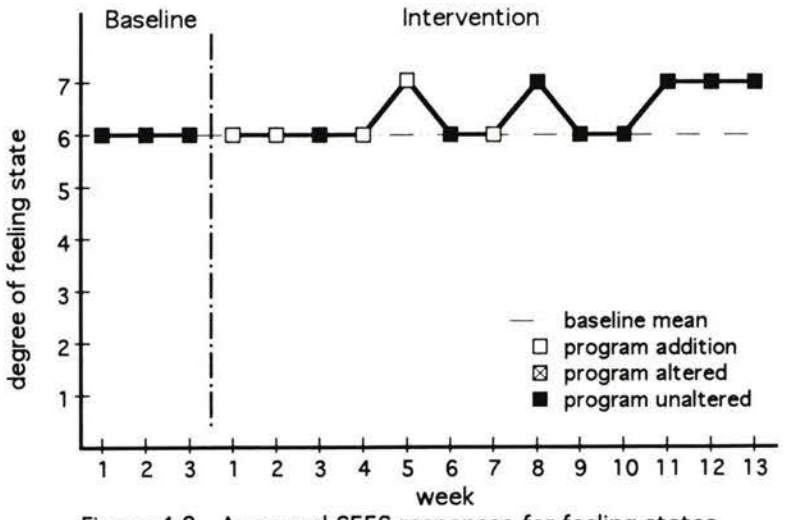

Figure 4.8. Averaged SEES responses for feeling states of Positive Well-Being.

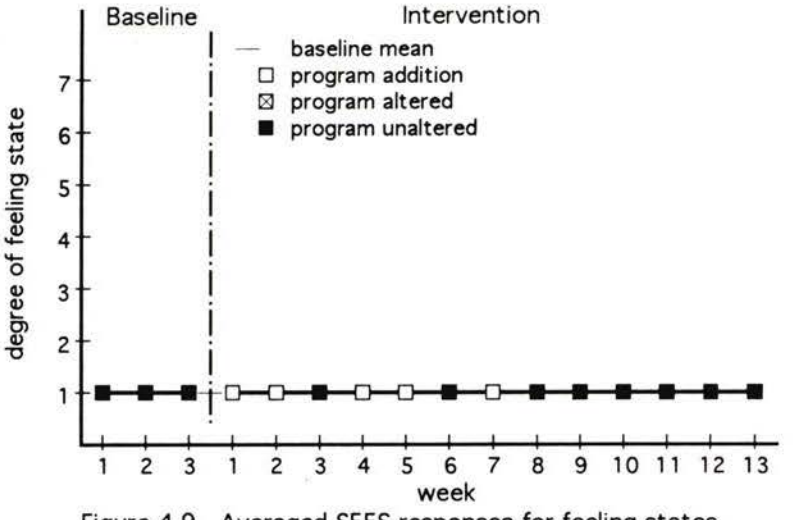

Figure 4.9. Averaged SEES responses for feeling states of Psychological Distress.

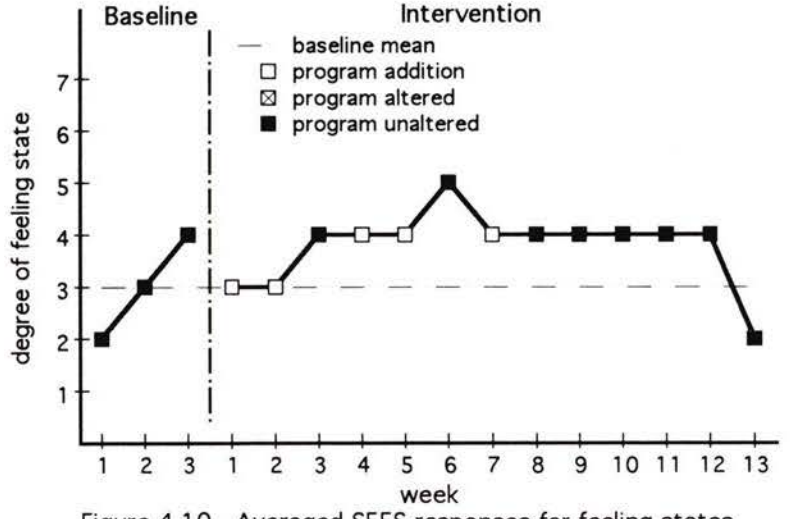

Figure 4.10. Averaged SEES responses for feeling states of Fatigue.

Participant P05

Participant P05 a 70 year old retired male, diagnosed with a degenerative spine at the L_4 - L_5 location. At the time of this study his condition required no medical treatment. He played tennis for two hours four times weekly and ran approximately 5 miles a day. This participant's adherence rate to this program was 87%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 5, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P05 are shown in Figure 5.1. His baseline resistance weight lifted in 1RM were 60 and 70 pounds with a mean of 65 pounds. Familiarization with the exercise equipment may have been an influencing factor in this variance in the baseline results. His intervention results increased relatively steadily from 70 to 95 pounds with a mean of 84.55 pounds, a 30% increase from the baseline mean.

The results for the BCend evaluation for participant P05 are shown in Figure 5.2. The resistance weight was set at 30 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 25 and 26 with a mean of 25.5 repetitions. His intervention results varied between 27 to 50 repetitions with a mean of 34.15 repetitions, a 34% increase from the baseline mean.

The results for the LEmax evaluation for participant P05 are shown in

Figure 5.3. His baseline resistance weight lifted in 1RM ranged from 100 to 110 pounds with a mean of 105 pounds. His intervention results steadily increased from 120 to 150 pounds with a mean of 130 pounds, a 24% increase from the baseline mean.

The results for the LEend evaluation for participant P05 are shown in Figure 5.4. The resistance weight assigned to this participant was 50 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results ranged from 24 to 40 repetitions with a mean of 32 repetitions. It is difficult to determine why there was a baseline trend. His intervention results increased steadily from 46 and up to 80 repetitions with a mean of 60.67 repetitions, a 90% increase from the baseline mean.

The results for the flexibility evaluation for participant P05 are shown in Figure 5.5. His baseline results ranged from 10.67 to 16.5 centimeters with a mean of 13.78 centimeters. Again, it was difficult to determine why there was a baseline trend. His intervention results varied between 0 and 12 centimeters with a mean of 6.41 centimeters, a 53% decrease from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P05 are shown in Figure 5.6. His baseline 1 results ranged from 8.63 to 7.69 minutes with a mean of 8.09 minutes. His intervention 1 results varied between 8.77 and 7.76 minutes with a mean of 8.26 minutes, a 2% decrease in gait velocity from the baseline 1 mean. Over the course of intervention 1 the participant

chose to decrease gait pace to help manage levels of anxiety which seemed to increase simultaneously with increases gait pace. His baseline 2 results ranged from 9.68 to 9.36 minutes with a mean of 9.52 minutes. His intervention 2 results ranged from 9.25 to 9.01 minutes with a mean of 9.11 minutes, a 4% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P05 are shown in Figure 5.7. His baseline ascension pace was established at 10.07 seconds. His intervention results uniformly decreased from 10.44 to 7.79 seconds with a mean of 9 seconds, an 11% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E5.8. On week 1 of the intervention phase this participant had an anxiety attack, an external influence which appeared to have a significant effect of the subjective well-being results.

The responses regarding positive well-being from the SEES questionnaire for participant P05 are shown in Figure 5.8. His baseline results remained constant, establishing a mean of 6. His intervention results were constant, with the exception of week 1, establishing the mean at 6.

The responses regarding psychological distress from the SEES questionnaire for participant P05 are shown in Figure 5.9. His baseline results

varied between 2 and 1 with a mean of 2. His intervention results varied between 5 and 1 with a mean of 2.

The responses regarding fatigue from the SEES questionnaire for participant P05 are shown in Figure 5.10. His baseline results varied between 3 and 4 with a mean of 3. His intervention results varied between 6 to 2 with a mean 3.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 31/35 (89%). His post-study SWLS questionnaire responses yielded a score of 30/35 (86%).

Summary

Participant P05 had a very active physical lifestyle which included running and a great love of tennis. His character was very upbeat and aggressive, in that he always seemed to be positive in all activities and he always worked hard to improve over his last achievement, "competitiveness against self felt good." Over the program's intervention phase, he demonstrated improvements in both his muscular strength and muscular endurance evaluations, even though he sustained some injuries from playing tennis. His week three results for flexibility were effected by a pulled hamstring muscle from a tennis match. From weeks 4 to 13 he worked very hard to improve his flexibility. It should be noted that the observed flexibility results from weeks 4 to 13 indicated a continual trend of improvement with a recovery of approximately 300% over this time frame.

The self-paced walk results indicated minimal change in gait pace over time. It may be of important to note however, that this participant had commented on the "raised anxiety levels" experienced during this evaluation seemed to have "decreased over time." The weighted stair climb noted an overall positive trend of improvement in his ascension pace. The degree of feeling states with regards to his responses to the SEES questionnaire appeared to be unaffected by the exercise program. There was minimal change reported from his responses to the SWLS. This participant gave the continual impression that he was a very high-spirited man and who expected himself to work hard at whatever he was doing. He appeared quite content with his life in general.

Table 5

P05: External Influences Recorded During the Intervention Phase

	Week	External Influence(s)
1	F	anxiety attack
3	M	pulled hamstring muscles playing tennis over the weekend
4	MWF	increased tennis activity
9	MF	arm stiff with discomfort, sore ankle and bruised shins from tennis tournament
10	F	strained muscles from lifting logs

Note. No external influences were recorded on the intervention weeks not indicated.

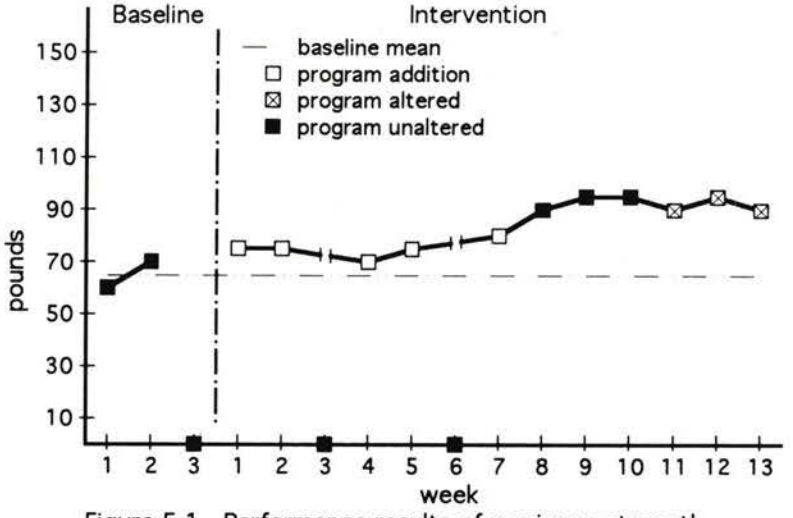

Figure 5.1. Performance results of maximum strength for Biceps Curl.

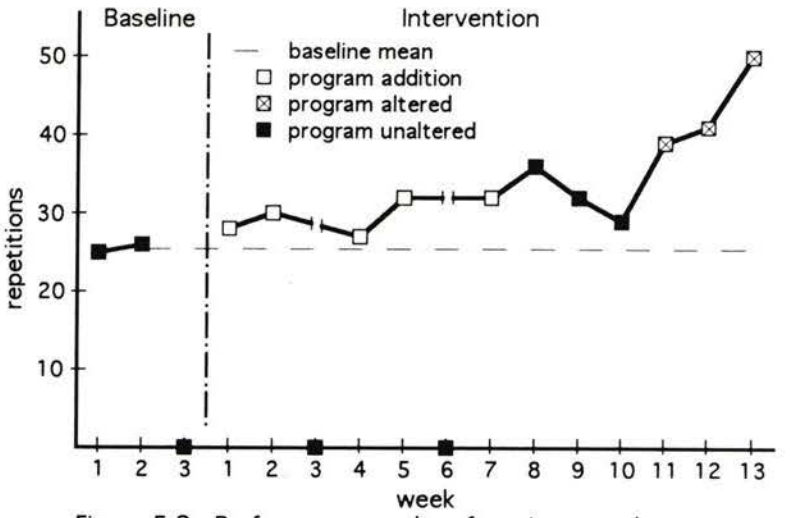

Figure 5.2. Performance results of maximum endurance for Biceps Curl.

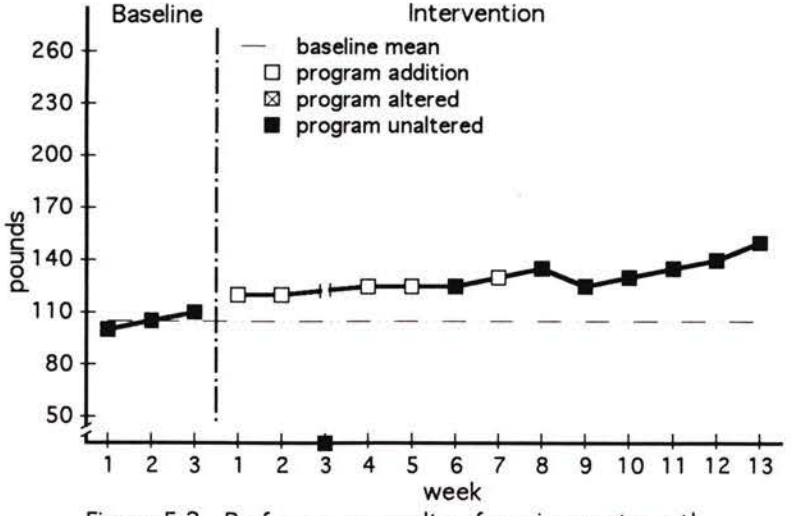

Figure 5.3. Performance results of maximum strength for Leg Extension.

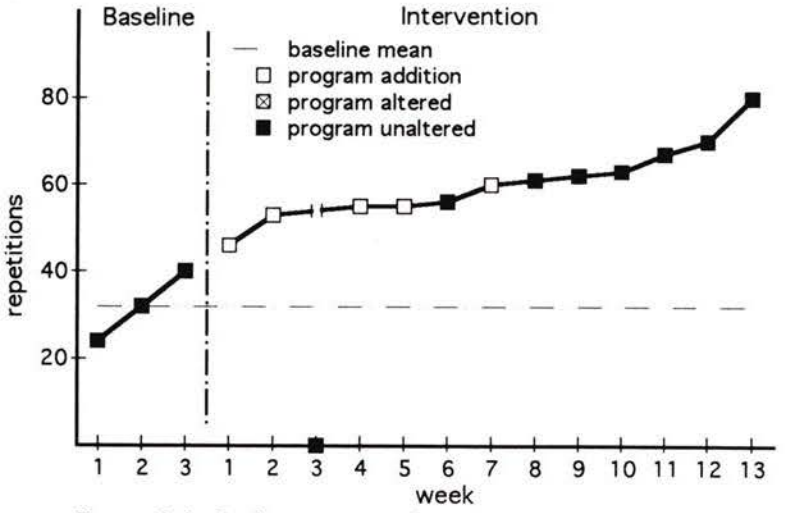

Figure 5.4. Performance results of maximum endurance for Leg Extension.

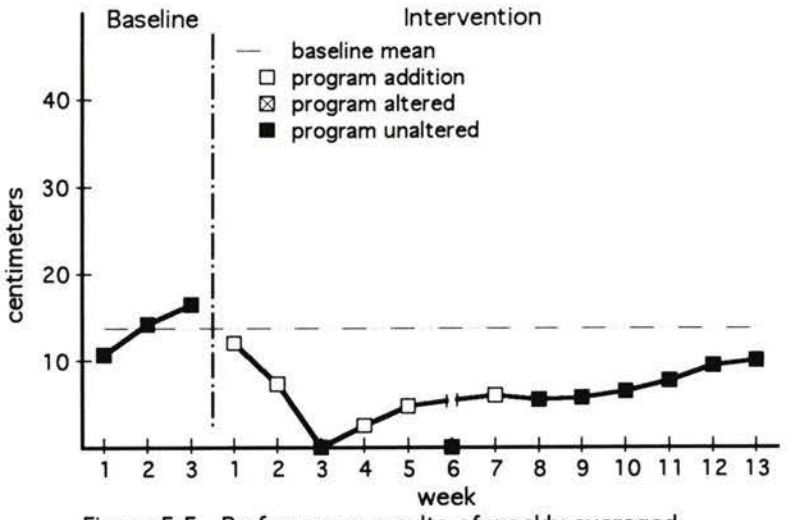

Figure 5.5. Performance results of weekly averaged trials for Flexibility.

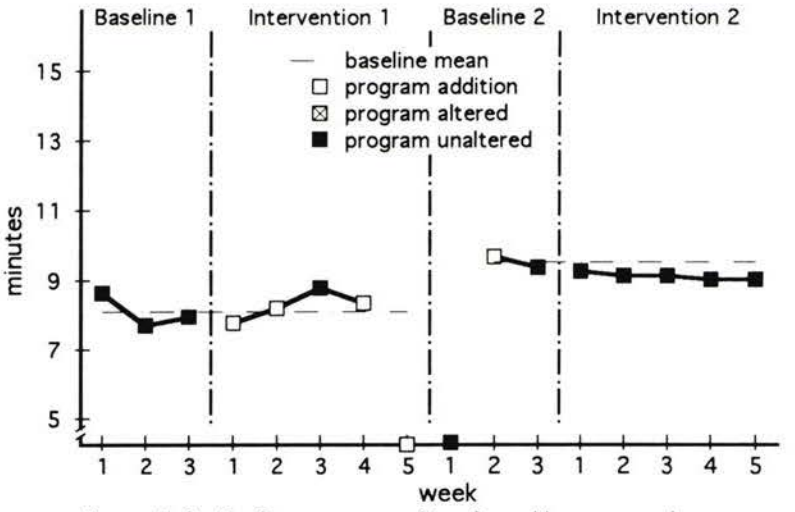

Figure 5.6. Performance results of weekly averaged trials for the Self-Paced Walk.

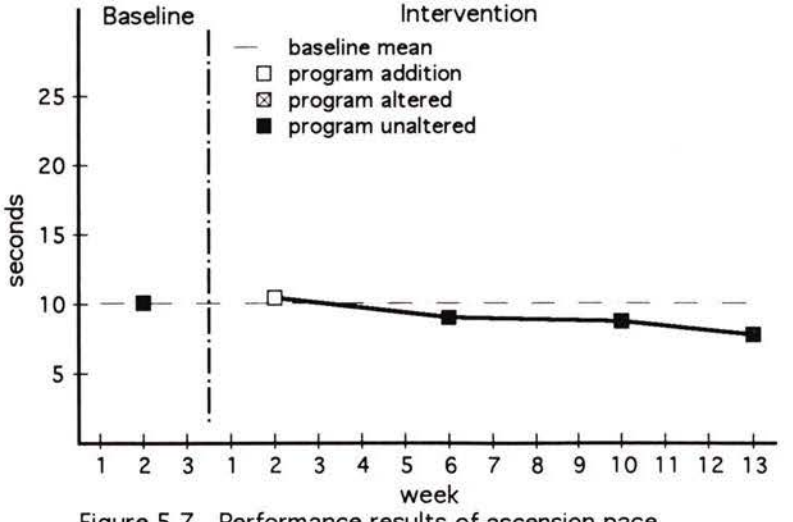

Figure 5.7. Performance results of ascension pace for the Weighted Stair Climb.

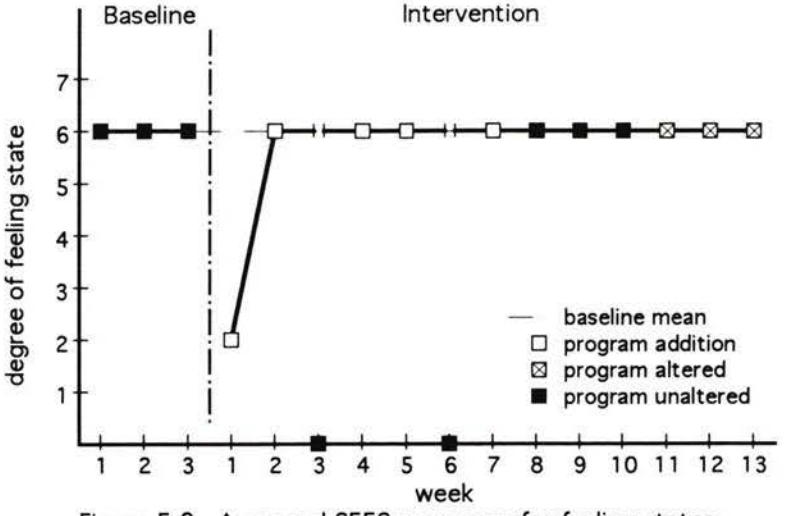

Figure 5.8. Averaged SEES responses for feeling states of Positive Well-Being.

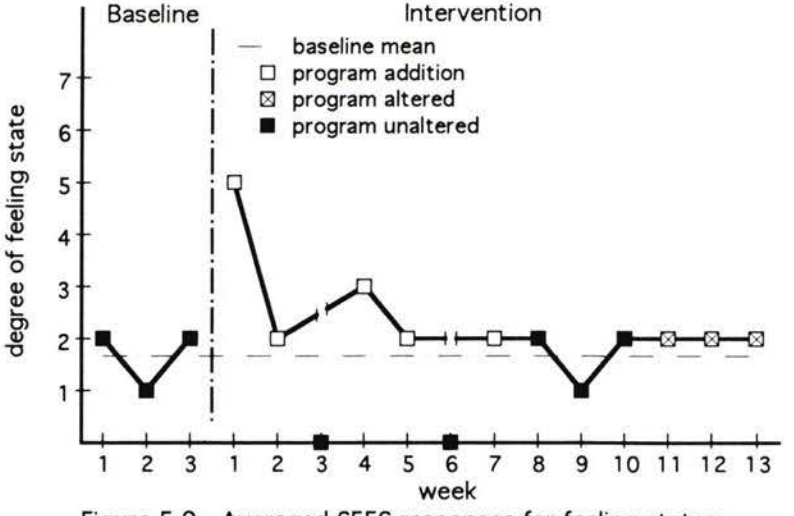

Figure 5.9. Averaged SEES responses for feeling states of Psychological Distress.

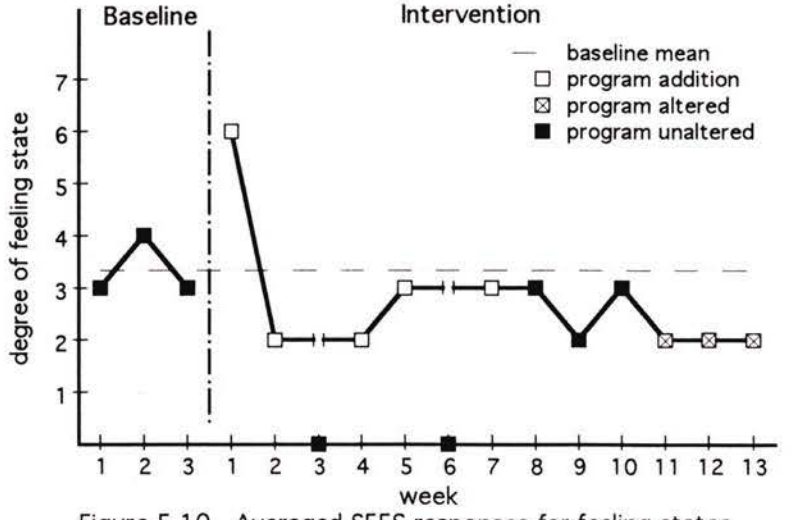

Figure 5.10. Averaged SEES responses for feeling states of Fatigue.

Participant P06

Participant P06 a 71 year old retired female medically diagnosed with osteoporosis and hypertension. At the time of this study these conditions were being controlled by Didronel, Norvasc, Estrogen, and Premarin. This participant was very active in the community as well as a caregiver for her family. Other fitness activities consisted of self-prescribed home exercises performed for about 20 minutes on a daily basis, and walking two to three times per week with a group of friends.

Once her full exercise program was in place, week 7, she had reported being very exhausted in the afternoons after exercising to the point where she felt she needed a sleep. This interfered with her regular busy routine so her program was altered to suit. This participant's adherence rate to the program was 91%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 6, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P06 are shown in Figure 6.1. Her baseline resistance weight lifted in 1RM were 25 and 30 pounds with a mean of 27.5 pounds. Her intervention results uniformly increased from 30 to 45 pounds with a mean of 36.82 pounds, a 34% increase from the baseline mean.

The results for the BCend evaluation for participant P06 are shown in Figure 6.2. The resistance weight was set at 12.5 pounds performed to

volitional fatigue at a cadence of 50 bpm. Her baseline results were 15 and 18 repetitions with a mean of 16.5 repetitions. Her intervention results varied between 16 to 45 repetitions with a mean of 29.82 repetitions, an 81% increase from the baseline mean.

The results for the LEmax evaluation for participant P06 are shown in Figure 6.3. Her baseline resistance weight lifted in 1RM varied between 80 and 95 pounds with a mean of 88.33 pounds. Her intervention results ranged from 90 to 110 pounds with a mean of 102.8 pounds, a 16% increase from the baseline mean.

The results for the LEend evaluation for participant P06 are shown in Figure 6.4. The resistance weight assigned to this participant was 47.5 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results ranged from 13 to 12 repetitions with a mean of 12.67 repetitions. Her intervention results varied between 12 to 15 repetitions with a mean of 14.25 repetitions, a 12% increase from the baseline mean.

The results for the flexibility evaluation for participant P06 are shown in Figure 6.5. Her baseline results were between 31.75 to 33 centimeters with a mean of 32.17 centimeters. Her intervention results ranged between 31.5 to 37.67 centimeters with a mean of 34.29 centimeters, a 7% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P06 are shown in Figure 6.6. Her baseline 1 results ranged between 8.20 and 7.85

minutes with a mean of 7.99 minutes. Her intervention 1 results ranged from 7.75 to 7.21 minutes with a mean of 7.47 minutes, a 7% increase in gait velocity from the baseline 1 mean. Her baseline 2 results ranged from 8.58 to 8.40 minutes with a mean of 8.5 minutes. Her intervention 2 results were between 8.5 and 8.34 minutes with a mean of 8.39 minutes, a 1% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P06 are shown in Figure 6.7. Her baseline ascension pace was established at 14.41 seconds. Her intervention results were between 12.26 and 10.09 seconds with a mean of 11.19 seconds, a 22% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E6.8.

The responses regarding positive well-being from the SEES questionnaire for participant P06 are shown in Figure 6.8. Her baseline results ranged from 6 to 5 with a mean of 6. Her intervention results varied between 6 and 4 with a mean 5.

The responses regarding psychological distress from the SEES questionnaire for participant P06 are shown in Figure 6.9. Her baseline results remained constant, establishing a mean of 1. Her intervention results also remained relatively constant establishing a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P06 are shown in Figure 6.10. Her baseline results were between 1 and 2 with a mean of 1. Her intervention results varied between 4 and 1 with a mean 2.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). Her pre-study SWLS questionnaire responses yielded a score of 29/35 (83%). Her post-study SWLS questionnaire responses yielded a score of 29/35 (83%).

Summary

Even though participant P06 had a bladder infection as well as other external influences throughout the program duration some positive results were recorded. To what degree the external influences affected performance results was difficult to determine. Her muscular strength and, for the most part, muscular endurance evaluation results indicated a modest trend of improvement. Her flexibility results had also indicated a modest trend of improvement. It is quite possible that this participant was reaching her optimal level of performance.

In regards to the self-paced walk, because she was already an active walker, it may be possible that she was performing at close to her optimal level. The weighted stair-climb results noted a very good improvement in her ascension pace.

Although the positive well-being results indicated a decrease, it should be noted that external influences recorded may have had some effect. Her

degrees of feeling states for psychological distress and life satisfaction responses indicated no changes. This participant seemed to be light-hearted and very dedicated throughout the program. Her fatigue results did increase, but it was difficult to determine the degree of effect the external influences may have had on her responses.

Table 6

P06: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1	F	cracked rib while reaching over baby crib
4	MWF	bladder infection
5	F	personal related stress, poor sleep
8	F	poor sleep, vertigo
10, 12, & 13	MWF	poor sleep, dehydrated

Note. No external influences were recorded on the intervention weeks not indicated.

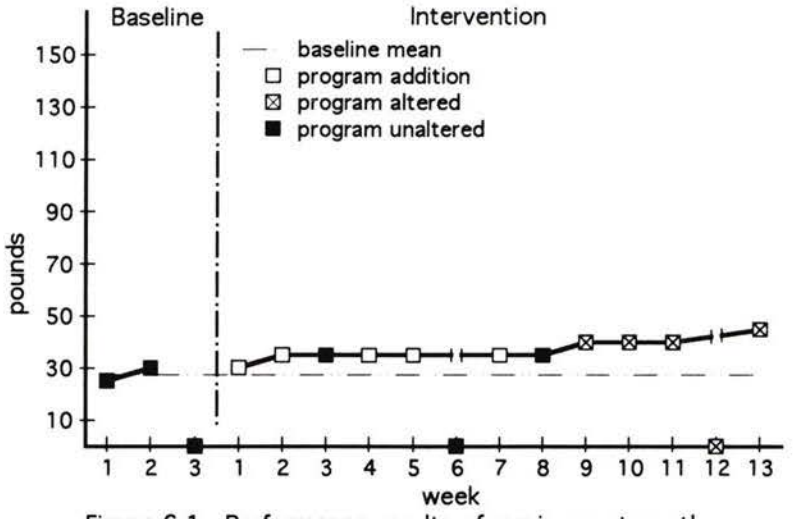

Figure 6.1. Performance results of maximum strength for Biceps Curl.

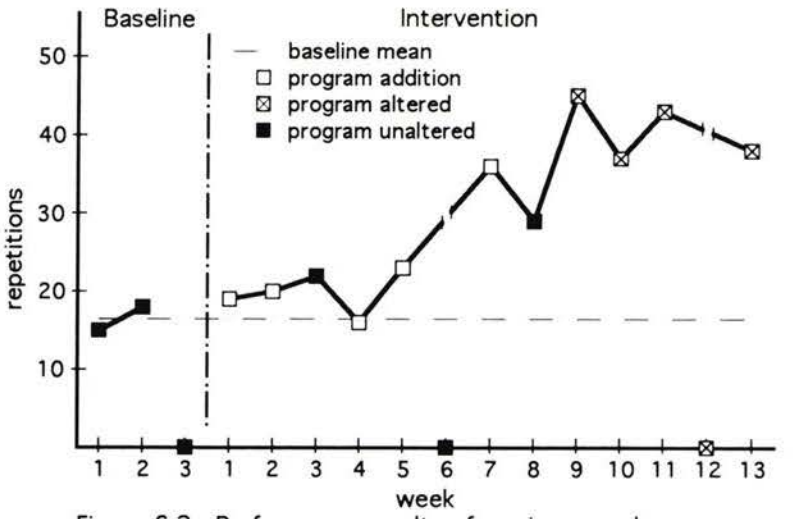

Figure 6.2. Performance results of maximum endurance for Biceps Curl.

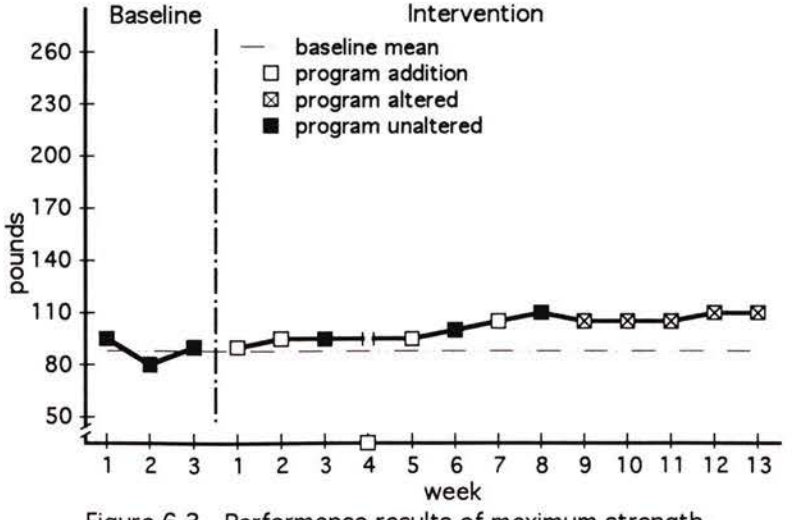

Figure 6.3. Performance results of maximum strength for Leg Extension.

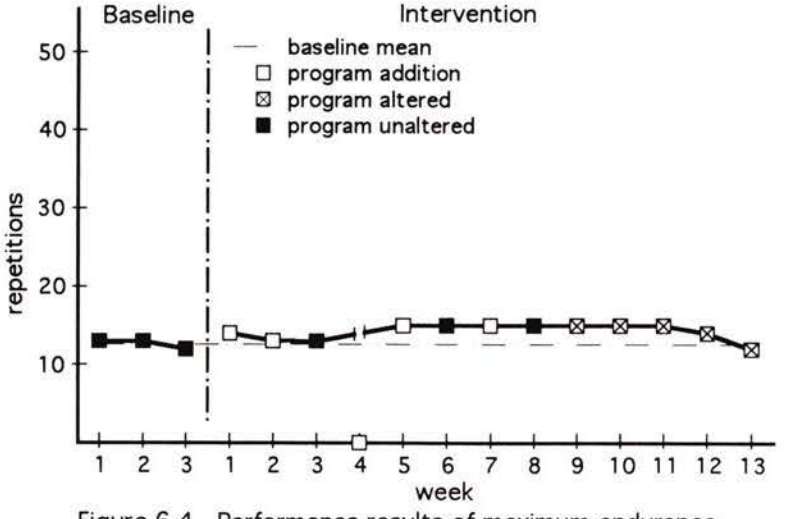

Figure 6.4. Performance results of maximum endurance for Leg Extension.

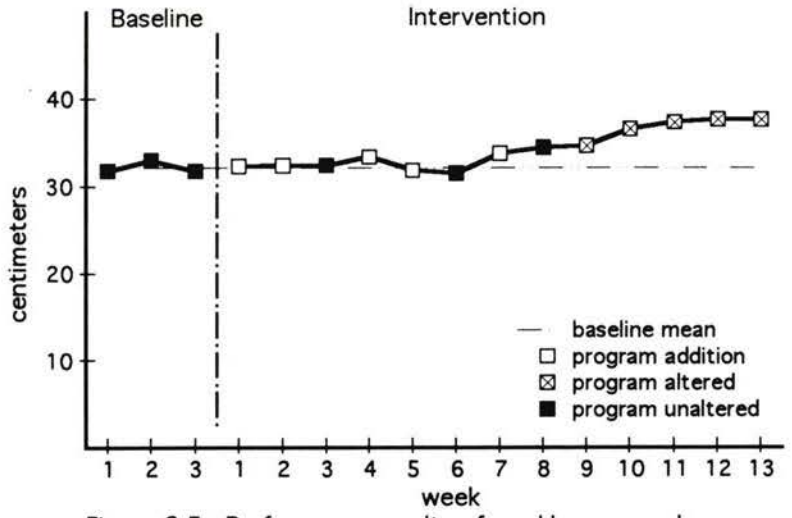

Figure 6.5. Performance results of weekly averaged trials for Flexibility.

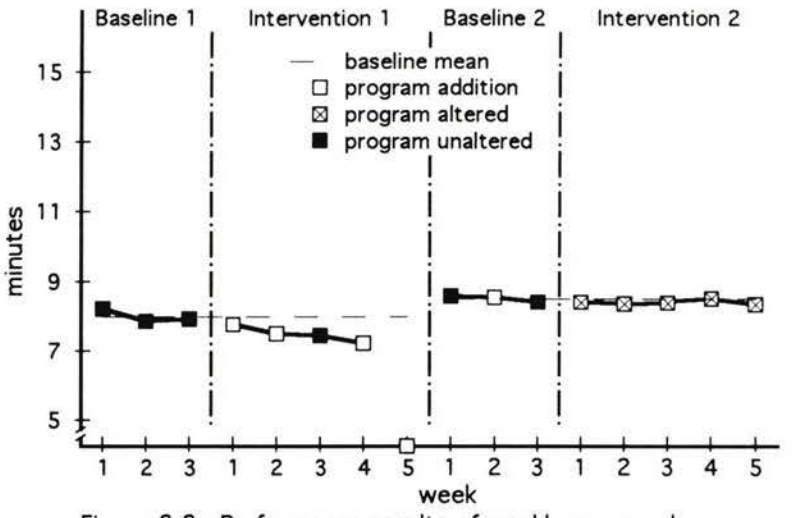

Figure 6.6. Performance results of weekly averaged trials for the Self-Paced Walk.

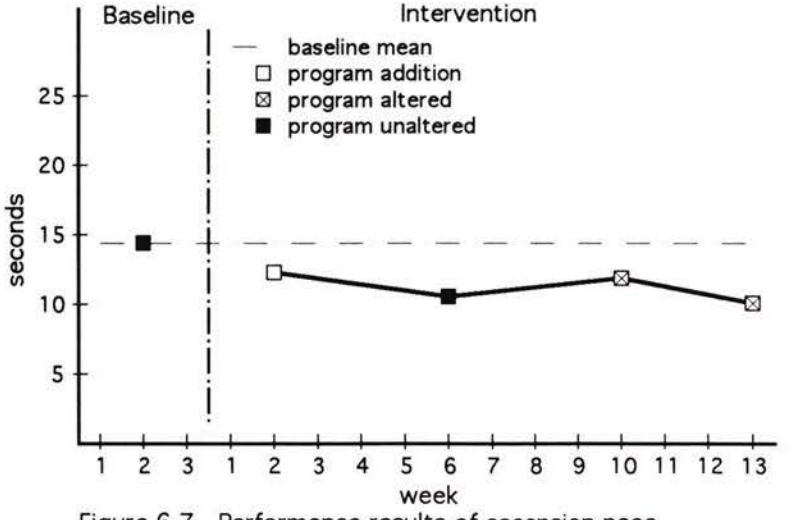

Figure 6.7. Performance results of ascension pace for the Weighted Stair Climb.

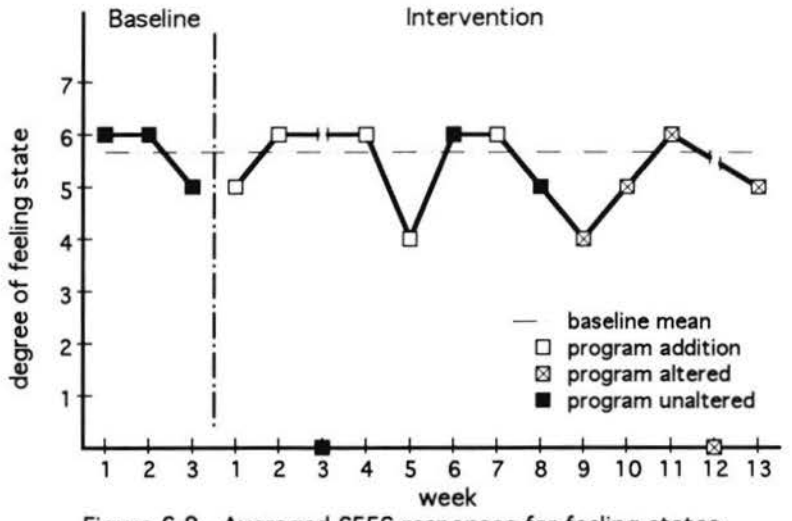

Figure 6.8. Averaged SEES responses for feeling states of Positive Well-Being.

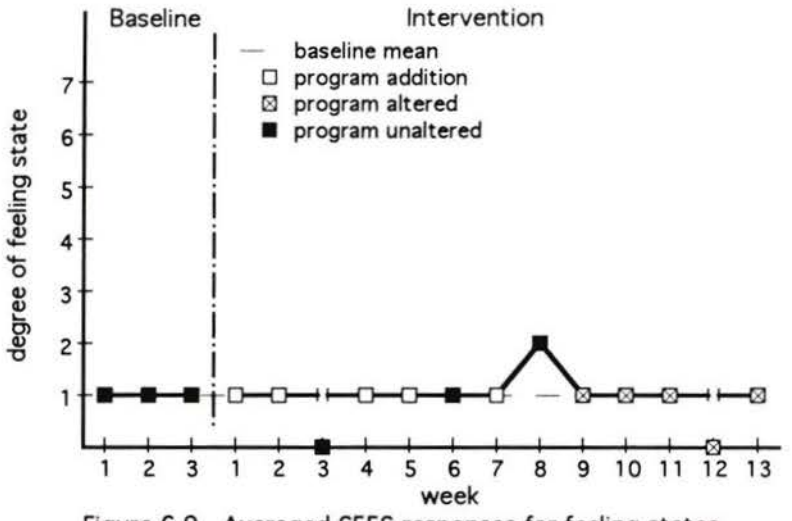

Figure 6.9. Averaged SEES responses for feeling states of Psychological Distress.

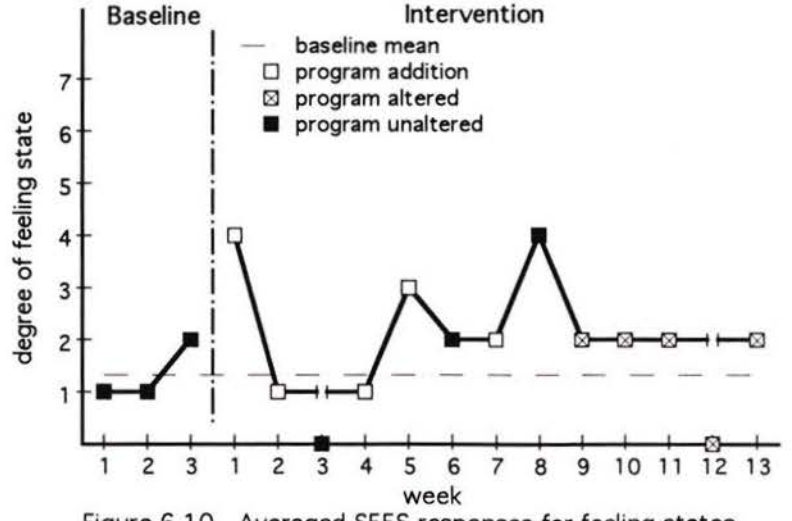

Figure 6.10. Averaged SEES responses for feeling states of Fatigue.

Participant P07

Participant P07 a 72 year old retired male with a history of prostrate cancer which was in remission at the time of this study. This condition required no medication or treatment over the course of the program. His leisure activities consisted of walking for approximately 60 minutes 3 to 4 times weekly, swimming daily, and he sailed occasionally. This participant's adherence rate to the program was 93%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 7, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P07 are shown in Figure 7.1. His baseline resistance weight lifted in 1RM established a mean of 55 pounds. His intervention results started at 55 pounds and varied up to 80 pounds with a mean of 68.75 pounds, a 25% increase from the baseline mean.

The results for the BCend evaluation for participant P07 are shown in Figure 7.2. The resistance weight was set at 27.5 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results indicated a mean of 20 repetitions. His intervention results varied between 15 and 49 repetitions with a mean of 31.75 repetitions, a 59% increase from the baseline mean.

The results for the LEmax evaluation for participant P07 are shown in Figure 7.3. His baseline resistance weight lifted in 1RM remained constant, establishing a mean of 90 pounds. His intervention results uniformly

increased from 100 to 135 pounds with a mean of 119.23 pounds, a 32% increase from the baseline mean.

The results for the LEend evaluation for participant P07 are shown in Figure 7.4. The resistance weight assigned to this participant was 45 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 20 and 18 repetitions with a mean of 19 repetitions. His intervention results varied between 17 and 35 repetitions with a mean of 25.62 repetitions, a 35% increase from the baseline mean.

The results for the flexibility evaluation for participant P07 are shown in Figure 7.5. His baseline results were 12.58 and 14.25 centimeters with a mean of 13.42 centimeters. His intervention results ranged from 9.92 to 14.42 centimeters with a mean of 12.38 centimeters, an 8% decrease from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P07 are shown in Figure 7.6. His baseline 1 results were 8.34 and 8.05 minutes with a mean of 8.20 minutes. His intervention 1 results were 8.01 to 7.51 minutes with a mean of 7.72 minutes, a 6% increase in gait velocity from the baseline 1 mean. His baseline 2 results were between 8.60 and 8.49 minutes with a mean of 8.55 minutes. His intervention 2 results varied between 8.64 and 8.26 minutes with a mean of 8.43 minutes, a 1% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P07

are shown in Figure 7.7. His baseline ascension pace was established at 11.58 seconds. His intervention results varied between 12.30 and 10.42 seconds with a mean of 11.71 seconds, a 1% decrease in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E7.8.

The responses regarding positive well-being from the SEES questionnaire for participant P07 are shown in Figure 7.8. His baseline results remained constant, establishing a mean of 6. His intervention results varied between 4 and 6 with a mean 5.

The responses regarding psychological distress from the SEES questionnaire for participant P07 are shown in Figure 7.9. His baseline results were 2 and 1 with a mean of 2. His intervention results remained constant, establishing a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P07 are shown in Figure 7.10. His baseline results remained constant establishing a mean of 4. His intervention results varied between 4 and 2 with a mean 4.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 32/35 (91%). His post-study SWLS questionnaire responses yielded a

score of 32/35 (91%).

Summary

In support of his noted improvements in muscular strength and muscular endurance participant P07 commented on how he "felt successful in achieving better strength" and that he noticed portaging his canoe was "much easier" than he remembered in the past. This participant found the flexibility evaluation the most difficult to perform. At the end of week 3 it was discovered that this participant was not performing the flexibility component of the exercise prescription. From weeks 4 to 13 a gradual improvement was recorded, as this participant was prescribed extra flexibility exercises to do on the days he did not attend the program.

To what extent the noted external influences regarding knee discomfort affected his results for the self-paced walk and the stair-climb was difficult to determine. Improvements demonstrated in the lower body muscular strength and muscular endurance evaluations may not have been affected by this external influence as these evaluations involved a different type of applied loading.

The SEES results recorded a decrease in positive well-being, it may be possible that some other unknown or uncommunicated external influence may have been a factor. The psychological distress and fatigue results indicated minimal to no change in the degree of feeling states. Life satisfaction for this participant remained constant, throughout this study he appeared to be quite high-spirited and most eager to learn more.

Table 7

P07: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1 & 2	MWF	dehydrated
3	MF	poor sleep
5	F	knee discomfort
9	MF	dehydrated, poor sleep, discomfort in knee
11	F	leg muscle discomfort, poor sleep
12 & 13	M	chopped wood on weekends

Note. No external influences were recorded on the intervention weeks not indicated.

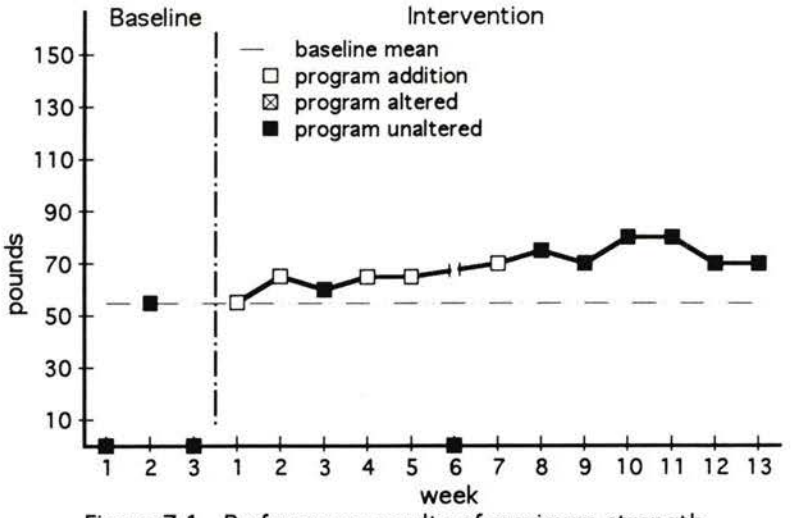

Figure 7.1. Performance results of maximum strength for Biceps Curl.

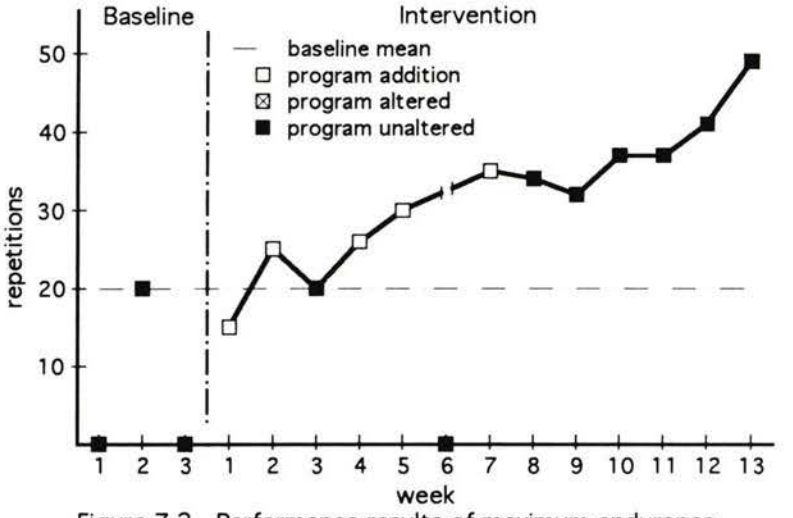

Figure 7.2. Performance results of maximum endurance for Biceps Curl.

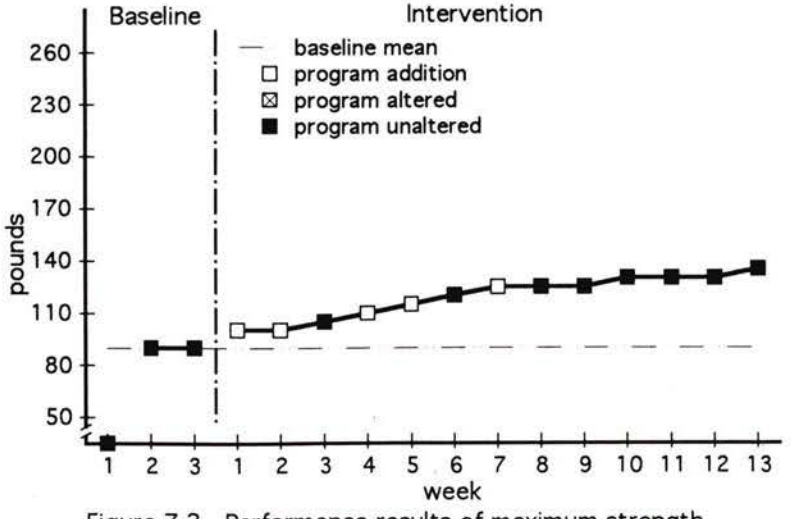

Figure 7.3. Performance results of maximum strength for Leg Extension.

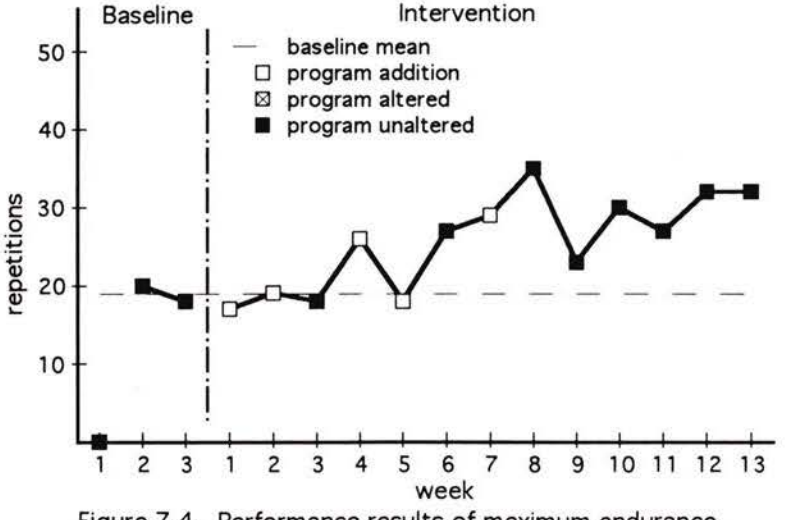

Figure 7.4. Performance results of maximum endurance for Leg Extension.

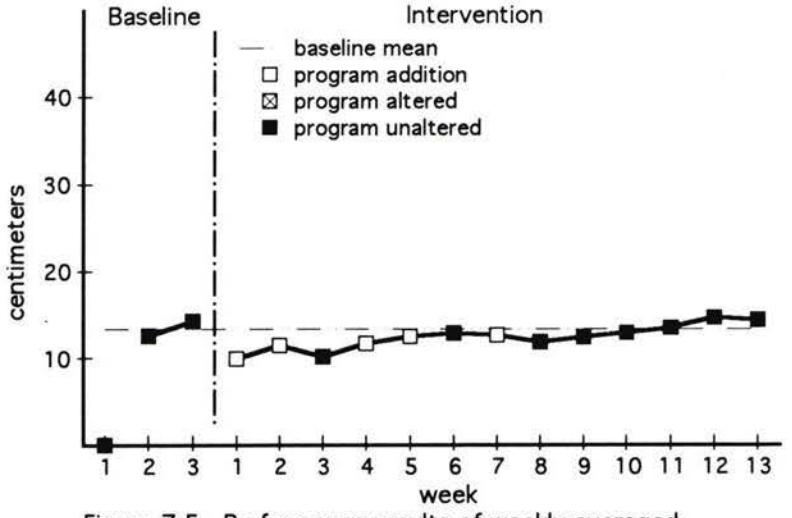

Figure 7.5. Performance results of weekly averaged trials for Flexibility.

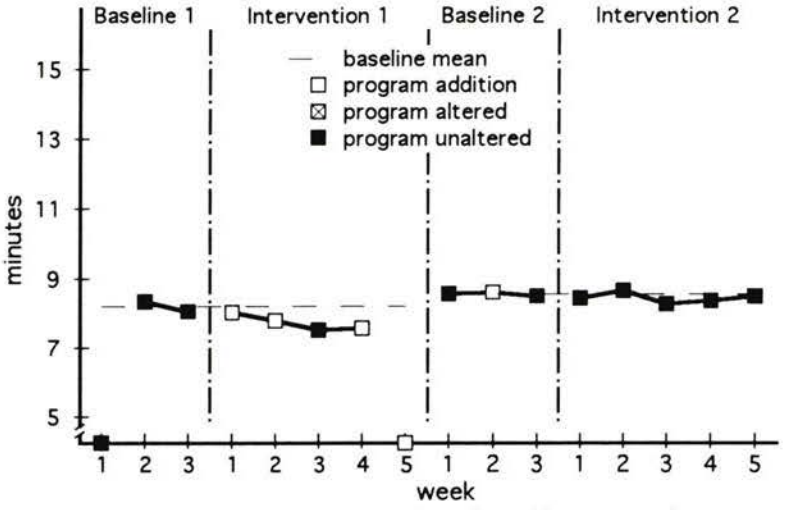

Figure 7.6. Performance results of weekly averaged trials for the Self-Paced Walk.

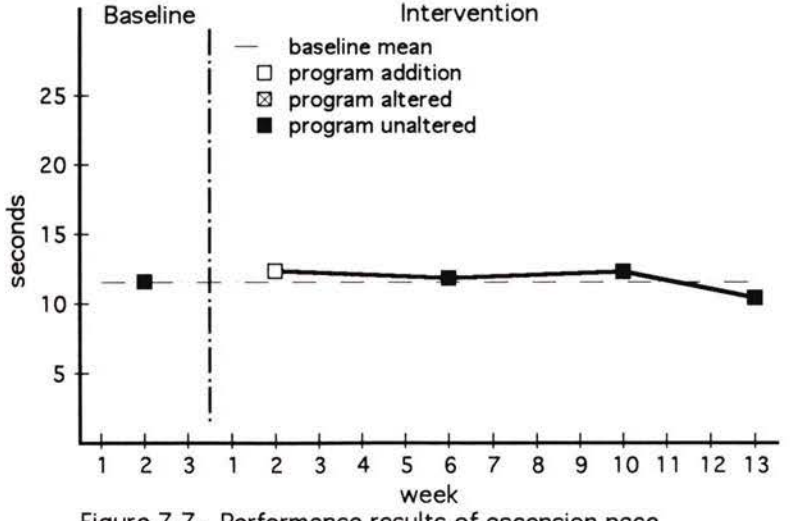

Figure 7.7. Performance results of ascension pace for the Weighted Stair Climb.

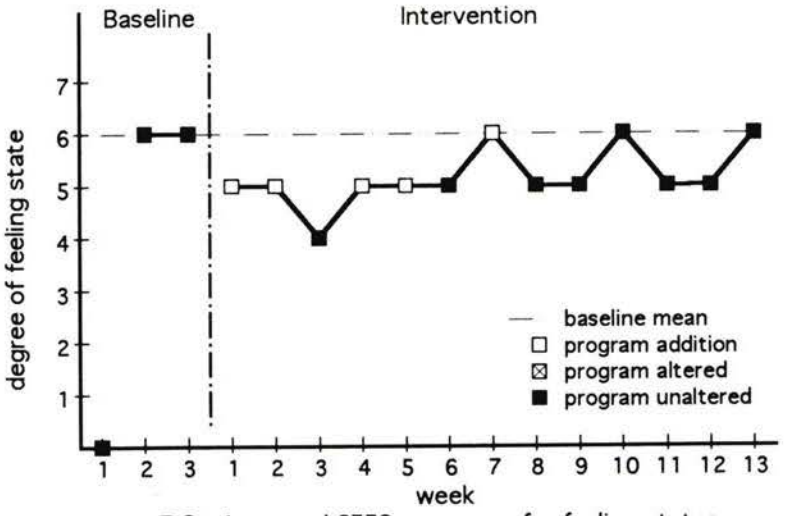

Figure 7.8. Averaged SEES responses for feeling states of Positive Well-Being.

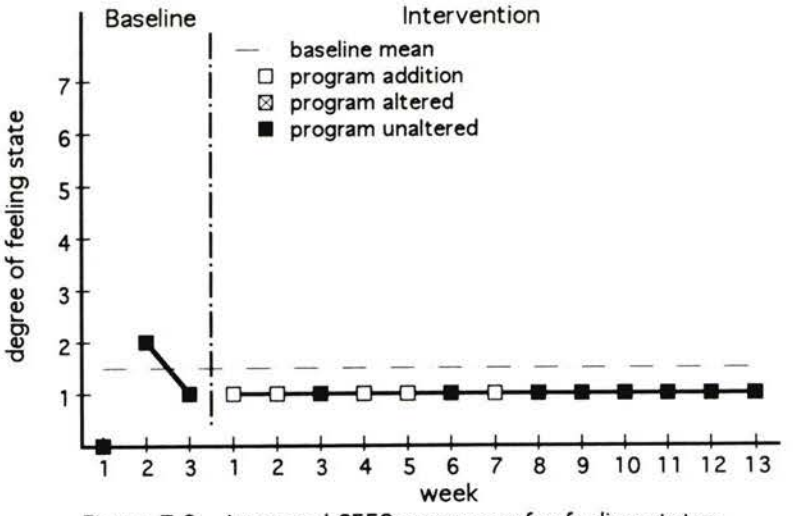

Figure 7.9. Averaged SEES responses for feeling states of Psychological Distress.

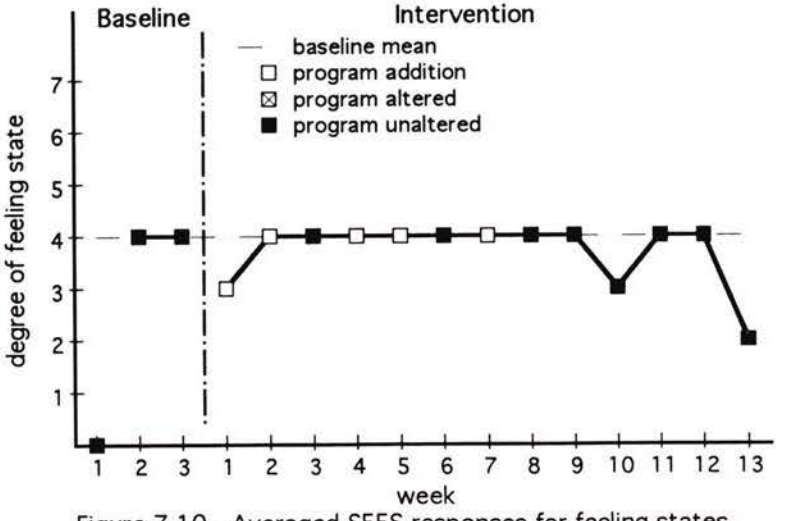

Figure 7.10. Averaged SEES responses for feeling states of Fatigue.

Participant P08

Participant P08 a 74 year old female who was diagnosed with osteoporosis. At the time of this study this participant was medically prescribed Premarin and Prozac. She swam daily for approximately one hour, occasionally performed self-prescribed home exercises, and walked a friends dog daily for 45 to 60 minutes prior to attending each of the program sessions. This participant's adherence rate to the program was 89%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 8, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P08 are shown in Figure 8.1. Her baseline resistance weight lifted in 1RM results remained constant, establishing a mean of 35 pounds. Her intervention results ranged from starting at 30 pounds and up to 45 pounds with a mean of 35.9 pounds, a 3% increase from the baseline mean.

The results for the BCend evaluation for participant P08 are shown in Figure 8.2. The resistance weight was set at 17.5 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results established a mean of 10 repetitions. Her intervention results varied between 12 and 41 repetitions with a mean of 25.2 repetitions, an 152% increase from the baseline mean.

The results for the LEmax evaluation for participant P08 are shown in

Figure 8.3. Her baseline resistance weight lifted in 1RM results remained constant, establishing a mean of 80 pounds. Her intervention results varied between 85 and 95 pounds with a mean of 89.6 pounds, a 12% increase from the baseline mean.

The results for the LEend evaluation for participant P08 are shown in Figure 8.4. The resistance weight assigned to this participant was 40 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results ranged from 16 to 20 repetitions with a mean of 18.67 repetitions. Her intervention results varied between 20 and 32 repetitions with a mean of 26.9 repetitions, a 44% increase from the baseline mean.

The results for the flexibility evaluation for participant P08 are shown in Figure 8.5. Her baseline results ranged from 28.75 to 29.75 centimeters with a mean of 29.14 centimeters. Her intervention results varied between 27.5 and 33.08 centimeters with a mean of 31.16 centimeters, a 7% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P08 are shown in Figure 8.6. Her baseline 1 results ranged from 9.45 to 8.58 minutes with a mean of 8.99 minutes. It was difficult to determine why there was this baseline trend. Her intervention 1 results were between 8.63 and 8.45 minutes with a mean of 8.54 minutes, a 5% increase in gait velocity from the baseline 1 mean. Her baseline 2 results varied between 9.92 and 9.58 minutes with a mean of 9.72 minutes. Her intervention 2 results ranged from 9.64 to

9.40 minutes with a mean of 9.56 minutes, a 2% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P08 are shown in Figure 8.7. Her baseline ascension pace was established at 16.7 seconds. Her intervention results varied between 22.64 and 14.93 seconds with a mean of 19.24 seconds, a 15% decrease in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E8.8.

The responses regarding positive well-being from the SEES questionnaire for participant P08 are shown in Figure 8.8. Her baseline results remained constant, establishing a mean of 7. Her intervention results remained constant with a mean of 7.

The responses regarding psychological distress from the SEES questionnaire for participant P08 are shown in Figure 8.9. Her baseline results remained constant, establishing a mean of 1. Her intervention results remained constant with a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P08 are shown in Figure 8.10. Her baseline results remained constant, establishing a mean of 1. Her intervention results were between 3 and 1 with a mean 1.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). Her pre-study SWLS questionnaire responses yielded a score of 32/35 (91%). Her post-study SWLS questionnaire responses yielded a score of 29/35 (83%).

Summary

Participant P08 required considerable supervision and instruction time overall. She seemed to socialize frequently with whoever was nearby and she could easily be distracted. A typical program exercise session, designed to take approximately 90 minutes, would frequently take her upwards to 3 hours. It was difficult to determine why this consistently took so long; perhaps she enjoyed socializing, perhaps this may have been an effect of her medications.

Her muscular strength evaluation results indicated positive trends of improvement. It may be possible that given this participant's light body frame that her muscular strength performance was at optimal level. Increases in muscular endurance results however indicated noticeable improvements. Flexibility results for this participant noted a modest trend of improvement. The exceptions to this improvement trend in weeks 5 and 6 could have been an effect of the external influences recorded. Other expressed improvements in flexibility were commented on by the participant these included; increased neck mobility when shoulder checking in the car, easier to reach her back zippers, and able to reach higher into kitchen cupboards.

Her self paced walk results indicated modest trends of improved gait pace. This participant, because she was a frequent walker, may have been

near her optimal performance level. Other visual improvements noted in the walk test were observed in her posture and stride. It was difficult to interpret the weighted stair climb results. A combination of several factors may have had an affect including; her medication, a light body frame, as well as the external influences noted. She seemed to find it difficult to balance the weighted backpack, and initiating the first step of the climb was observed in weeks 6,10, and 13. The external influences on weeks 6 and 10 may also have had an effect on the results. She did however comment that she found climbing stairs outside of the program much easier "without the added weight."

This participant seemed generally in high-spirits throughout the program, which was indicated in the SEES positive well-being and psychological distress results. This participant's degree of feeling states for fatigue appeared unaffected by her performance over the course of the intervention. Perhaps this was because it took up to 3 hours to complete the exercise prescription. She mentioned that over the first half of the study she found herself to be tired the afternoons after her exercise program, but that this feeling subsided over the last half of the study. This participant also commented that she thought she was in good shape before commencement of this program, but soon realized a difference once into the exercise routine. Even though her life satisfaction responses indicated a decrease, there must have been some other uncommunicated issue as this participant had indicated an increase in self-confidence and a "great feeling of wellness."

Table 8

P08: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1	M	poor sleep
3 & 6	F	spent time cycling between LEmax and LEend evaluations
3, 4, &7	M	dehydrated, poor sleep, increased swimming, activity over weekends
5 & 6	MWF	sore hip and lower back
9 & 12	M	spent time cycling between LEmax and LEend evaluations
10	W	spent time on the stationary bike before the stair climb evaluation
11	M	personal related stress, poor sleep, increased stationary cycling and swimming over the weekend

Note. No external influences were recorded on the intervention weeks not indicated.

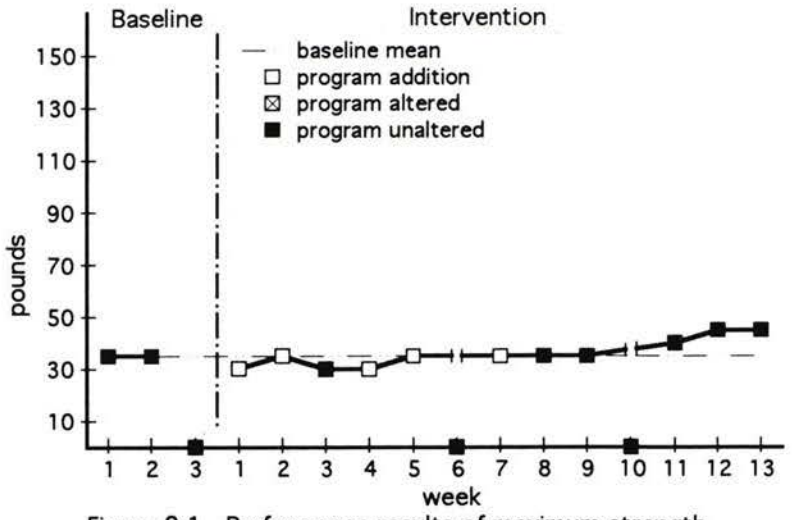

Figure 8.1. Performance results of maximum strength for Biceps Curl.

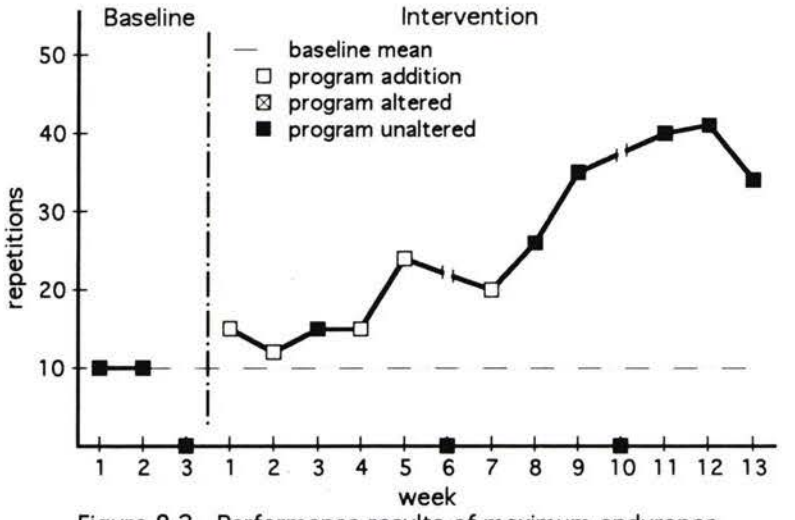

Figure 8.2. Performance results of maximum endurance for Biceps Curl.

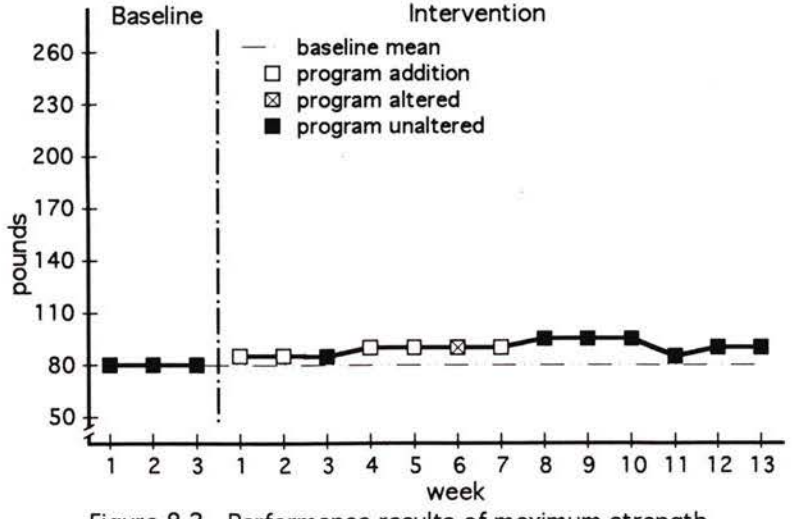

Figure 8.3. Performance results of maximum strength for Leg Extension.

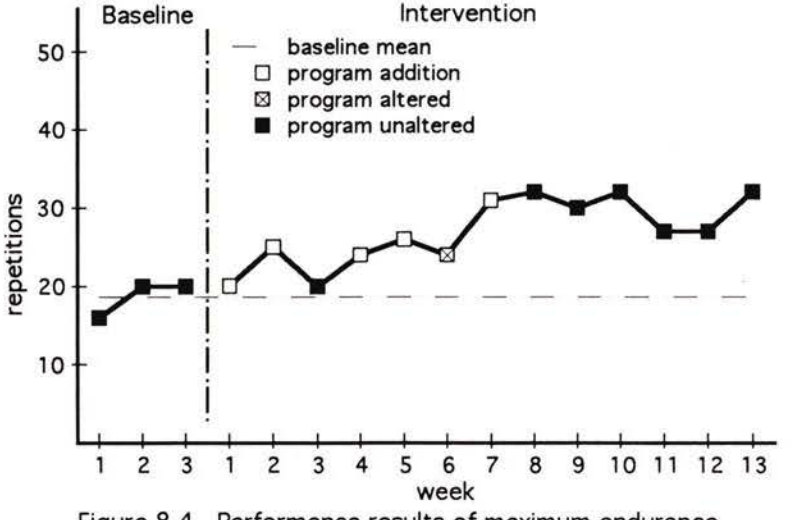

Figure 8.4. Performance results of maximum endurance for Leg Extension.

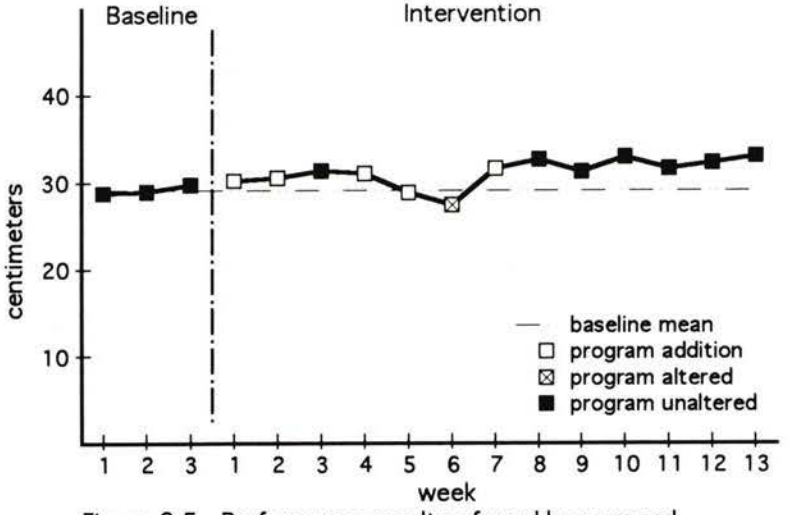

Figure 8.5. Performance results of weekly averaged trials for Flexibility.

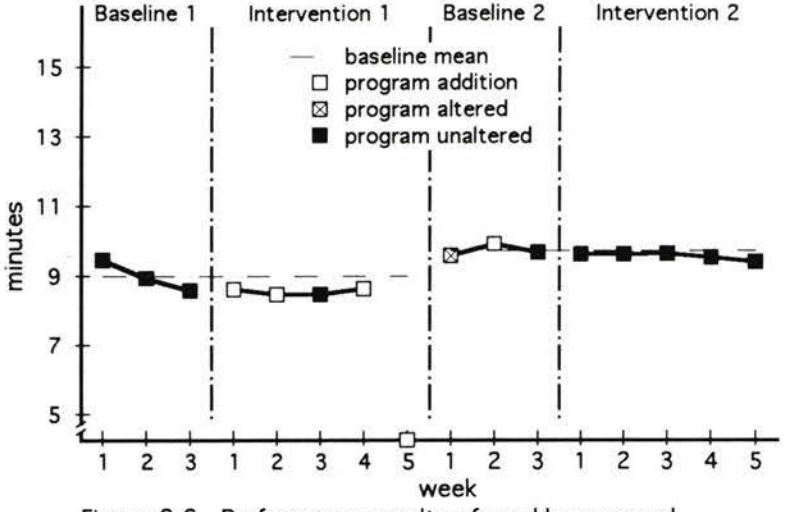

Figure 8.6. Performance results of weekly averaged trials for the Self-Paced Walk.

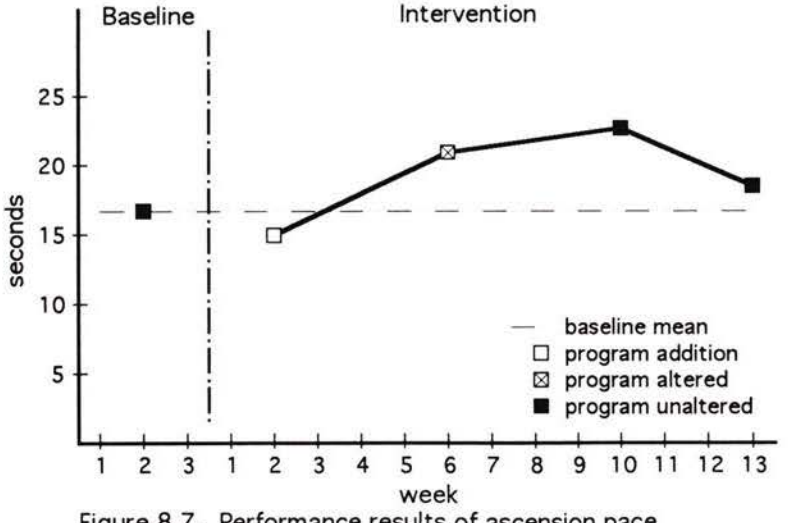

Figure 8.7. Performance results of ascension pace for the Weighted Stair Climb.

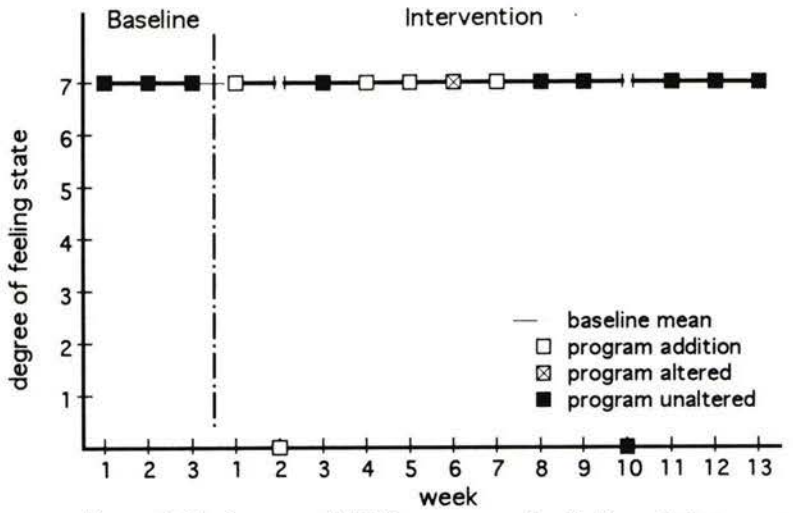

Figure 8.8. Averaged SEES responses for feeling states of Positive Well-Being.

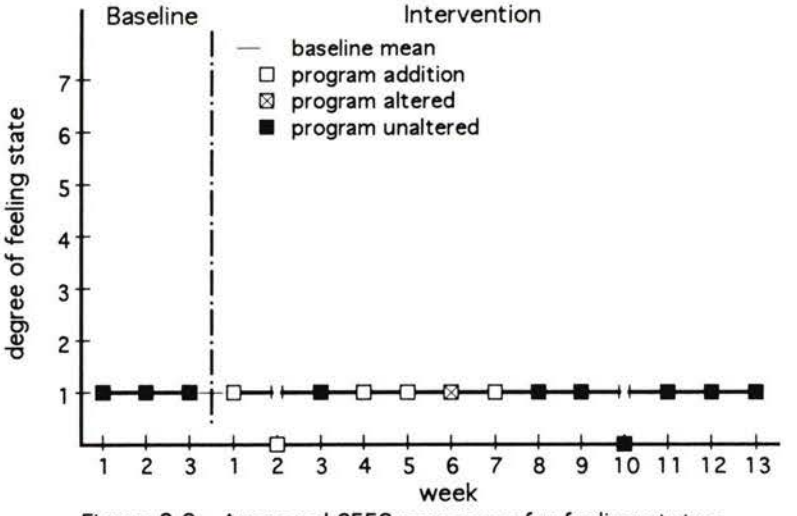

Figure 8.9. Averaged SEES responses for feeling states of Psychological Distress.

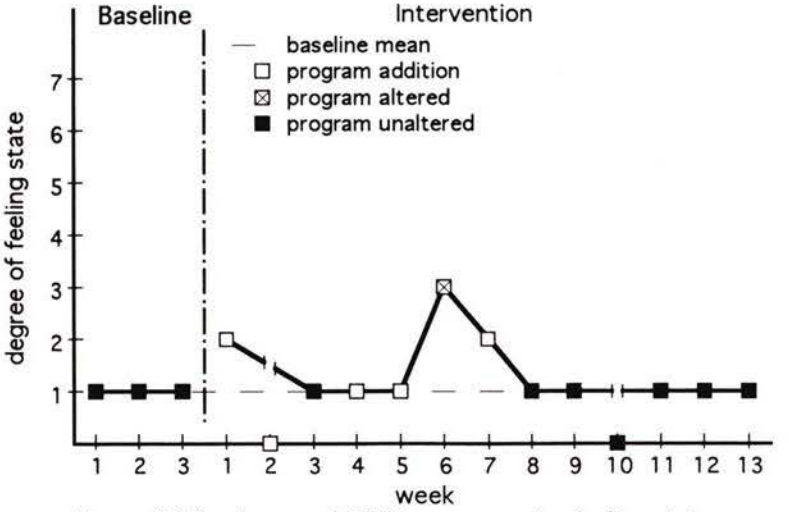

Figure 8.10. Averaged SEES responses for feeling states of Fatigue.

Participant P09

Participant P09 a 76 year old retired female with a medical history of heart condition which required a quadruple bypass approximately 5 years prior to this study. Other medical concerns included diagnoses of hyperlipidemia, osteoporosis, arthritis of the hands, knees and ankles, stomach ulcers, as well as recovering from a pre-existing injury sustained from a fall. At the time of this study treatment for these medical conditions included prescriptions of Premarin, Entrophin, Rantidine, and Nitroglycerin. Her activities prior to and over the program duration involved walking intermittently.

On week 7 of the intervention this participant reported feelings of increased tiredness on the same afternoons of her exercise program. The exercise prescription was modified to better suit her energy levels. This participant's adherence rate to this study was 93%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 9, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P09 are shown in Figure 9.1. Her baseline resistance weight lifted in 1RM results remained constant, establishing a mean of 17.5 pounds. Her intervention results started at 17.5 pounds and varied up to 30 pounds with a mean of 26.5 pounds, a 50% increase from the baseline mean.

The results for the BCend evaluation for participant P09 are shown in Figure 9.2. The resistance weight was set at 9 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results were 8 and 19 repetitions with a mean of 13.5 repetitions. There were no indicators to suggest why there was a baseline trend, familiarization with the exercise equipment may have been an influencing factor. Her intervention results varied between 12 to 34 repetitions with a mean of 23.42 repetitions, a 73% increase from the baseline mean.

The results for the LEmax evaluation for participant P09 are shown in Figure 9.3. Her baseline resistance weight lifted in 1RM ranged from 70 to 85 pounds with a mean of 78.33 pounds. Her intervention results ranged from 85 to 95 pounds with a mean of 91.25 pounds, a 16% increase from the baseline mean.

The results for the LEend evaluation for participant P09 are shown in Figure 9.4. The resistance weight assigned to this participant was 35 pounds performed to volitional fatigue at a cadence of 50 bpm. Her baseline results varied between 15 to 13 repetitions with a mean of 13.67 repetitions. Her intervention results varied between 14 and 22 repetitions with a mean of 18 repetitions, a 32% increase from the baseline mean.

The results for the flexibility evaluation for participant P09 are shown in Figure 9.5. Her baseline results ranged from 27.17 to 29.63 centimeters with a mean of 28.38 centimeters. Her intervention results ranged from 26.42 to 31.25 centimeters with a mean of 28.70 centimeters, a 1% increase from the

baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P09 are shown in Figure 9.6. Her baseline 1 results ranged from 10.82 to 9.50 minutes with a mean of 9.98 minutes. Her intervention 1 results ranged from 9.26 to 10.32 minutes with a mean of 9.78 minutes, a 2% increase in gait velocity from the baseline 1 mean. Her baseline 2 results ranged from 11.99 to 13.62 minutes with a mean of 12.77 minutes. Her intervention 2 results ranged from 13.34 to 12.05 minutes with a mean of 12.71 minutes, a 0% increase in gait velocity from the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P09 are shown in Figure 9.7. Her baseline ascension pace was established at 16.84 seconds. Her intervention results varied between 17.42 and 12.96 seconds with a mean of 15.14 seconds, a 10% improvement in the ascension pace from the baseline mean.

Subjective well-being results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E9.8.

The responses regarding positive well-being from the SEES questionnaire for participant P09 are shown in Figure 9.8. Her baseline results remained constant, establishing a mean of 6. Her intervention results were between 6 and 7 with a mean 6.

The responses regarding psychological distress from the SEES questionnaire for participant P09 are shown in Figure 9.9. Her baseline results remained constant, establishing a mean of 1. Her intervention results also remained constant with a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P09 are shown in Figure 9.10. Her baseline results varied between 1 and 3 with a mean of 2. Her intervention results varied between 2 to 5 with a mean 3.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). Her pre-study SWLS questionnaire responses yielded a score of 16/35 (46%). Her post-study SWLS questionnaire responses yielded a score of 21/35 (60%).

Summary

Over the program intervention participant P09 demonstrated improvements in both her muscular strength and muscular endurance evaluations. Her flexibility seemed to indicate minimal change however it is possible that she was performing at an optimal level.

Minimal change was noted in her self-pace walk evaluation, because of reported symptoms including angina on exertion and recorded irregularity of her heart rate and blood pressure, this participant was asked to decrease her gait pace. Upon referral to her physician it was recommended that she use her nitro spray as required and to continue with the exercise program. It may be important to note that over the course of the intervention the number of

incidences of angina decreased, as well as her need to use the nitro spray. Her weighted stair climb results indicated an increase a modest trend of improvement in ascension pace even though she found it awkward to balance the weighted back-pack up the stairs. This was also supported by remarks from the participant where she stated finding the walk to the grocery store, at the base of a hill from her residence, much easier to travel.

This participant seemed generally in good spirits throughout the program, which was indicated in the SEES positive well-being and psychological distress results. The degree to which the external influences affected her responses to the fatigue results was difficult to determine. Once her program was modified her degree of feeling fatigued appeared to reflect these changes. Her feeling state for life satisfaction noted a very positive change. This participant had indicated that she was pleased with her ability to do more than she "previously thought possible."

Table 9

P09: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
2	M	poor sleep
3	M	fell in parking lot outside of residence
5	F	kidney infection
6	F	discomfort in lower back & knees
7	M	discomfort in lower back & knees
8	F	dehydrated, personal related stress, poor sleep, angina
9	W	discomfort in legs; angina
10	MWF	discomfort in arm from B12 & pneumonia shots, discomfort in legs

Note. No external influences were recorded on the intervention weeks not indicated.

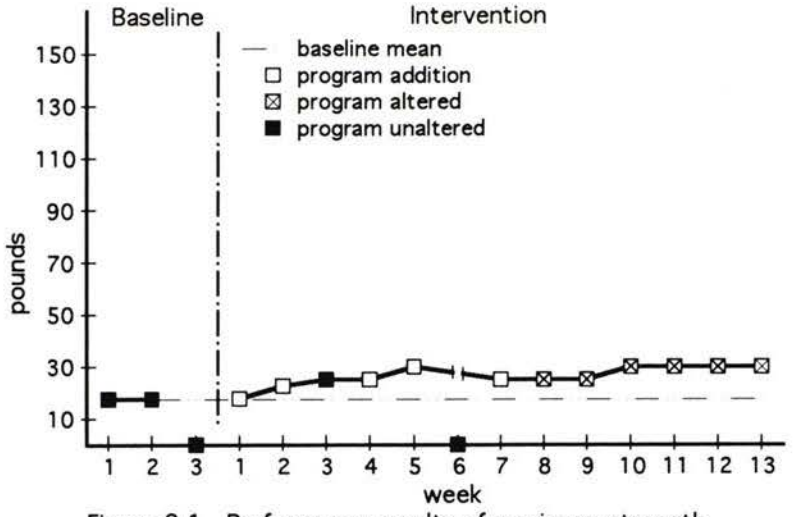

Figure 9.1. Performance results of maximum strength for Biceps Curl.

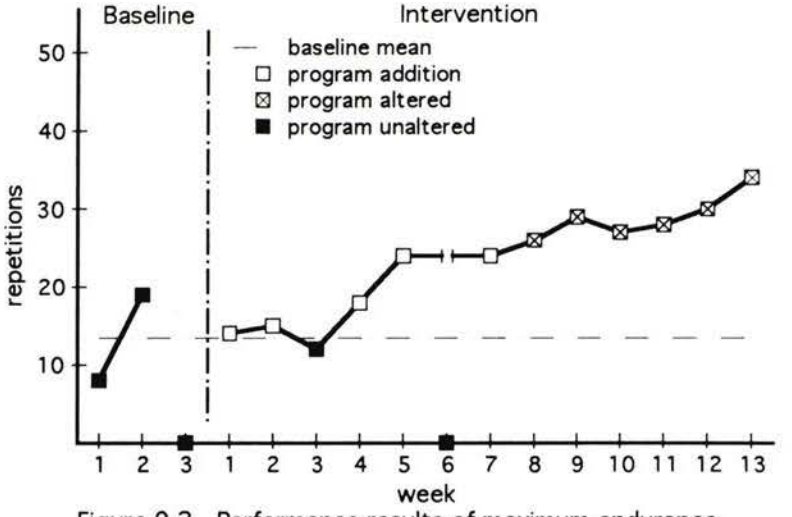

Figure 9.2. Performance results of maximum endurance for Biceps Curl.

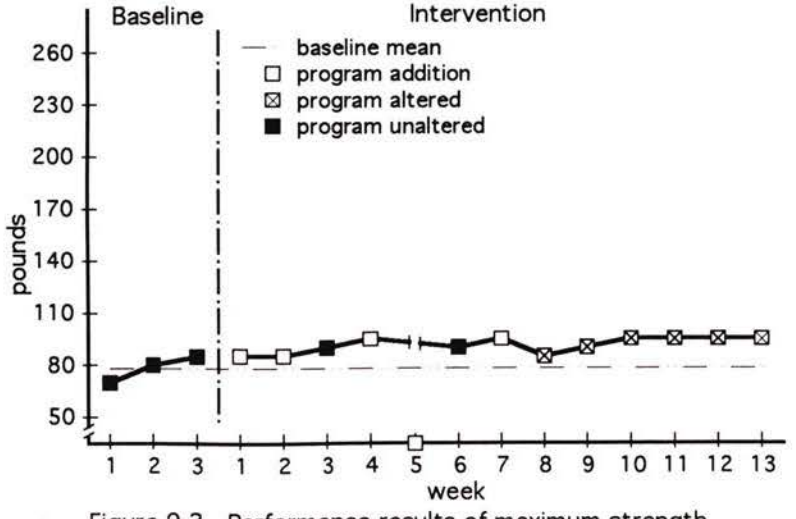

Figure 9.3. Performance results of maximum strength for Leg Extension.

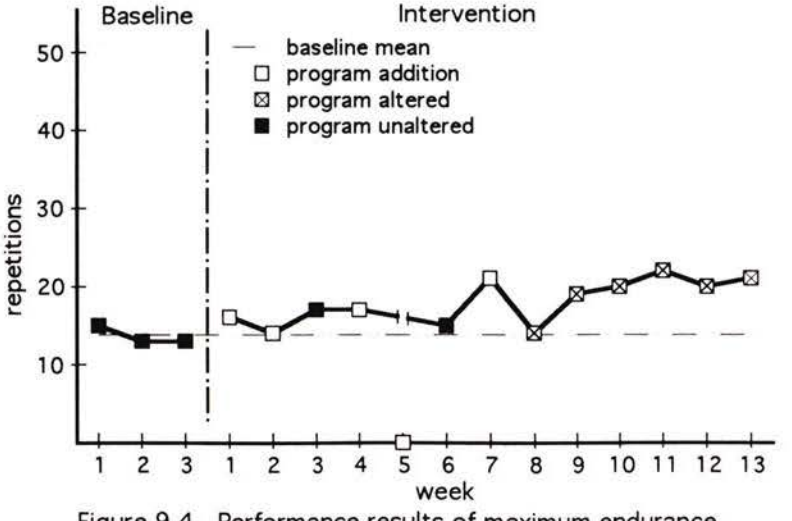

Figure 9.4. Performance results of maximum endurance for Leg Extension.

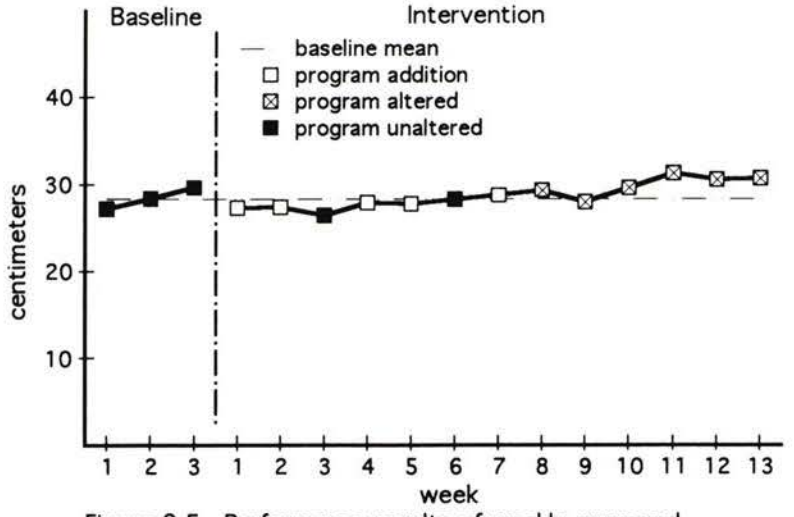

Figure 9.5. Performance results of weekly averaged trials for Flexibility.

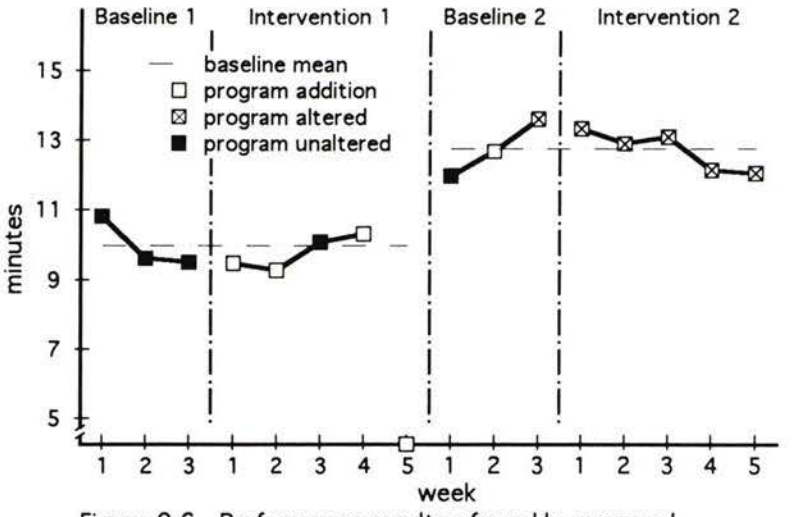

Figure 9.6. Performance results of weekly averaged trials for the Self-Paced Walk.

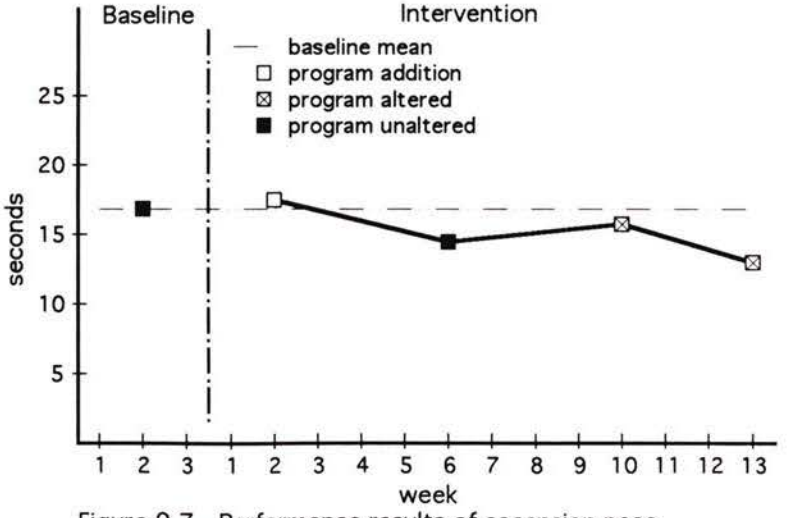

Figure 9.7. Performance results of ascension pace for the Weighted Stair Climb.

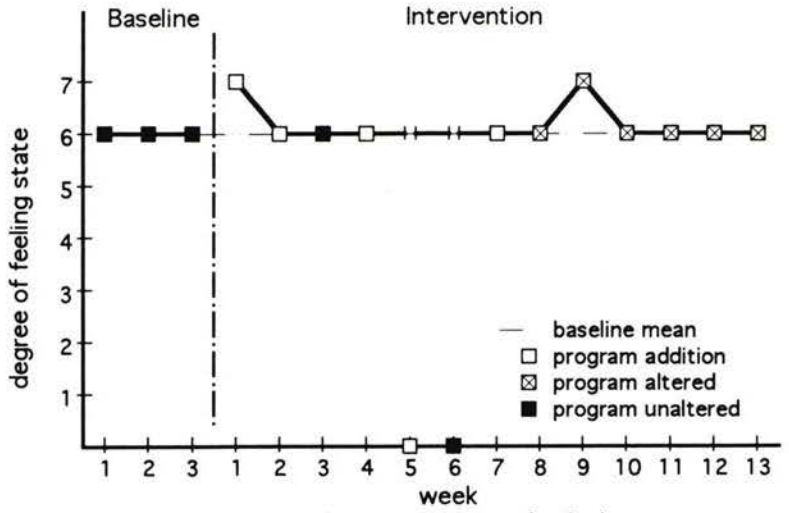

Figure 9.8. Averaged SEES responses for feeling states of Positive Well-Being.

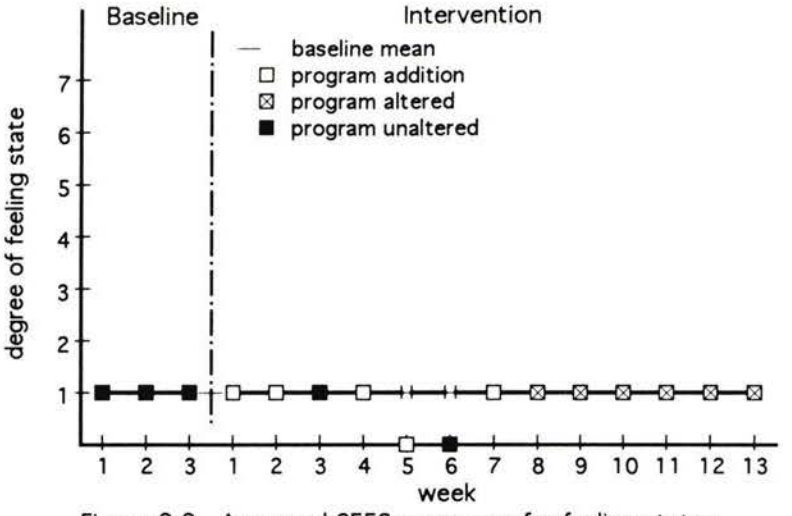

Figure 9.9. Averaged SEES responses for feeling states of Psychological Distress.

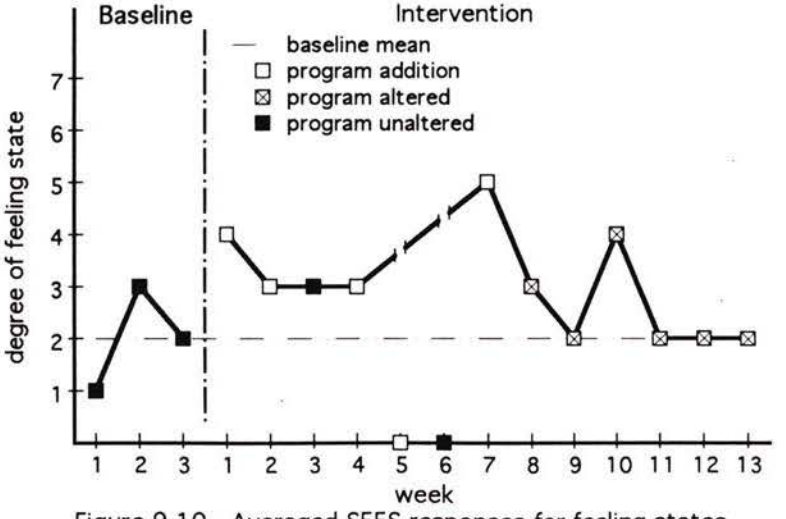

Figure 9.10. Averaged SEES responses for feeling states of Fatigue.

Participant P10

Participant P10 a 77 year old retired male was considered medically in good health. At the time of this study he required no medical treatment. He walked three to four times weekly with his wife for about 30 to 45 minutes, as well as regular gardening activities. His adherence rate to this study was noted at 100%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 10, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P10 are shown in Figure 10.1. His baseline resistance weight lifted in 1RM ranged from 35 to 40 pounds with a mean of 37.5 pounds. There were no indicators to suggest why there was a baseline trend, familiarization with the exercise equipment may have been an influencing factor. His intervention results started at 45 pounds and varied up to 60 pounds with a mean of 52.5 pounds, a 40% increase from the baseline mean.

The results for the BCend evaluation for participant P10 are shown in Figure 10.2. The resistance weight was set at 17.5 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 22 and 18 repetitions, establishing a mean of 20 repetitions. His intervention results varied between 20 to 49 repetitions with a mean of 31.3 repetitions, a 57% increase from the baseline mean.

The results for the LEmax evaluation for participant P10 are shown in

Figure 10.3. His baseline resistance weight lifted in 1RM ranged from 80 to 85 pounds with a mean of 81.67 pounds. His intervention results steadily increased from 90 to 120 pounds with a mean of 105 pounds, a 29% increase from the baseline mean.

The results for the LEend evaluation for participant P10 are shown in Figure 10.4. The resistance weight assigned to this participant was 40 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were from 13 to 14 repetitions with a mean of 13.33 repetitions. His intervention results varied between 14 to 37 repetitions with a mean of 23.5 repetitions, a 76% increase from the baseline mean.

The results for the flexibility evaluation for participant P10 are shown in Figure 10.5. His baseline results ranged from 16.58 to 15.50 centimeters with a mean of 16.03 centimeters. His intervention results varied between 16.25 and 20.42 centimeters with a mean of 17.72 centimeters, a 11% increase from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P10 are shown in Figure 10.6. His baseline 1 results ranged from 8.16 to 7.84 minutes with a mean of 7.95 minutes. His intervention 1 results ranged from 7.68 to 7.62 minutes with a mean of 7.65 minutes, a 4% increase in gait velocity from the baseline 1 mean. His baseline 2 results ranged from 8.18 to 8.03 minutes with a mean of 8.09 minutes. His intervention 2 results ranged from 8.10 to 7.95 minutes with a mean of 8.02 minutes, a 1% increase in gait velocity from

the baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P10 are shown in Figure 10.7. His baseline ascension pace was established at 9.77 seconds. His intervention results ranged from 9.15 to 7.14 seconds with a mean of 8.26 seconds, a 15% improvement in the ascension pace from the baseline mean.

Subjective well-being results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E10.8.

The responses regarding positive well-being from the SEES questionnaire for participant P10 are shown in Figure 10.8. His baseline results remained constant, establishing a mean of 6. His intervention results were between 6 and 7 with a mean 7.

The responses regarding psychological distress from the SEES questionnaire for participant P10 are shown in Figure 10.9. His baseline results remained constant, establishing a mean of 1. His intervention results also remained constant with a mean of 1.

The responses regarding fatigue from the SEES questionnaire for participant P10 are shown in Figure 10.10. His baseline results remained constant, establishing a mean of 2. His intervention results also remained constant with a mean 2.

The life satisfaction responses are defined in the 7-point satisfaction

with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 32/35 (91%). His post-study SWLS questionnaire responses yielded a score of 29/35 (83%).

Summary

In support of his noted improvements in muscular strength and muscular endurance participant P10 commented on how he experienced "renewed energy, moderate increases in physical strength, and that domestic chores were noticeably easier to manage." His flexibility results noted a modest trend of improvement. He seemed to find the flexibility component rather difficult however he diligently applied himself and was able to demonstrate good results.

The self-pace walk results were relatively consistent throughout the program, perhaps he was traveling at his optimal pace. A consistent improvement was noted in his ascension pace for the stair climb evaluation.

This participant seemed generally to be in high spirits throughout the program which was indicated in the SEES positive well-being and psychological distress results. It was difficult to determine why his degree of feeling states regarding fatigue were unaffected by participation in the program. Perhaps some other uncommunicated influence affected his degree of feeling state for life satisfaction as he had remarked on how he found it important to be "out and engaged in living." He added "the ravages of time have been arrested, if not reversed."

Table 10

P10: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
3	M	dehydrated
4	F	discomfort in knee
8 & 9	MWF	dehydrated
11	M	gardening
12 & 13	F	low in energy

Note. No external influences were recorded on the intervention weeks not indicated.

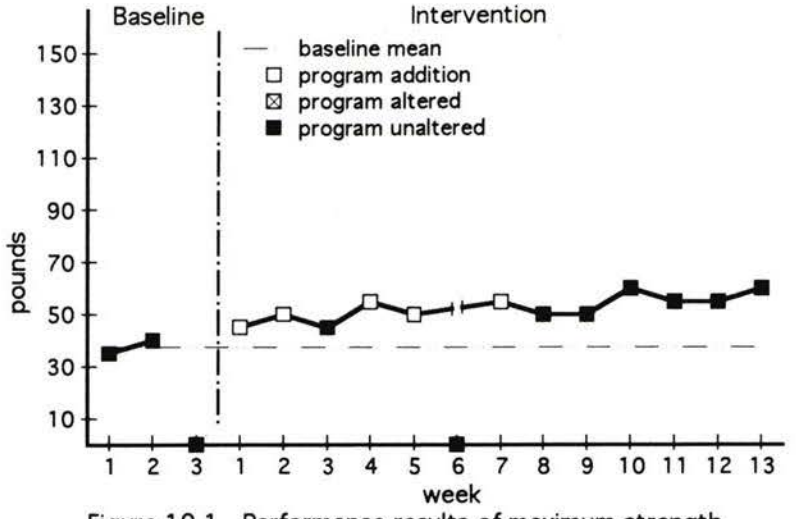

Figure 10.1. Performance results of maximum strength for Biceps Curl.

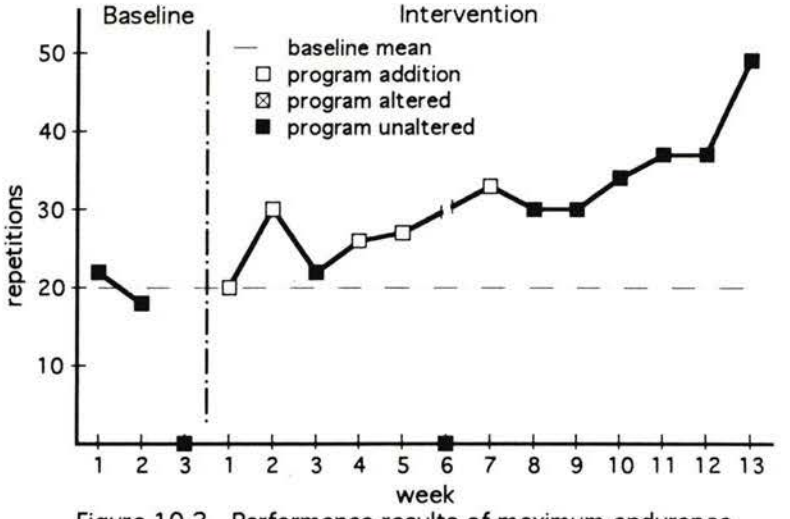

Figure 10.2. Performance results of maximum endurance for Biceps Curl.

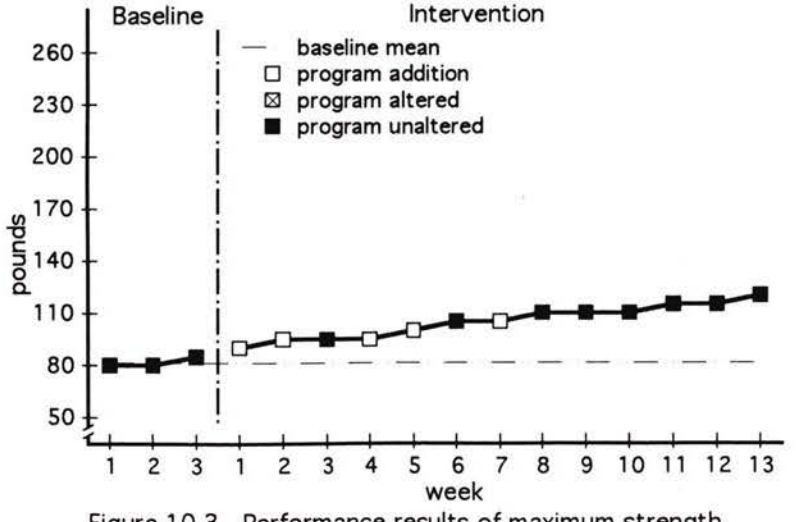

Figure 10.3. Performance results of maximum strength for Leg Extension.

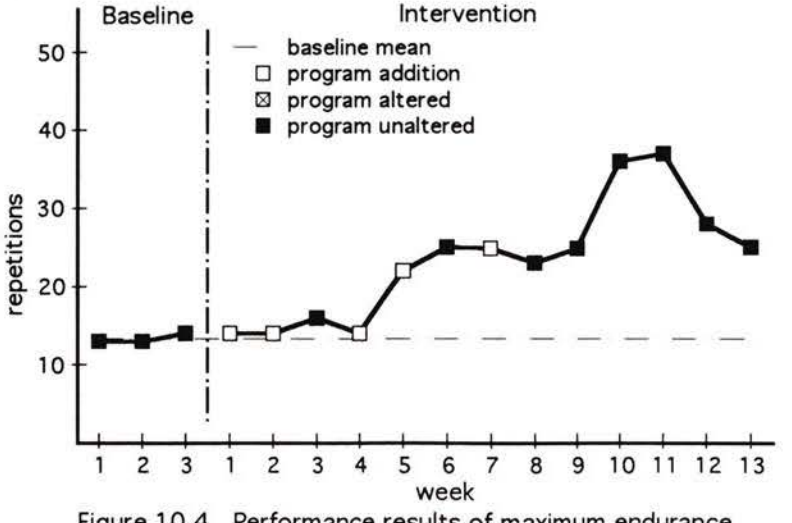

Figure 10.4. Performance results of maximum endurance for Leg Extension.

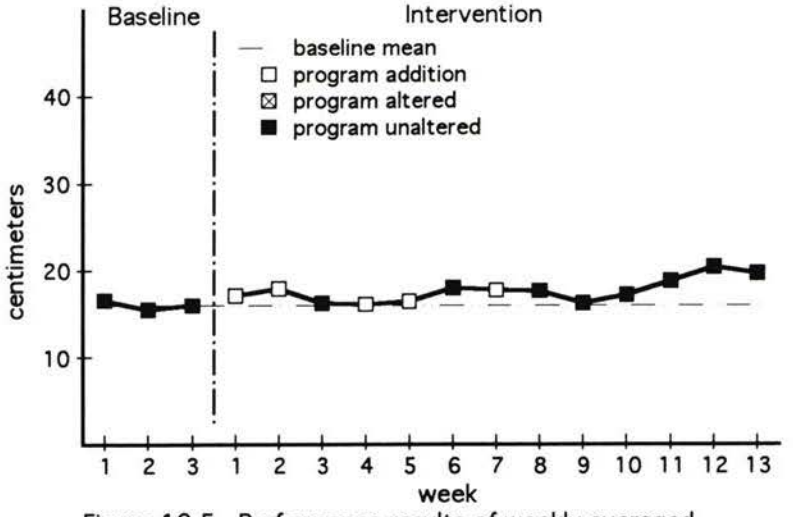

Figure 10.5. Performance results of weekly averaged trials for Flexibility.

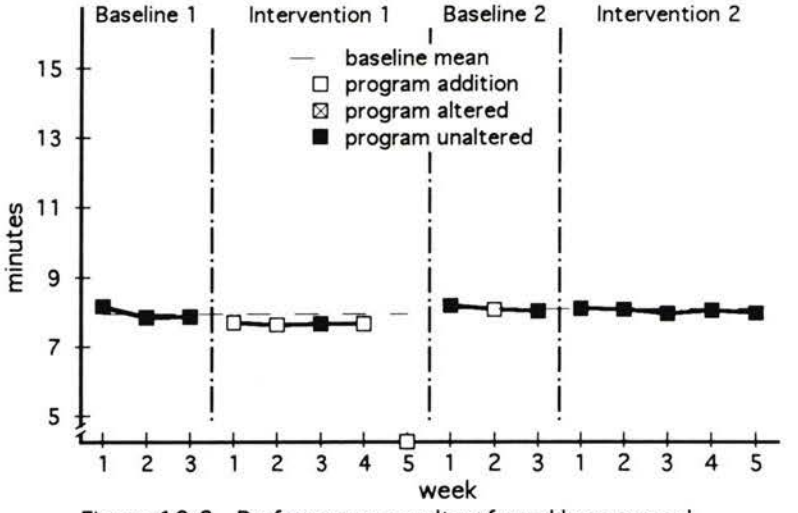

Figure 10.6. Performance results of weekly averaged trials for the Self-Paced Walk.

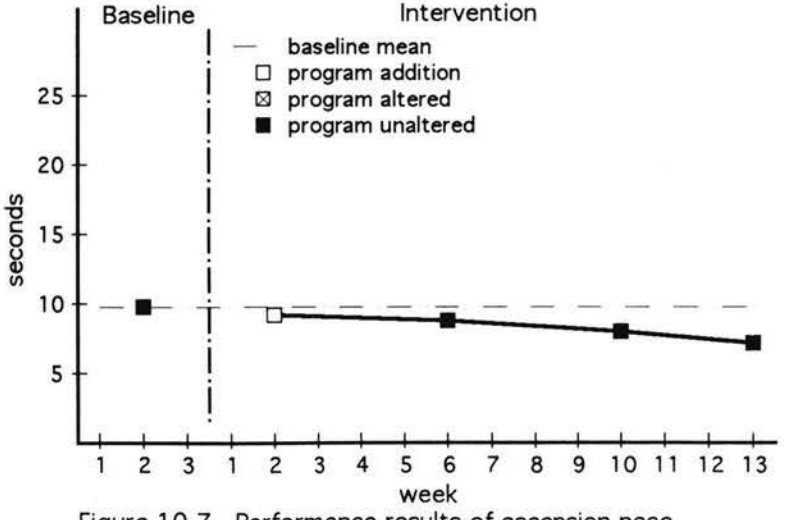

Figure 10.7. Performance results of ascension pace for the Weighted Stair Climb.

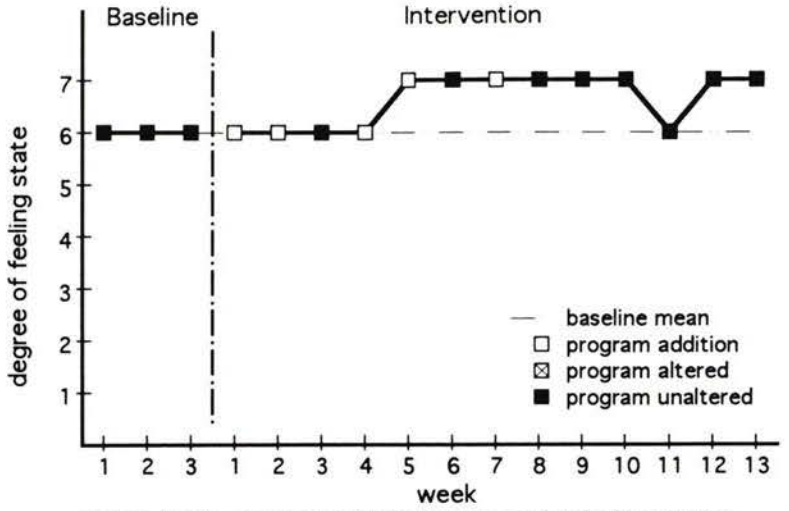

Figure 10.8. Averaged SEES responses for feeling states of Positive Well-Being.

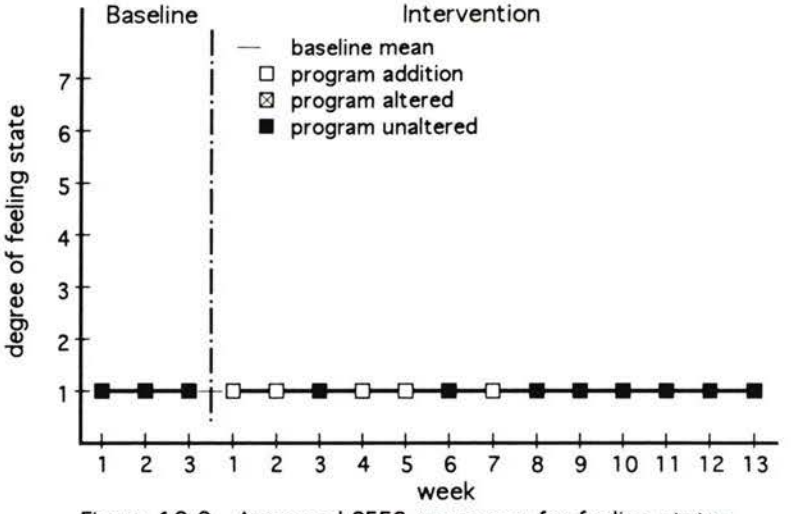

Figure 10.9. Averaged SEES responses for feeling states of Psychological Distress.

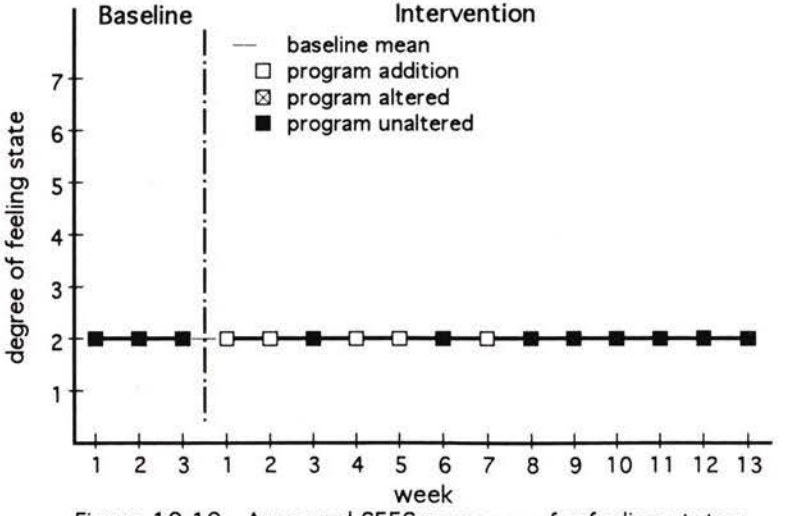

Figure 10.10. Averaged SEES responses for feeling states of Fatigue.

Participant P11

Participant P11 an 82 year male diagnosed with hypertension, prostrate cancer (in remission), and a heart condition. He was sole caregiver to his wife who was very ill and who had passed on shortly after the study completion. Medications prescribed for this participant were ASA and Vasotec. His activities prior to the program included utilizing light free-weights at home, and over the course of the program he instructed a stretch class for an hour each week to a group of elderly people in his residential complex. This participant was required to leave the exercise program early due to a skin cancer condition requiring immediate attention. His adherence rate to the program for this participant was recorded at 89%. The combination and frequency of the external influences reported and observed during the intervention phase, see Table 11, may have had an effect on the performance results.

Muscular Fitness Results

The results for the BCmax evaluation for participant P11 are shown in Figure 11.1. His baseline resistance weight lifted in 1RM were 85 and 90 pounds with a mean of 87.5 pounds. His intervention results started at 80 pounds and varied up to 95 pounds with a mean of 87.27 pounds, a 0% increase from the baseline mean.

The results for the BCend evaluation for participant P11 are shown in Figure 11.2. The resistance weight was set at 42.5 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results were 16 and 20

repetitions a mean of 18 repetitions. His intervention results varied between 17 and 25 repetitions with a mean of 20 repetitions, an 11% increase from the baseline mean.

The results for the LEmax evaluation for participant P11 are shown in Figure 11.3. His baseline resistance weight lifted in 1RM ranged from 90 to 95 pounds with a mean of 93.33 pounds. His intervention results steadily increased 95 to 110 pounds with a mean of 105 pounds, a 13% increase from the baseline mean.

The results for the LEend evaluation for participant P11 are shown in Figure 11.4. The resistance weight assigned to this participant was 45 pounds performed to volitional fatigue at a cadence of 50 bpm. His baseline results ranged from 25 to 21 repetitions with a mean of 23.67 repetitions. His intervention results varied between 22 to 31 repetitions with a mean of 26.83 repetitions, a 13% increase from the baseline mean.

The results for the flexibility evaluation for participant P11 are shown in Figure 11.5. His baseline results ranged from 34.25 up to 36.38 centimeters with a mean of 35.01 centimeters. His intervention results varied between 32.17 and 35.33 centimeters with a mean of 34 centimeters, a 3% decrease from the baseline mean.

Functional Mobility Results

The results for the self-paced walk evaluation for participant P11 are shown in Figure 11.6. His baseline 1 results ranged from 9.02 to 8.44 minutes with a mean of 8.65 minutes. His intervention 1 results varied between 8.32

and 9.22 minutes with a mean of 8.76 minutes, a 1% decrease in gait velocity from the Baseline 1 mean. This participant was asked to decrease gait pace due to irregularities in heart rate and blood pressure. His baseline 2 results ranged from 10.93 to 10.58 minutes with a mean of 10.81 minutes. His intervention 2 results were between 10.55 and 10.70 minutes with a mean of 10.61 minutes, a 2% increase in gait velocity from the Baseline 2 mean.

The results for the weighted stair-climb evaluation for participant P11 are shown in Figure 11.7. His baseline ascension pace was established at 13.20 seconds. His intervention results varied between 11.10 and 13.59 seconds with a mean of 12.21 seconds, an 8% improvement in the ascension pace from the baseline mean.

Subjective Well-Being Results

The degree of feeling states for the positive well-being, psychological distress, and fatigue responses are defined in the 7-point subjective exercise experience scale (SEES); Appendix E, Figure E11.8.

The responses regarding positive well-being from the SEES questionnaire for participant P11 are shown in Figure 11.8. His baseline results ranged from 6 to 5 with a mean of 5. His intervention results were from 4 to 5 with a mean 4.

The responses regarding psychological distress from the SEES questionnaire for participant P11 are shown in Figure 11.9. His baseline results were from 1 to 2 with a mean of 1. His intervention results varied between 1 to 4 with a mean of 2.

The responses regarding fatigue from the SEES questionnaire for participant P11 are shown in Figure 11.10. His baseline results were from 2 to 3 with a mean of 3. His intervention results remained constant establishing a mean of 4.

The life satisfaction responses are defined in the 7-point satisfaction with life scale (SWLS). His pre-study SWLS questionnaire responses yielded a score of 25/35 (71%). His post-study SWLS questionnaire responses yielded a score of 21/35 (60%).

Summary

In consideration of participant P11's health and age, he was able to maintain his upper body muscular strength and demonstrate modest trends of improvements in his muscular endurance and lower body muscular strength. Perhaps he was performing at his optimal level. To what degree the noted external influences affected his overall performance and evaluation results was difficult to determine. It is important to note that this participant continually applied himself diligently throughout the program. His flexibility results remained relatively consistent throughout the program, since he actively was instructing a stretch class it may be possible that no further improvement could be expected.

Improvements observed in his self-paced walk evaluation were posture and gait stride. Because of the noted irregularities in his blood pressure and heart rate readings he was asked to remain walking within a specified target heart rate range. In support of a positive trend of

improvement noted for the weighted stair-climb, this participant reported finding climbing the stairs in his residence much easier to the point of practicing climbing 76 steps per day with ease and no reported discomfort. With the combination of caregiving for his wife and dealing with the stresses of his own state of health, this participant's responses to his degree of feeling states in regards to the SEES positive well-being, psychological distress, and to the SWLS may have been influenced by these external factors. His degree of feeling state for fatigue remained consistent over the course of the intervention, perhaps this supports his continual honest efforts to fully participate at his exercise program. Overall this participant had reported having a positive experience as he commented at his program completion that he "would continue to exercise at own residence, in a more enlightened manner."

Table 11

P11: External Influences Recorded During the Intervention Phase

Week	Day	External Influence(s)
1, 2, & 3	MWF	dehydrated, poor sleep
6	W	tripped at the top step of stair climb
8	F	discomfort in legs, dehydrated, poor sleep
9	M	construction over the weekend
10	MWF	discomfort in arm from flue shot, received news of urgent surgery
11 & 12	MWF	personal related stress
12	MWF	increased stair climb activity at home

Note. No external influences were recorded on the intervention weeks not indicated.

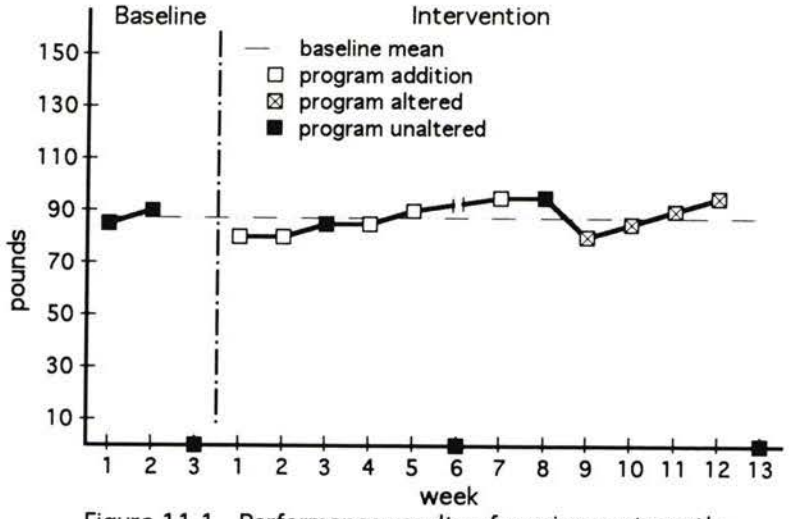

Figure 11.1. Performance results of maximum strength for Biceps Curl.

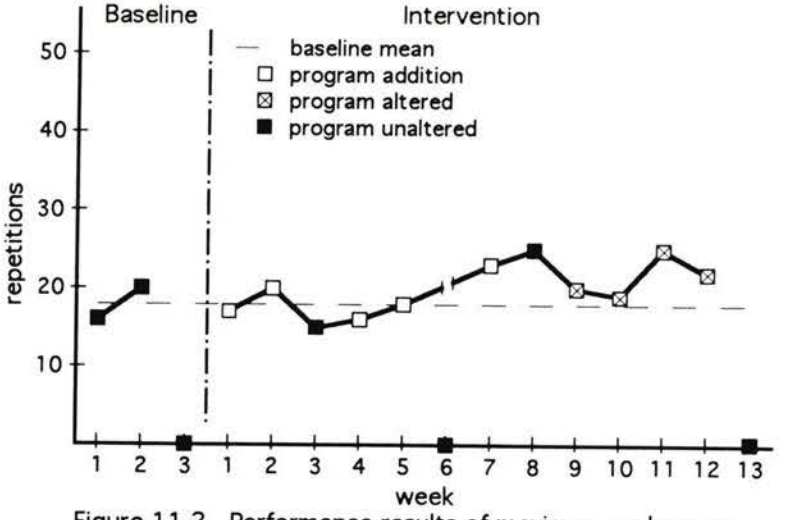

Figure 11.2. Performance results of maximum endurance for Biceps Curl.

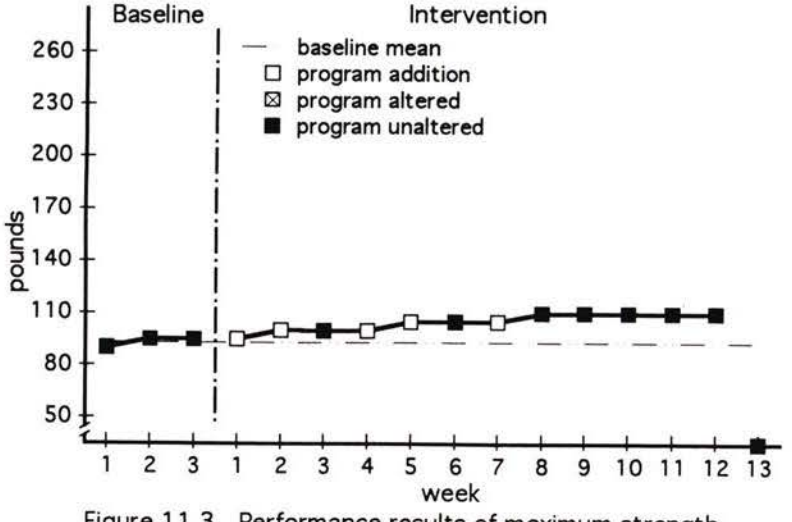

Figure 11.3. Performance results of maximum strength for Leg Extension.

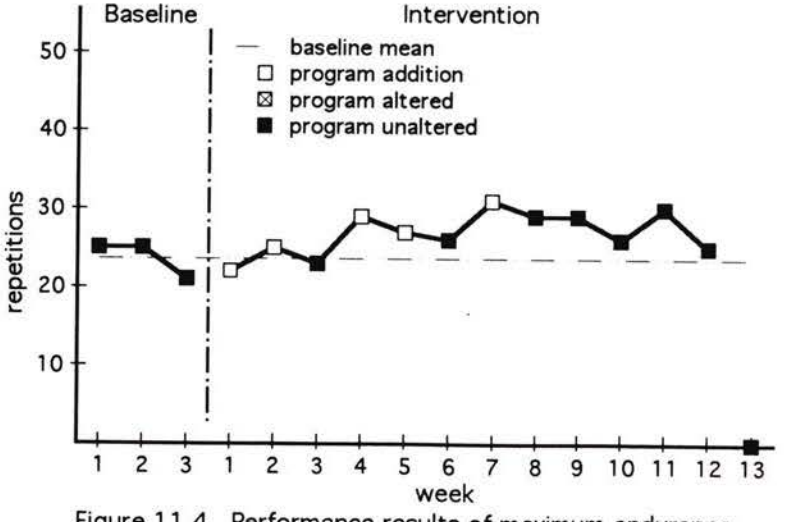

Figure 11.4. Performance results of maximum endurance for Leg Extension.

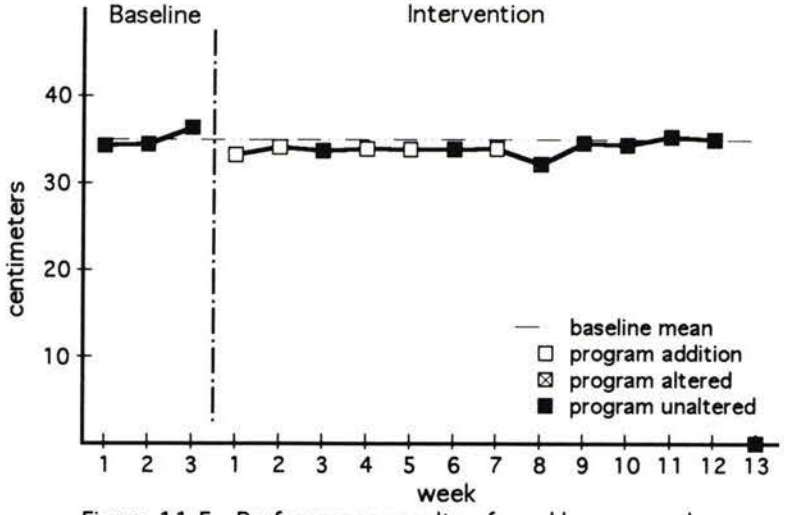

Figure 11.5. Performance results of weekly averaged trials for Flexibility.

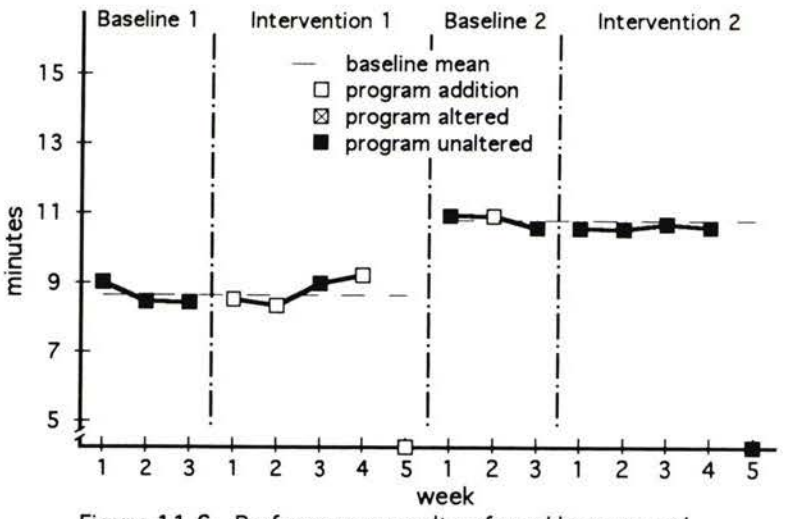

Figure 11.6. Performance results of weekly averaged trials for the Self-Paced Walk.

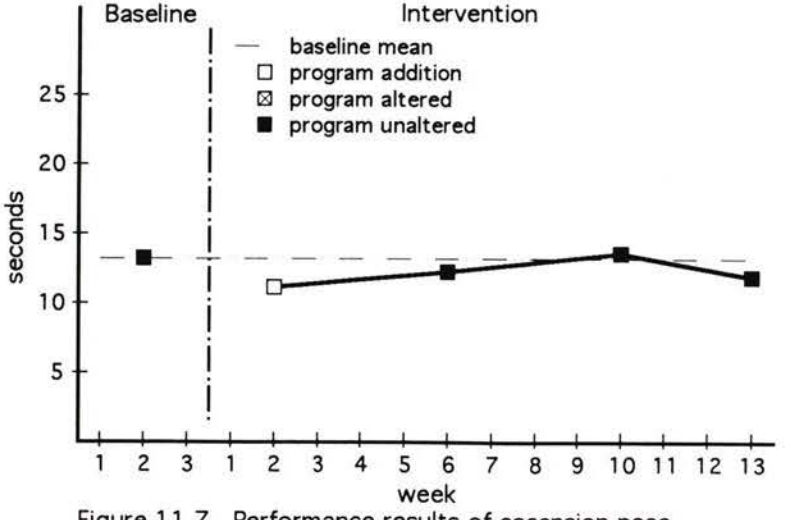

Figure 11.7. Performance results of ascension pace for the Weighted Stair Climb.

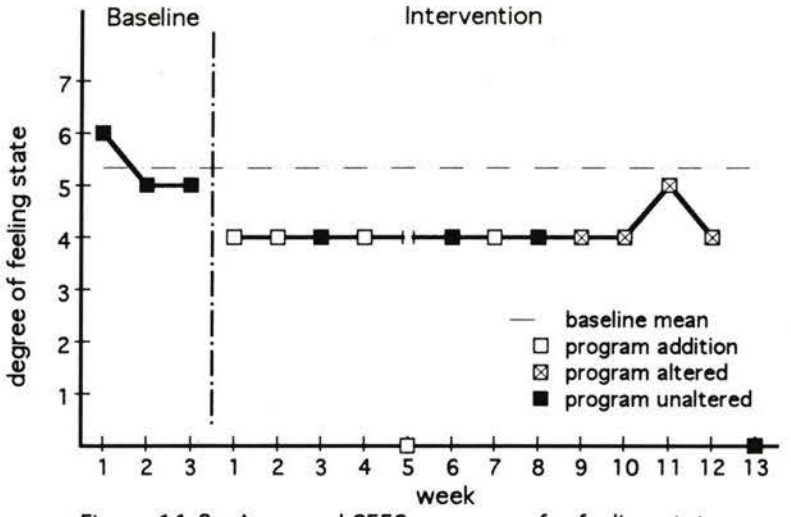

Figure 11.8. Averaged SEES responses for feeling states of Positive Well-Being.

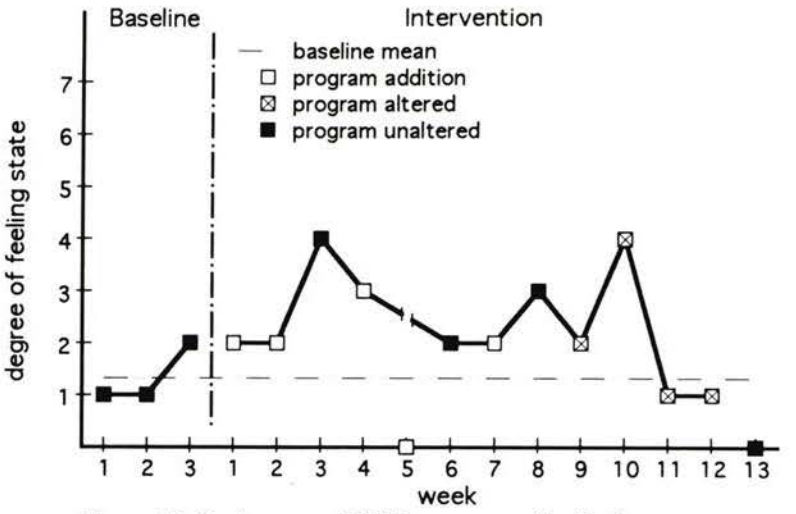

Figure 11.9. Averaged SEES responses for feeling states of Psychological Distress.

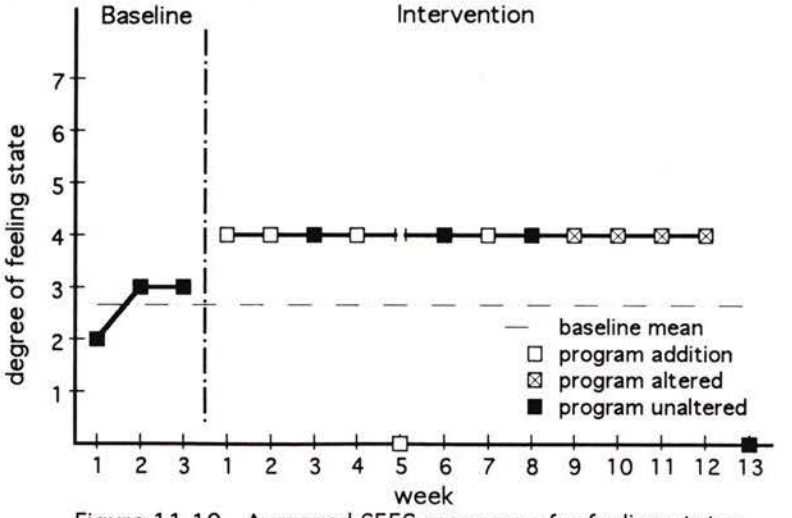

Figure 11.10. Averaged SEES responses for feeling states of Fatigue.

Summary

The results of this study indicate that an overall improvement was achieved by all 11 participants as defined in the components of muscular fitness, functional mobility, and subjective well-being.

The adherence rates from this program ranged from 87% to 100% which is generally higher than those reported in other similar types of exercise research for this population. This may in part be attributable to the ongoing supervision each participant received. As participants became more comfortable with their exercise program, it seemed that so did the interest in continuing. Additionally, the participants appeared to appreciate the camaraderie created between themselves and the supervisory personnel as well as with other facility users.

The number and type of external influences varied with each participant. It was difficult to determine to what extent these external influences affected the performance of each participant; and in some cases whether all the external influences were even reported by the individual.

The muscular strength and endurance results indicated a positive change for all participants. The eldest participant remained constant throughout the study with regards to the upper body maximal strength, it was established that external influences were involved. The increases in the BCmax results ranged from 0% to 50% with a mean of 27%. The increases in the BCend results ranged from 11% to 152% with a mean of 55%. The increases in the LEmax results ranged from 13% to 38% with a mean of 22%.

The increases in the LEend results ranged from 12% to 90% with a mean of 38%.

Factors that may have influenced the flexibility results of the participants included physical limitations or perhaps some individuals had reached a plateau in performance. The majority of improvements in flexibility were noted from the 8th week of the intervention onward. This is to be expected since improvements in this area of fitness take a long time to occur (Åstrand, 1994) Of those participants in their 7th decade, the females were found to be overall more flexible than the males, also expected as females are throughout life more flexible than males.

In the self-paced walk, minimal changes in gait pace were observed amongst the participants. All participants however, did demonstrate improvements in body posture and carriage. Some participants were asked to decrease their walking pace because of irregularities in blood pressure and heart rates, or angina experienced with exertion. These symptoms seemed to diminish as the study neared completion. All participants noted a decrease in walking pace with the change in the walking circuit. Possible factors affecting this change in pace may include (a) the room temperature was noticeably cooler in the 2nd walking circuit, (b) the change in the configuration of the walking circuit, (c) comments from some of the participants indicated they "felt disoriented by the echo" in the large gymnasium, and (d) the number of laps were increased to maintain the same distance for both the first and second circuit.

Results for the weighted stair-climb indicated generally positive results in ascension pace. The males seemed to be overall faster in ascension pace than the females. All participants demonstrated improved body posture and carriage while carrying the weighted back-pack as the study progressed.

The overall responses to the subjective experience scale (SEES) indicated that the participants had a positive experience with little to no distress while still experiencing feeling states of fatigue. The males indicated a higher level of fatigue than the females. The reason for this difference in fatigue levels was difficult to determine. The accumulated responses to the satisfaction with life scale (SWLS) indicated a variety of changes in feeling state of life satisfaction including (a) two participants noted increases of greater than 30% improvement; (b) one individual had a 15% decrease, possibly due to an external influence; and (c) the balance of participants indicated little or no change.

The overall results of this study would suggest that this type of comprehensive and progressive exercise programming would be beneficial in improving an older individual's health.

Limitations

1. Individual participant health conditions and injuries varied over the course of the study.

2. Medications may have had some influence on some of the participant's performance.

3. Although results are mainly in agreement with past research, because of the smaller number of participants it may be difficult to suggest generalities in overall performance based on the parameters of this program.

Discussion

The primary purpose of conducting this study was to observe the individual changes in performance of older persons, 60 - 82 years of age, when integrated into a comprehensive and progressive exercise program. The combined components of muscular fitness, functional mobility, and subjective well-being were used to determine the success of the program on an individual basis.

Changes in each participant's performance level were observed over the duration of the study which was designed to introduce, at specific intervals, exercise prescription regulated to individual performance. Implications have been made regarding the importance of individually prescribed and supervised exercise sessions including the duration and intensity of the exercise prescription, for this population (Morganti, Nelson, Fiatarone, Dallal, Economos, Crawford, & Evans, 1995; Jones et al., 1994; Pollock, Graves, Swart, & Lowenthal, 1994). In this study, the participant was given the empowerment to exercise efficiently and safely while still challenging themselves, mainly because they seemed to have developed an increased confidence in self. This increased self confidence may in part be due to the approach taken by the researcher, and the research support team, in the implementation of the program. By taking a genuine interest in each participant, and by working with the individual towards small improvements or achievements, the researcher was able to build a comfort

level where the participants felt they were able to progress and therefore show improvements in performance. This may suggest that there are other factors or requirements necessary to motivate the individual (see Appendix F) which may help increase self confidence in the older person. As the participants became more comfortable with their program, adherence to exercise prescription became more acceptable.

Several participants seemed to be affected by a number of external influences which were unrelated to the program. In some instances the affect of these external influences, required that a modification to the exercise prescription be made in order that the affected participant could safely continue with the program. The degree of modification varied with each individual depending on an evaluation of physical capabilities and the comfort level that each individual perceived as acceptable. A number of the participants reported external influences from over exertion or pulled muscles sustained from at least one of the following; (a) injuries from falls, (b) domestic physical activities (home and yard), (c) recreational activities, and (d) in one instance an employment related physical activity. Other external influences affecting individual performance included (a) poor sleep, (b) dehydration, (c) personal stress, and (d) health related issues (flu, kidney & bladder infection, food poisoning, etc.). These external influences may indicate that perhaps other factors such as life circumstances should be considered as an individual is integrated into a prescribed exercise program.

Positive change for all participants was noted in muscular strength and

muscular endurance for both upper and lower body evaluations in this study. This is consistent with other research findings where improvements have also been reported using moderate intensity resistance training programs (Judge, Whipple, & Wolfson, 1994; Mihalko & McAuley, 1996; Rooks, Ransil, & Hayes, 1997). This program was designed to improve muscular strength and muscular endurance overall. For this reason the percentage increases for some of the participants may appear lower than what has been previously reported by other researchers (Pyka et al., 1994; Fiatarone et al., 1990). The findings from this study seem to concur with the literature that through the improvement and maintenance of muscular strength and endurance, muscular weakness associated with aging may be reversed with sufficient stimulus intensities (Davis, Ross, Preston, Nevitt, & Wasnich, 1998; Dupler & Cortes, 1993; Posner, Gorman, Windsor-Landsberg, Larsen, Bleiman, Shaw, Rosenberg, & Knebl, 1992).

As reviewed by Phillips and Haskell (1995) the lack of flexibility has been considered a major cause of discomfort and disability due to the limitations imposed on the range of motion at the joints. To date no definitive norms have been established for flexibility for this population, however it has been shown that flexibility may be increased through training (Morey et al., 1996; Cunningham et al., 1993; Raab et al., 1988). With technique guidance a modest positive trend in the flexibility results were noted in a number of the participants. Many of the participants reported difficulty in performing the flexibility test. Either the lack of flexibility

(unable to straighten legs & sit upright) and/or the body's physique (excess waist girth) were some of the observed problems. Other possible factors affecting flexibility performance included external influences related to strenuous physical activities. Additionally, it is possible that because the flexibility exercise was not comfortable to perform, perhaps motivation was somewhat affected. The results from this study seem to be in agreement with other researchers who have found that with sufficient stimulus, flexibility gains can be expected in older persons (Morey et al., 1996; O'Brian Cousins, 1995). Further study would be required to determine a clear dose-response relationship for this population (Mazzeo et al., 1998). The dose-response, in reference to flexibility, is described in terms of the anticipated increases in the usable range of motion about a joint, or set of joints, based on a prescribed amount of exercise stimulus.

Some researchers have found gait pace to improve in frail elderly (Ades et al., 1996; Hunter et al., 1995; Fiatarone et al., 1994; Judge et al., 1993; Sauvage et al., 1992). Other researchers did not seem to note any changes in the populations they studied (Berg & Lapp, 1998; Judge et al., 1994; Topp, Mikesky, Wigglesworth, Holt, & Edwards, 1993). All researchers who were unable to elicit change in gait pace agreed that low to moderate resistance training intensities may be insufficient stimulus. In each study the method of data collection varied, as did the duration and intensity of the resistance training. The results from this study seem to agree with the researchers that moderate training intensities may be insufficient to elicit change. This would

require further study. Through visual observations, it was noted that there were improvements in posture and carriage for all study participants. In this study a common positive change of gait pace occurred with the change of test location for all participants. It is speculated that the difference in walking area temperature and the change of walking configuration were somewhat responsible for the change in gait pace results.

All participants demonstrated at least some degree of improvement in ascension pace in the weighted stair climb. These results are in agreement with most resent research (Berg & Lapp, 1998; Rooks, Ransil, & Hayes, 1997; Nichols et al., 1995; Fiatarone et al., 1994). There were reports from at least five of the participants that they had noticed a change in their ability to adapt to their home environments, were stairs and steep grades were involved, with much more ease and less discomfort.

The results from the subjective well-being components of this study seemed to be in agreement with other research findings (Mihalko & McAuley, 1996; McAuley & Courneya, 1994; Stewart, King, & Haskell, 1993) where limited effects on the enhancement of subjective well-being were found as a result of participation in a comprehensive exercise program. Most of the participants in this study were already at a high level of positive well-being at the start of the program and indicated little to no change. This is in agreement with previous research findings (Mihalko & McAuley, 1996). The participants level of psychological distress remained relatively constant throughout the study and there was no indication of elevated distress as a

result of participation in the exercise program. Fatigue levels were found to initially increase along with dosage increases in the exercise program and then level off perhaps suggesting an improvement in resistance to fatigue which would be in agreement with Åstrand (1992). The responses to the SWLS questionnaire generally indicated minimal change in life satisfaction as a result of participation in the program. This may suggest that participation in this type of exercise program has little effect on life satisfaction.

An interesting observation about this program was the sense of community that developed between the participants and the other users of the facility. There seemed to be a common element shared by the study participants and other facility users in that they were all working to improve or maintain their physical condition. This seemed to provide and/or reinforce the incentive for study participants to come to the program sessions.

The results of this study indicate that an individualized, comprehensive, and progressive exercise program can improve an individual's health as defined by the components of muscular fitness, functional mobility and subjective well-being. Muscular fitness management should be encouraged on a regular basis in order to improve and/or maintain functional mobility, especially in relation to walking, stair climbing, and performance of fine and gross motor movements used in daily life tasks. Since loss of muscle strength and range of motion have both been noted as contributing to musculoskeletal impairment (Berman & Studenski, 1998), an

appropriately designed exercise program may be an important factor in the reversal of sacropenia (Butler, Davis, Lewis, Nelson, & Strauss, 1998), and play a role in both the primary and secondary prevention of functional disability (Buckwalter, 1997; Morey, Pieper, & Cornoni-Huntley, 1998). In agreement with other researchers (Jones et al., 1994; Pollock et al., 1994; Graves, Pollock, & Carroll, 1994), a comprehensive individualized program consisting of resistance training, flexibility, and cardiorespiratory exercises in a well supervised setting is recommended for the older population. This would provide the required guidance and ensure adequate safety while optimizing individual functional health.

This study has demonstrated that this type of exercise program can have a positive effect on the health condition of the older adult. There are few performance standards available for this type of comprehensive exercise programming. It is reasonable to recommend, therefore, further study in this area. Implications for practice and future research could include a number of factors such as (a) A definition of the scope of a comprehensive exercise program designed to optimize individual health while ensuring adequate safety; (b) Duplicate this study to determine if positive trends of improvement can be maintained over a larger number of participants, and over a longer period of time; (c) Investigate the role of flexibility in maintaining functional mobility in the older person.

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Appendix A

Review of the Literature

Review of the Literature

Introduction

It has been estimated that by the year 2020, 24% of the population will be over the age of 65 (Bokovoy & Blair, 1994). This expected increase in the elderly population is accompanied by a growing interest in the effects of aging on human physiology (Booth, Weeden, & Tseng, 1994). A variety of physiological changes may be seen in the elderly, some of which are a result of the aging process, while others are attributed to inactivity, disease, and disability (Barry, Rich, & Carlson, 1993).

Given that body movements are produced by a series of skeletal muscle contractions, any impairment in muscular fitness may result in some degree of immobility (Brooks & Faulkner, 1994). With a decline in mobility, physical activities of daily life may be restricted resulting in further deterioration of skeletal muscle, loss of independence, and a poorer quality of life. Danner and Edwards (1992) have indicated that 40% of Americans do not exercise, 40% are active at levels too low for fitness and health gains, while only 20% are regularly exercising at an intensity to be beneficial.

Roger and Evans (1993), in their review of the literature, found a great deal of evidence to support the idea that with sufficient exercise stimulus the aging skeletal muscle can be rescued from an atrophied state. Muscular fitness is needed to help provide protection from injuries and to sustain the skills required for daily independent living (Dinsmoor, 1993).

The American college of sports medicine has recommended a number

of considerations be addressed before evaluating an older person. These include a knowledge of the aging process on the variables being measured; the effects of deconditioning, age-related decline, and disease; the pace and potential of reversibility of the aging process that may be influenced by the intervention; the number and type of prescribed medications the individual may be taking (Skinner, 1993); and finally, the possibility of an active or latent disease process presence. In agreement with Skinner (1993) the two main purposes of testing the older person is to determine the degree of risk associated with various work loads and to establish the appropriate intensities for exercise prescription. To date no ideal testing protocols exist for older adults (ACSM, 1995).

Physiological Changes With Aging

Change in physiological capacity is part of the aging process. Some of these changes include decreases in lean body mass, skeletal muscle protein, cross sectional muscle area, bone density, total body water, resting metabolic rate; and an increase in percentage body fat (Rogers and Evans, 1993). It has been generally agreed that between the ages of 30 - 70 years muscle mass may decrease up to 30% (Rogers and Evans, 1993). This decrease in the muscle mass may influence the individual's ability to carry out activities of daily living.

Decreases in muscular strength with age may be caused by an overall change in muscle function. Dynamic muscle strength and speed of movement between the ages of 50 - 70 years has been shown to decrease by 24

to 36% (Rogers & Evans, 1993). Rogers and Evans have reported that type II fiber area was found to be approximately 36% smaller in a 60 year old than in to a 40 year old. Women displayed declines in maximum strength of 35% and a decreased cross sectional area of quadriceps of 33%. It appears that between the ages of 70 and 80 years quadriceps strength decreases by approximately 30% (Rogers and Evans, 1993). In the 6^{th} and 7^{th} decades, there was an estimated decrease in muscle strength of 15% per decade, followed by an approximate decline of 30% per decade thereafter (Rogers and Evans, 1993).

In regards to fiber type and numbers with aging, Rogers and Evans (1993), found evidence " that during aging when loss of skeletal muscle mass occurs, it is not because of the preferential loss of a specific fiber type but that both Type I and Type II skeletal muscle are equally affected." An estimated 25% fewer muscle fibers have been noted between the elderly and the younger populations accounting for approximately 18% difference in muscle size (Rogers & Evans, 1993). Damage to muscle cells without regeneration and interruption in the connection between motor neurons and fibers innervated are the two mechanisms for which significant decreases in muscle fibers may be accounted (Rogers & Evans, 1993).

Rogers and Evans (1993), provided further evidence that muscle size decreases about 40% between the ages of 20 and 80 years. This decline in skeletal muscle size was found to be related to the decrease in muscle strength with age. In the studies reviewed, Rogers and Evans (1993), indicated differences in men and women with respect to cross sectional upper thigh

muscle sizes. The results demonstrated that these sizes were 25% smaller in older men than in younger men, and 33% smaller in older women than in younger women.

Muscular Fitness

Muscular fitness is the combination of three components: muscular strength, muscular endurance and flexibility (ACSM, 1995).

Muscular strength is defined as the ability of a muscle or group of muscles to exert a force against a resistance and is usually measured by performing one maximal effort (Anshel, Freedson, Hamill, Haywood, Horvat, & Ploughman, 1991).

Muscular strength training is divided into three types of contractions; isometric, isotonic, and isokinetic. Isometric or static contraction occurs when muscle length does not change with tension development. This type of contraction is measured with cable tensiometers and handgrip dynamometers which are specific to the muscle group or joint angle involved. Isometric contraction is beneficial in rehabilitation to counter the loss of strength and atrophy of muscles associated with immobilization. A limitation of isometric contractions is that it frequently encourages breath holding. The result is an increase in intrathoracic pressure which causes elevations in blood pressure. As a result, isometric contractions are unsuitable for elderly, hypertensive, and coronary individuals (American College of Sports Medicine, 1993; American College of Sports Medicine, 1995; Liemohn & Sharpe, 1992).

Isotonic or dynamic contractions occur when the muscle shortens

(concentric) or lengthens (eccentric) while overcoming or resisting a constant load. This type of contraction is measured while performing a one-repetition maximum (1-RM) using free weights or a machine where the resistance moves along a fixed path. There are four variables that may be manipulated to achieve optimum results in strength gain through isotonic contractions. These variables are load intensity, rate or speed of repetition, number of repetitions, and rest intervals between repetitions. To date it has yet to be determined which combination of these variables is the most appropriate for specific muscular strength needs of the elderly (ACSM, 1993; ACSM, 1995; Liemohn & Sharpe, 1992; Kreighbaum, & Barthels, 1990).

Isokinetic contractions occur when the muscle shortens with a maximal tension through a full range of motion at a constant speed. Measurement of isokinetic contractions is usually performed on exercise devices that utilize a hydraulic form of resistance that is controlled by a speed governor. The advantage of this type of contraction is that it allows for the development of strength at different velocities through a full range of motion. Because the measurement is of a maximal amount of performance at a set speed, there is a potential for breath holding and significantly increased blood pressure. The isokinetic type of contraction appears to be more appropriate for athletes wishing to develop strength speeds to match their required skills than for the elderly in general (ACSM, 1993; ACSM, 1995; Liemohn & Sharpe, 1992; Kreighbaum, & Barthels, 1990).

Muscular strength and muscular endurance are inter-related in that

improvement in one of these components is usually accomplished by positive gains in the other (ACSM, 1995). Muscular endurance is defined as the ability of the working muscle or muscle groups to perform with a sub-maximal resistance for an extended period of time (Anshel et al., 1991). Two common muscular endurance evaluation protocols include relative load tests and calisthenics. Relative load tests use identical repetitions of a set load repeated over time to determine the endurance of a muscle or group of muscles (ACSM, 1993).

The Canadian Society for Exercise Physiology (CSEP, 1996) has recognized three types of relative load tests: weight lifting, isokinetics, and isometrics. The weight lifting protocol requires the participant to lift a relative load at a cadence set by a metronome. The number of repetitions successfully completed before falling behind the cadence is recorded. The isokinetic protocol recommended by CSEP requires that the participant perform maximal repetitions at pre determined degrees/second. The isometric protocol requires that the participant maintain a percentage of maximal isometric strength for as long as possible (CSEP, 1996). The safety of these tests has yet to be determined for the older person.

Calisthenics or static testing involves a muscle or muscle group to maintain a certain tension over time (ACSM, 1993). Two of the more common test protocols recommended by CSEP are continuous sit-ups for 1 minute and continuous push-ups for 1 minute. Protocols for these tests may be found in the CSEP (1996) manuals. Static testing may not be appropriate

for the older person as it encourages breath holding which results in increased blood pressure and there may be an increased risk of injury. Standard values for the sit-up and push-up evaluations have been established for healthy individuals between the ages of 20 and 69 years (ACSM, 1993; CSEP, 1996). To date no standard values or protocols for muscular endurance were found for individuals in the 7th plus decades.

Adequate flexibility in an individual is important for maintaining functional capabilities such as bending and twisting in addition to decreasing the potential for injuries such as muscle strains and low back problems (ACSM, 1995). Flexibility is defined as the range of motion about a joint (Anshel et al., 1991), and is dependent on variables such as distensibility of the joint capsule, muscle temperature, amount of muscle, and tightness of other tissues such as ligaments and tendons (ACSM, 1995). Flexibility exercises are designed to improve passive and active range of motion (ROM).

There are three types of stretching techniques discussed in the literature: static, dynamic, and proprioceptive neuromuscular facilitation (PNF). Static stretching is where the targeted musculature is lengthened to the point of discomfort by increasing the distance between the origin and insertion (ACSM, 1993). This position is held for approximately 10 to 30 seconds followed by a brief rest, then repeated 3 - 5 times for each targeted area (ACSM, 1995). This would be an effective and safe protocol for the elderly to use in improving flexibility.

Dynamic stretching includes movements that are jerky or bouncy.

There is an increased risk of injury should the motion exceed the range of motion of the joint, the result of which might be sprained ligaments or tendons (Howley & Franks, 1992). For this reason, dynamic stretching is not considered appropriate for an older individual.

Proprioceptive neuromuscular facilitation (PNF) was originally used in clinical settings. Recently however, this method has received more use in other populations, including seniors, for improving ROM (ACSM, 1993). This method involves the target muscle group to briefly contract (5 to 6 seconds) against a resistance after the limb is at the end-ROM. Muscle injuries and soreness have been reported as a result of this technique (ACSM, 1993). For this reason it may not be appropriate for the older population.

Some of the more common laboratory tests for flexibility determine the range of motion in degrees. Devices used to evaluate flexibility include goniometers, electrogoniometers and the leighton flexometer, all of which have been found to be expensive and/or time consuming.

Two regions of importance in the maintenance of flexibility are the lower back and posterior thigh. These are commonly assessed using sit-and-reach protocols. The standard values provided by CSEP for the sit-and-reach evaluation are limited to those individuals aged 20 - 69 years. To date there are no sit-and-reach standard values provided for the 70 plus individual.

Muscular Fitness and the Elderly

Every activity in a persons life requires some degree of muscular fitness. By improving and maintaining muscular strength, muscular

endurance and flexibility the individual will be under less physiological stress when performing daily tasks. Good muscular fitness in the elderly is necessary for improved mobility in terms of gait velocity, and stair climbing (Verfaillie, Nichols, Turkel, & Hovell, 1997; Nichols, Hitselberger, Sherman, & Patterson, 1995). Studies have indicated an association between lower extremity weakness and the risk of falls (Binder, Brown, Craft, Schechtman, & Birge, 1994; Lord, Caplan, & Ward, 1993). Falls in the elderly result in injuries, fractures, decreased mobility, and increased fear (Work, 1989). Work (1989, p. 136) stated that " ...very old people are probably not destined genetically to die of heart disease. What they die of is osteoporosis, hip fractures, and immobility. Inability to get out of a chair - not inability to run across the street - is limiting their quality of life."

The role of resistance training for the elderly should include sufficient gains to effectively climb stairs, get in and out of the bath, transfer out of a chair, make the bed, carry groceries, open jars, and to lift and carry objects (Danner & Edwards, 1992), in order to simply maintain their independence. Recent research has shown resistance training to have positive and significant increases in strength and functional mobility (Brown, McCartney, & Sale, 1990; Fiatarone, Marks, Ryan, Meredith, Lipsitz, & Evans, 1990; Sauvage, Myklebust, Crow-Pan, Novak, Millington, Hoffman, Hartz, & Rudman, 1992; Munnings, 1993). The authors concluded by suggesting progressive resistance training programs are a feasible way to reverse or reduce "age-related" muscle weakness. When considering cardiac

rehabilitation, Sparling, Cantwell, Dolan, Niederman (1990) found that using low resistance exercise (30% - 40% of one RM) with a selected group of patients improved their strength by 22% over a six month period.

Fiatarone et al. (1990) presented a paper based on information gathered from working with frail institutionalized volunteers at the age of 90 ± 1 year using a high-intensity resistance training program over an eight week period. Results from this study indicated an average strength gain of 174% ± 31%, mid-thigh muscle area increased by 9.0% ± 4.5%, and the mean tandem gait speed improved by 48% after training. Not surprisingly the authors concluded that "high-resistance weight training leads to significant gains in muscle strength, size, and functional mobility among frail residents of nursing homes up to 96 years of age." (Fiatarone et al., 1990, p. 3034).

Åstrand (1992) has indicated that physical training produces essential functional improvements in physical fitness which minimizes fatigue and enhances performance thus economizing the energy output in the elderly. In a study by Menkes, Mazel, Redmond, Koffler, Libanati, Gundberg, Zizic, Hagberg, Pratley, & Hurley (1993), inactive untrained males of an average age of 59 ± 2 years were studied over a 16 week period with regards to the effects of resistance training on bone mineral density and bone remodeling. Training was found to increase the muscular strength by 45% ± 3%, and the bone mineral density increased by 3.8% ± 1.0% in the femoral neck, and by 2.0% ± 0.9% in the lumbar spine. Menkes et al. (1993) concluded that a resistance

training program was beneficial for increasing regional bone density and would therefore have a favorable impact on reducing the risk of fractures.

Brown et al (1990) found that older men respond to weight-lifting training in the same way as younger men with large increases in maximal load accompanying enlargement of whole muscle and muscle fiber areas. Adaptations to resistive exercise training with the elderly are similar to that of younger people; therefore, a decrease in the muscles metabolic and force-producing capacity may no longer be considered as just a consequence of the aging process. Through the maintenance and improvement of muscular fitness in the elderly, the means required to live a more independent and healthy lifestyle are set in place, reducing the reliance on the health care system and institutionalization (Drought, 1994). With increases in muscular strength, muscular endurance, and flexibility, the elderly are better equipped to sit and stand without assistance. As well, they are better able to move about more freely with perhaps a lessened fear of a fall and the potential injuries that may occur.

Functional Mobility

Functional mobility has been defined as the ability to access one's environment, and is considered a major contributor to maintaining independence and quality of life (Patla & Shumway-Cook, 1999; Campanelli, 1996; Anshel et al., 1991). Walking and stair climbing are an important part of accessing the environment independently. These will be briefly discussed as measures of functional mobility.

Walking is frequently used to assess the health and function of the neuromuscular system (Spirduso, 1995; Judge, Underwood, Gennosa, 1993) and is considered a major contributor to maintaining independence and quality of life for the older person (Patla & Shumway-Cook, 1999; Campanelli, 1996; Sauvage, Myklebust, Crow-pan, Novak, Millington, Hoffman, Hartz & Rudman, 1992). Shephard (1997) has reported that the following factors contribute to an older persons poor mechanical gait efficiency: (a) Loss of confidence, (b) muscle weakness, (c) impaired coordination of motor unit activation, and (d) stiffing of the joints.

Average walking speeds have been reported to decline with age (Spirduso, 1995; Rikli & Jones, 1998), with that of women decreasing more than men (Spirduso, 1995). Slower gait was observed in the older person for the following four reasons: (a) Endurance of the weaker muscles in the lower limbs was maximized with the use of a shorter stride, (b) less flexibility in the ankle and knee joints which constrained the stride length, (c) less time was spent in the single-support phase of gait, and (d) more time was required to monitor and react to changes in the environment (Spirduso, 1995).

One way of assessing gait involves a laboratory force platform which measures heel strike, midstance, pushoff, swing, and double support phases of an individual's walking cycle (Shephard, 1997). Other gait assessments involve timed free walking which involves the use of walking circuits, and treadmills. Some recent validation studies of walk tests for the older person have included the 6-minute walk test (Rikli & Jones, 1998), 5-minute walking

field test (Péloquin, Gauthier, Bravo, Lacombe, Billiard, 1998) and a 1-mile walk (Bazzano, Cunningham, Cama, & Falconio, 1998). Each of these studies varied in the size of the circuit used and all subjects were healthy community dwelling volunteers. The results from each of the validation studies indicated that walking tests were suitable for measurement of a healthy older individual's functional performance.

Verfaillie, Nichols, Turkel, & Hovell (1997) measured gait speed in older adults, ranging in age from 65 to 83 years, by recording the length of time subjects took to walk at normal pace over 6 meters. The authors found that by developing the lower limb strength of the older person, gains in gait speed could be achieved. After a 12 week resistance training program, subjects (mean age, 82.1 years) were tested using infrared timing devices on an 8-meter walk-way. The results indicated that there was improvement in gait velocity in the older subjects ranging between 3% and 13% (Judge, Underwood, Gennosa, 1993).

The environment in which the older population lives and moves is not always level. Street curbs and stairs are very much a part of the environmental terrain which must be considered by the older individual as part of every day activity. Few studies include a stair-climb test as part of evaluating functional mobility in community dwellers. Nichols et al. (1995) evaluated subjects with an average age of 67 years using a weighted stair-climb where the participants carried 20% of their pre-program body weight up a flight of 20 stairs. Each subject was timed on ascension pace. These subjects

were symptom free of any chronic condition yet were considered to be low activity individuals. The results indicated that the experimental group of subjects who participated in a resistance training program increased ascension pace by 11% over the control group of non-exercisers.

Rooks, Ransil, and Hayes (1997) used a timed 14 step stair climb and decent to assess functional mobility in symptom free older community dwellers. Subjects were divided into two groups; walkers and resistance training. The results indicated that all subjects improved in the stair climb with the resistance training group demonstrating greater improvement (28%) than the walking group (16%).

Well-Being

Subjective well-being "is an emotional feeling, it is personal, relatively transitory, and can be influenced by temporary environmental occurrences." (Spirduso, 1995, p. 305) For these reasons subjective well-being tests are difficult to validate and are reported to have lower reliabilities compared to tests of physical attributes (Spirduso, 1995). As defined by Caspersen, Powell, and Merritt (1994, p. 199) life satisfaction is considered the general feeling states "of well-being indicated by taking pleasure in daily activities, finding life meaningful, having a feeling of success in achieving major goals, and having a positive self-image and optimism." Shephard (1997) found a number of studies to report that the more leisure activities the older person participated in the higher the level of life satisfaction experienced. In their review of 38 studies, McAuley and Rudolph (1995) concluded that there was

little consistency in the measurements used to evaluate subjective well-being in older individuals, and that participation in physical activities rather than physical fitness may be more related to the improvements reported. Little is known of how much exercise is needed to achieve positive well-being and life satisfaction, or the role that a comprehensive exercise program may play in the well-being of an older adult.

To date limited information exists on the effects of resistance training on the older adult's subjective well-being. Mihalko and McAuley (1996) studied resistance training effects on subjective well-being and physical function in a group of subjects ranging between the ages of 71 and 101 years. Their results indicated that participants who participated in an 8 week resistance training program, designed to improve upper body strength, were found to report higher levels of well-being and life satisfaction than those individuals who participated in a fluid movement control program.

Single or multiple questions are used to gather information about an individual's well-being. The questions can either be in the form of a symbolic rating scale or a Likert rating scale. The responses to these questions are then combined to produce a single score which represents the individual's overall well-being (Andrews & Robinson, 1991).

Conclusion

Spirduso (1994) has suggested that the greatest challenge for future research lies in determining how to get the adult population to recognize the benefits of physical activity, and to become more active in leaving their

sedentary lives behind. It is now well established that progressive resistance training programs may benefit older persons (Verfaillie, Nichols, Turkel, & Hovell, 1997; Hunter, Treuth, Weinsier, Keses-Szabo, Kell, Roth, & Nicholson, 1995; Jones, Rikli, Benedict, & Williams, 1994; Munnings, 1993; Brown, McCartney, & Sale, 1990). As pointed out by Bokovoy & Blair (1994, p. 256), "an important goal for exercise scientists and sports medicine clinicians is to discover new ways to encourage physical activity in the most sedentary and unfit people." McAuley & Rudolph (1995), in their review of the literature were unable to find a causal relationship between psychological well-being and physical activity. There were, however, indications that physical activity participation was related to improvements in psychological well-being. "Physical training can readily produce a profound improvement of functions essential for physical fitness in old age and thus effectively postpone physical deterioration for some 10-20 years." Astrand (1992, p. 159).

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Appendix B

Pre-Program Forms:

Physician Referral

Consent/ Waiver

Client Profile

University of Victoria, Faculty of Education, School of Physical Education.

Exercise Therapy Program

97/01 - 1 of 2

physician referral

Clientname: _____

phone: _____ birth date: _____

Present prescribed medications:

Medication(s)	*Amount prescribed*	*How often*

1. Any medical condition(s) which may preclude participation in the described exercise therapy program? Yes ❑ No ❑

comments: _____

2. Medical summary of the health status of the participant: _____

3. Any type of exercise movement(s) that should be avoided which would potentially put the client at risk? Yes ❑ No ❑

comments: _____

4. Would you like to receive a progress report for your patient's file? Yes ❑ No ❑

University of Victoria, Faculty of Education, School of Physical Education.

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physician referral

Exercise program recommendations

_____ A. Temporarily delay participation in the exercise therapy program while further investigative procedure(s) are conducted. Probable date of exercise program participation. _____

_____ B. Authorized participation in the exercise therapy program while further investigative procedure(s) are conducted. Probable date of completion of investigative procedures. _____

_____ C. Authorized participation in the exercise therapy program. No further investigative procedures to be conducted.

Additional comments:

Date: _____

Physician name: _____ _____

signature

Address: _____

Postal Code: _____ Phone: _____ Fax: _____

For further information, please call Flo Bongiovanni-Russell @ 000-0000. Thank-you.

Consent/ Release/ Waiver

For participation in the University of Victoria's thesis study titled "Effects of individualized exercise programming on muscular fitness and subjective well-being in older persons."

The purpose of this study is to examine the effects of an individualized exercise program on components of muscular fitness in a population of older persons. A second purpose of this study is to examine the influence that this exercise program may have on life satisfaction and subjective well-being.

This study is scheduled to operate for three 1.5 hour sessions each week for 16 weeks. All participants will require written permission from their personal physician prior to participation in this study. You will be instructed on correct exercise technique, posture, and breathing related to each activity. Your pre-exercise blood pressure and heart rate will be monitored as required. You will be taught to monitor and record your activities for each exercise session. There will be both ongoing and post-program evaluations to monitor your progress and to provide data for this study.

It is anticipated that you will find this study both enjoyable and beneficial. Although no assurance can be given that this study will increase your functional capacity; widespread experience and research indicates that improvement is usually achieved. During the exercise sessions the participants are likely to experience certain conditions including lightheadedness, dizziness, fatigue, or muscle discomfort. All exercise sessions will be fully supervised by qualified personnel capable of monitoring and minimizing any potential problem conditions.

Information obtained on the participant for use during this study will be treated as privileged, confidential, and kept in a locked filing cabinet on the premises. In this study, your data and documentation will be identified by a coded numerical system. Only the researcher and assistants will have access to the participants documentation. This data will not be released or revealed to any person without your written consent. Study data obtained will be used for statistical analysis or scientific purpose with your right to privacy retained by the use of coded numbers to identify the results; your name will not appear on any documentation. There is a potential opportunity for further research. Data utilized for any future research will be in the coded numerical system only, no identifying information will be released. You have the right to withdraw from this study at any time. Should you decide to withdraw from this study prior to completion, any documentation and data collected will remain as part of this study. All documentation will be held for five years before being destroyed by fire.

Consent/ Release/ Waiver

Responsibility of the Participant:

To gain expected benefits you must give priority to regular attendance and adherence to prescribed amounts of intensity, duration, frequency, progression, and type of exercise activity. To assure the safest exercise environment:

a) **DO NOT** withhold any information pertinent to any symptoms from the professional staff.
b) **DO NOT** exceed target heart rate or perceived exertion scale rating provided by the exercise specialist.
c) **DO NOT** exercise when not feeling well.
d) **DO NOT** exercise within two hours of using tobacco products.
e) **DO NOT** exercise within two hours after eating a heavy meal.
f) **DO NOT** exercise after drinking alcoholic beverages.
g) **DO NOT** use extremely hot water during showering after exercise (stay out of sauna, steam bath, and similar extreme temperatures).
h) **DO** report any unusual symptom(s) that you experience before, during, or after exercise, or that you notice in an exercising colleague.
i) **DO** check in with the researcher or the research assistant prior to leaving the facility at the end of each session.
j) **DO** follow, without exception, all recommendations made by the exercise specialist concerning the limits on any exercise.

Participants will be required to purchase passes at a cost of $70.00 for each 20 sessions. For those requiring a parking space there is an additional $1.00 charge per session. Car pooling may be arranged pending availability of interested parties. If you require further details or questions please contact me (Flo Bongiovanni-Russell) at 000-0000, or my faculty supervisor (Dr. Bob Bell) at 000-0000.

Consent/ Release/ Waiver

Freedom of Consent:

Your decision to engage in this study is voluntary. You are free to deny any activity if you so desire, both now and at any point during this study. Whether you participate or choose not to participate will have no bearing on the services received.

Release:

I acknowledge that I have read this form in its entirety, or it has been read to me, and I understand my responsibility in this study in which I will be participating. I accept the risks, rules, and regulations set forth. I consent to allow pertinent information, used only for my exercise prescription, to be released to the exercise specialist. I consent to participate in this study.

I am aware that participation in this study involves risk of personal injury including but not limited to soft tissue injury and/or broken bones. Any use of equipment, facilities or programs of the University of Victoria of which I will be participating, shall constitute acceptance of risk regardless of the nature of the injury. Therefore for guidance and supervision in this study, I hereby for myself, my heirs, Executors and Administrators, waive and release any and all rights and claims for damages I may now and hereafter have against the staff of the University of Victoria exercise therapy program, its Agents, Representatives or Assigns, and consultants.

---

participant signature _____ date _____

witness signature _____ date _____

University of Victoria, Faculty of Education, School of Physical Education.

Exercise Therapy Program

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client profile

Date: _____

Name: _____

Birth date: _____ Age: _____ Gender: Male ❑ Female ❑

Address: _____

Postal Code: _____ Phone: (Home) _____ (Work) _____

Occupation: _____

Doctor: _____ Phone: _____

Doctor requests a progress report? Yes ❑ No ❑

Physiotherapist/Chiropractor: _____ Phone: _____

Other: _____ Phone: _____

Referral source: _____

rPAR-Q

1. Has your doctor ever said you have a heart condition and that you should only do physical activity recommended by a doctor? Yes ❑ No ❑
2. Do you feel pain in your chest when you do physical activity? Yes ❑ No ❑
3. In the past month, have you had chest pain when you were not doing physical activity? Yes ❑ No ❑
4. Do you lose your balance because of dizziness or do you ever lose consciousness? Yes ❑ No ❑
5. Do you have a bone or joint problem that could be made worse by a change in your physical activity? Yes ❑ No ❑
6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition? Yes ❑ No ❑
7. Do you know of any other reason why you should not do physical activity? Yes ❑ No ❑

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Exercise Therapy Program

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client profile

Demographics

8. Do you participate in any physical activity(s) presently?: Yes ❑ No ❑

Type of Activity	*Frequency*	*Duration*

9. Are you aware of any other problem(s) or concern(s) which may affect your exercise ability? Yes ❑ No ❑

Comment: _____

_____

10. Please list the medications you are presently taking:

Medication(s)	*Amount taken*	*How often*	*Time of Day*

11. What are your expectations from this exercise program? _____

_____

_____

12. Do you drink alcohol? Yes ❑ No ❑

How much? _____

13. Do you smoke? Yes ❑ No ❑

How much? _____

14. Have you fallen in the past year? Yes ❑ No ❑

How often? _____ Date of last fall? _____

University of Victoria, Faculty of Education, School of Physical Education.

Exercise Therapy Program

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client profile

15. Are you affected by any of the following?

- ❑ *allergies* _____
- ❑ *arthritis* _____
- ❑ *breathingdisorder (s)* _____
- ❑ *chronic fatigue* _____
- ❑ *diabetes* _____
- ❑ *emotional problems* _____
- ❑ *epilepsy* _____
- ❑ *fibromyalgia* _____
- ❑ *heart conditions* _____
- ❑ *hernia(s)* _____
- ❑ *hyperlipidemia* _____
- ❑ *hypertension* _____
- ❑ *injuries (bones, tissues)* _____
- ❑ *low back pain* _____
- ❑ *migraines* _____
- ❑ *obesity* _____
- ❑ *orthopedic* _____
- ❑ *osteoporosis* _____
- ❑ *seizures* _____
- ❑ *stroke* _____
- ❑ *surgeries* _____
- ❑ *other* _____

16. How many sessions per week do you plan to attend? _____ (2/wk) _____ (3/wk)

Appendix C

Tester Reliability Results

and

Measure Scales:

Borg's Perceived Exertion

Perceived Exertion for Resistance Intensity

```
Worksheet size: 3500 cells
MTB > Save 'max - reliability'

Worksheet saved into file: max - reliability.MTW
MTB > Save 'max - reliability.MTW'

Worksheet saved into file: max - reliability.MTW
MTB > AOVOneway 'LE max1' 'LE max2' 'LE end1' 'LE end 2' 'BC max1'  &
CONT>     'BC max2' 'BC end 1' 'BC end2'.

ANALYSIS OF VARIANCE
SOURCE     DF        SS        MS        F        p
FACTOR      7     62444      8921    44.40    0.000
ERROR      64     12858       201
TOTAL      71     75302

                                    INDIVIDUAL 95 PCT CI'S FOR MEAN
                                    BASED ON POOLED STDEV
 LEVEL      N      MEAN     STDEV  ------+---------+---------+---------+
LE max1     9     91.94     20.95                                  (---*---)
LE max2     9     92.78     20.97                                  (---*---)
LE end1     9     19.44      3.81  (---*---)
LE end 2    9     19.67      3.71  (---*---)
BC max1     9     37.22     13.25        (---*---)
BC max2     9     37.50     13.23        (---*---)
BC end 1    9     22.67     13.81   (---*---)
BC end2     9     20.89     12.61   (---*---)
                                    ------+---------+---------+---------+
POOLED STDEV =    14.17               25        50        75       100
MTB > AOVOneway 'LE max1' 'LE max2'.

ANALYSIS OF VARIANCE
SOURCE     DF        SS        MS        F        p
FACTOR      1         3         3     0.01    0.934
ERROR      16      7028       439
TOTAL      17      7031

                                    INDIVIDUAL 95 PCT CI'S FOR MEAN
                                    BASED ON POOLED STDEV
 LEVEL      N      MEAN     STDEV  ---+---------+---------+---------+---
LE max1     9     91.94     20.95  (--------------*--------------)
LE max2     9     92.78     20.97   (--------------*--------------)
                                    ---+---------+---------+---------+---
POOLED STDEV =    20.96              80        90       100       110
MTB > AOVOneway 'LE end1' 'LE end2'.

ANALYSIS OF VARIANCE
SOURCE     DF        SS        MS        F        p
FACTOR      1       0.2       0.2     0.02    0.902
ERROR      16     226.2      14.1
TOTAL      17     226.4

                                    INDIVIDUAL 95 PCT CI'S FOR MEAN
                                    BASED ON POOLED STDEV
 LEVEL      N      MEAN     STDEV  ---------+---------+---------+-------
LE end1     9    19.444     3.812   (----------------*----------------)
LE end2     9    19.667     3.708    (----------------*----------------)
                                    ---------+---------+---------+-------
POOLED STDEV =    3.760            18.0      19.5      21.0
MTB > AOVOneway 'BC max1' 'BC max2'.

ANALYSIS OF VARIANCE
SOURCE     DF        SS        MS        F        p
```

```
FACTOR      1          0          0     0.00    0.965
ERROR      16       2806        175
TOTAL      17       2806

                                        INDIVIDUAL 95 PCT CI'S FOR MEAN
                                        BASED ON POOLED STDEV
 LEVEL      N       MEAN      STDEV    ----+---------+---------+---------+--
BC max1     9      37.22      13.25    (---------------*---------------)
BC max2     9      37.50      13.23     (---------------*---------------)
                                        ----+---------+---------+---------+--
POOLED STDEV =     13.24               30.0      36.0      42.0      48.0
MTB > AOVOneway 'BC end1' 'BC end2'.

ANALYSIS OF VARIANCE
SOURCE     DF         SS         MS         F         p
FACTOR      1         14         14      0.08     0.779
ERROR      16       2799        175
TOTAL      17       2813

                                        INDIVIDUAL 95 PCT CI'S FOR MEAN
                                        BASED ON POOLED STDEV
 LEVEL      N       MEAN      STDEV    -+---------+---------+---------+-----
BC end1     9      22.67      13.81       (---------------*---------------)
BC end2     9      20.89      12.61    (---------------*---------------)
                                        -+---------+---------+---------+-----
POOLED STDEV =     13.23            12.0      18.0      24.0      30.0
MTB >
```

Borg's PERCEIVED EXERTION SCALE

6	
7	very very light
8	
9	very light
10	
11	fairly light
12	
13	somewhat hard
14	
15	hard
16	
17	very hard
18	
19	very very hard
20	

PERCEIVED EXERTION FOR WEIGHT INTENSITY

1 Very light

2 Light

3 Somewhat heavy

4 Heavy

5 Very heavy

Appendix D

Evaluation Protocols

Evaluation Protocols

Physiological Measures

Bicep Curl Muscular Strength

Equipment

- Apex arm curl and three 2.5 pound weight add-ons

Procedure

- adjust seat height for each participant.
- ten repetitions of bicep curl with body weight only.
- participant to exhale on the flexion and inhale on the extension.
- participant to perform one full range of motion (one repetition with the maximum weight determined within five trials.
- recovery time of 90 seconds between trials.
- record to the nearest 0.5 lb.
- termination of the test includes volitional fatigue, or participants inability to perform the full range of motion, (The previous weight will then be used as the maximum weight achieved).
- criteria for a "successful" lift with the bicep curl maximum evaluation occurred when the participant was able to maintain a straight spine, used a supine grip on the bar with straight arms at the starting position curling evenly to full flexion, and returning to start position.

Bicep Curl Muscular Endurance

Equipment

- Apex arm curl and three 2.5 pound weight add-ons, hand held counter, and metronome.

Procedure

- 5 minute recovery time between the muscular strength and muscular endurance measures.
- adjust seat height for each participant.
- participant to exhale on the flexion and inhale on the extension.

- participant to perform full range of motion continuously, working with an intensity of 50% of measured maximum, at a cadence of 50 bpm. Record number of completed reps.

- termination of the test includes volitional fatigue, or participant's inability to perform the full range of motion, or perform to the required cadence.

Leg Extension Muscular Strength

Equipment

- Body Masters leg extension machine, three 2.5 pound weight add-ons

Procedure

- adjust back cushion so that the seat edge will be against the back of the knees, and the leg cushion top at the base of the gastrocnemius muscle.

- hands placed on provided handle bars at the side of the seat.

- use the belt provided to help stabilize the hips.

- participant begins with extending and lowering legs while on the leg extension machine with body weight only for ten repetitions.

- participant to exhale on the knee extension and inhale on the knee flexion.

- participant to perform one full range of motion (one repetition with the maximum weight determined within five trials.

- recovery time of 90 seconds between trials.

- record to the nearest 0.5 lb.

- termination of the test includes volitional fatigue, or participants inability to perform one full range of motion, (The previous weight will then be used as the maximum weight achieved).

- criteria for a "successful" lift for the leg extension maximum evaluation was that the participant maintained the spine and buttocks in contact with the cushions, the legs were extended evenly to a straight leg position, and returned to start position.

Leg Extension Muscular Endurance

Equipment

- Body Masters leg extension machine, three 2.5 pound weight add-ons, hand held counter, and metronome.

Procedure

- 5 minute recovery time between the muscular strength and muscular endurance measures.

- adjust back cushion so that the seat edge will be against the back of the knees, and the leg cushion top at the base of the gastrocnemius muscle.

- hands placed on provided handle bars at the side of the seat.

- use the belt provided to help stabilize the hips.

- participant begins with extending and lowering legs while on the leg extension machine with body weight only for ten repetitions.

- participant to exhale on the knee extension and inhale on the knee flexion.

- participant to perform one full range of motion (one repetition with the maximum weight determined within five trials.

- participant to exhale on the knee extension and inhale on the knee flexion.

- participant to perform full range of motion continuously, working with an intensity of 50% of measured maximum, at a cadence of 50 bpm. Record number of completed reps.

- termination of the test includes volitional fatigue, or participant inability to perform the full range of motion, or perform to the required cadence.

Flexibility Sit-&-Reach

Equipment

- modified Wells and Dillon flexometer and floor exercise mat.

- may require a wider based elevated platform for those who are unable to get down to the floor.

Procedure

- start with participant given a hamstring stretch, held for a minimum of 20 seconds each, performed twice on each leg.

- removed shoes, participant sits with legs extended fully and the soles of the feet placed flat against the boards of the flexometer.

- the legs must remain fully extended, the arms must be stretched forward, and the palms face down.

- participants instructed to exhale as they gently push the slider along the scale with both index fingers, reaching forward until maximum flexion is reached and held for two seconds.

- two trails recorded to the nearest 0.5 cm, and the average of the two trails used for the attained score.

Functional Mobility Measures

Cardiovascular Measures Resting Heart Rate

Equipment

- chair, stethoscope, stopwatch.

Procedure

- sit in chair, feet flat on floor, for five minutes before using the measured resting heart rate (rHR).

- stethoscope positioned so ear pieces point forward.

- place diaphragm of stethoscope on either the sternum or over the second intercostal space on the left side. May also use the carotid pulse or the radial artery to measure rHR.

- use 15 second count and record in beats per minute.

- if rHR is 100 beats per minute (bpm) or more, check for dehydration (may require water), and wait five more minutes before taking another reading.

- if **rHR is ≥ 100 bpm** after second reading participant will **not** be permitted to continue with the evaluation.

Cardiovascular Measures Resting Blood Pressure

Equipment

- chair, stethoscope, sphygmomanometer (with proper cuff sizes available).

Procedure

- apply cuff to participant's left arm.
- lower margin of cuff two to three centimeters above the antecubital space.
- arm should be comfortably supported at an angle of 10 to 45 degrees from the trunk with lower edge of cuff at heart level.
- locate brachial artery at antecubital space by palpation.
- stethoscope ear pieces pointed forward.
- rapidly inflate cuff to level 20 to 30 mmHg above radial palpatory pressure.
- quickly position diaphragm of stethoscope over brachial artery. Diaphragm in complete contact with skin. Diaphragm should not touch the cuff or the tubing. Release cuff pressure at a rate of about two mm-per-second.
- record systolic and diastolic pressure to the nearest two mmHg.
- if resting blood pressure (rBP) is ≥ 144/94 mmHg than wait five minutes, check for dehydration, poor sleep the evening before, not feeling well.
- if after the second reading the **rBP is still ≥ 144/94 mmHg** than the participant will **not** be able the perform the evaluation.

Self-Paced Walk, Corridor - Five total laps

Equipment

- circular hall, stopwatch, polar heart monitor, Borg perceived exertion scale (6 - 20 scale).

Procedure

- first lap is the warm up lap regular walking pace.

- watch for posture: hips under shoulders?
  loose swinging arms?
  eyes up?
  even gait?
  walking assistance required?

- second to fifth laps pacing increased to the participant's perceived maximum walking ability.

- record at the end of each lap the participant's perceived exertion rate (RPE), heart rate (bpm), and time (min.).

- stop test when participant: can not speak without gasping for air,
  volitional fatigue,
  has pain in joints.

- two and four minute post blood pressure recorded.

- four minute post heart rate recorded.

Self-Paced Walk, Gymnasium - Nine total laps

Equipment

- large gymnasium, stopwatch, polar heart monitor, Borg perceived exertion scale (6 - 20 scale).

Procedure

- first lap is the warm-up lap at regular walking pace.

- watch for posture (see corridor walk).

- second to ninth laps pacing increased to the participant's perceived maximum walking ability.

- record at the end of each odd numbered lap the participant's perceived exertion rate (RPE), heart rate (bpm), and time (min.).

- stop test when participant: can not speak without gasping for air,
  volitional fatigue,
  has pain in joints.

- two and four minute post blood pressure recorded.

- four minute post heart rate recorded.

Weighted Stair Climb

Equipment
- backpack, free weights, and 20 stairs

Procedure
- prior to evaluation participants will be asked to stretch the gastroc and quad muscle groups.

- participant to carry backpack containing 25% of total body weight up 22 steps. (Carrying weight determined on August 18).

- participants allowed to rest if needed to complete the task.

- participants given one trial, with the time required to ascend the stairs recorded in seconds.

- performed on August 27, September 17, October 15, November 12, and December 3.

Subjective Well-Being Protocols

Subjective Exercise Experience Scale

Equipment
- table, chair, pen

Procedure
- at the end of the third session of each week this scale will be filed out in response to the training sessions for the previous week.

The Satisfaction With Life Scale

Equipment
- table, chair, pen

Procedure
- to be filled out prior to and once again upon completion of the program. (August 18 and December 5).

Appendix E

Activity Record

and

Supplement (data records)

EXERCISE THERAPY PROGRAM ACTIVITY RECORD Name:

date																		
bike	time																	
	dist																	
	cal																	
rower	time																	
	dist																	
	cal																	
walk	time																	
	dist																	
sets		#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3	#1	#2	#3
biceps	wt																	
	reps																	
quadriceps	wt																	
	reps																	
triceps	wt																	
	reps																	
hamstrings	wt																	
	reps																	
latissimus	wt																	
	reps																	
abdominals	wt																	
	reps																	
deltoids	wt																	
	reps																	
hip abductors	wt																	
	reps																	
pectorals	wt																	
	reps																	
torso twist	wt																	
	reps																	
	wt																	
	reps																	
	wt																	
	reps																	

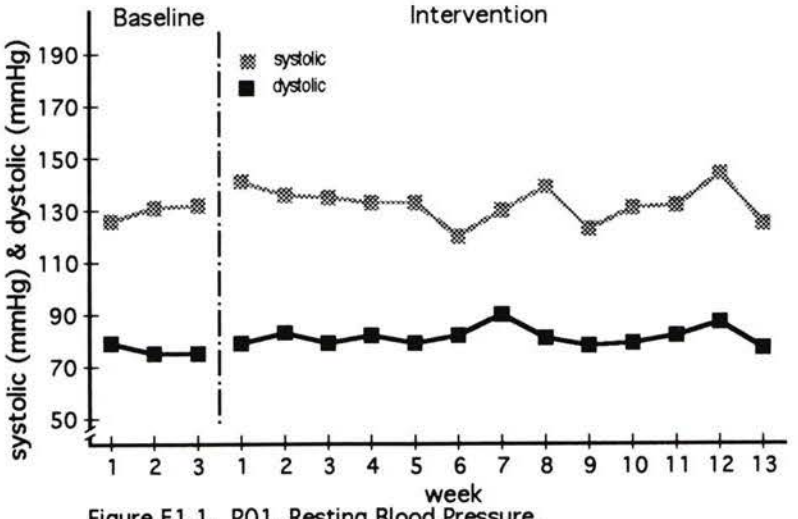

Figure E1.1. P01, Resting Blood Pressure.

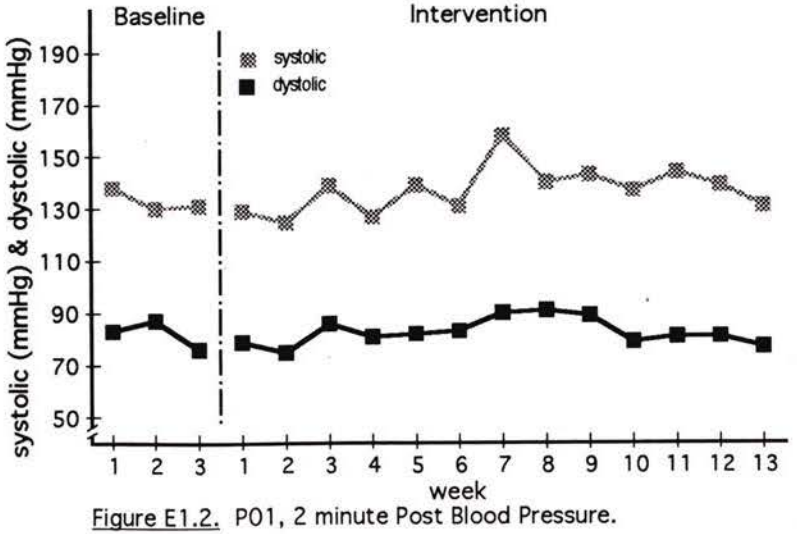

Figure E1.2. P01, 2 minute Post Blood Pressure.

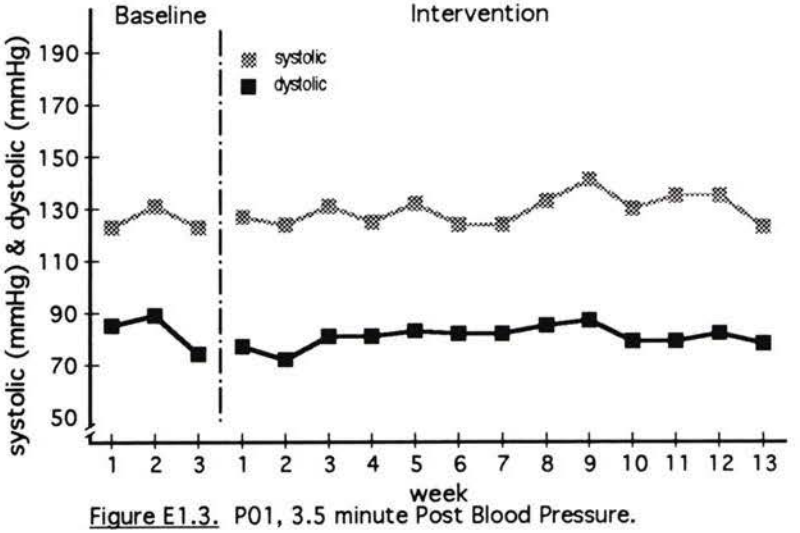

Figure E1.3. P01, 3.5 minute Post Blood Pressure.

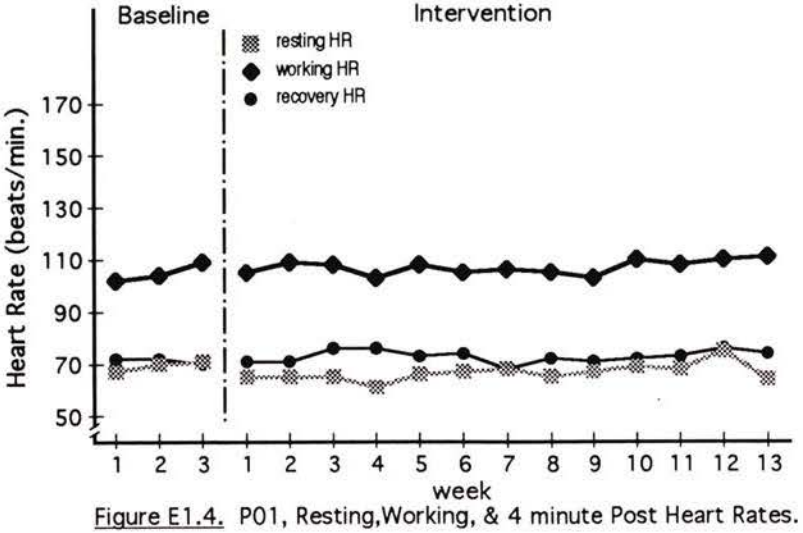

Figure E1.4. P01, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	130	130			142	140	140	130	130		130	140	118	120	132	146	122	
W	130	130	134		140	136	136	128	140	110		140	132	136	132	150	122	
F	118	132	130		140	132	130	140	128	130		138	120	136	132	136	130	
weekly avg	126	131	132	130	141	136	135	133	133	120	130	139	123	131	132	144	125	132
% change	-3%	1%	2%	0%	9%	5%	4%	2%	2%	-7%	0%	8%	-5%	1%	2%	11%	-4%	
Resting Diastolic																		
M	90	76			72	80	82	82	90		90	82	82	78	88	84	82	
W	78	76	72		80	86	76	82	76	80		80	82	78	80	88	82	
F	70	72	78		86	82	80	82	72	84		82	70	82	78	90	68	
weekly avg	79	75	75	76	79	83	79	82	79	82	90	81	78	79	82	87	77	82
% change	4%	-2%	-2%	0%	4%	8%	4%	7%	4%	7%	18%	7%	2%	4%	7%	14%	1%	
Resting Heart Rate																		
M	64	72			68	68	70	60	68		68	64	70	68	66	82	66	
W	70	68	70		68	70	64	64	64	70		68	64	68	66	78	65	
F	68	70	72		60	56	60	60	67	64		64	68	72	72	65	62	
weekly avg	67	70	71	69	65	65	65	61	66	67	68	65	67	69	68	75	64	67
% change	-3%	1%	2%	0%	-6%	-7%	-7%	-12%	-4%	-4%	-2%	-6%	-3%	0%	-2%	8%	-7%	
Working Heart Rate																		
M	101	106			107	106	110	107	107		106	104	102	109	109	108	106	
W	106	101	111		102	114	107	102	111	104		102	103	110	109	110	116	
F	100	104	106		106	107	106	99	105	105		108	103	112	106	112	111	
weekly avg	102	104	109	105	105	109	108	103	108	105	106	105	103	110	108	110	111	107
% change	-2%	-1%	3%	0%	0%	4%	3%	-2%	3%	0%	1%	0%	-2%	5%	3%	5%	6%	
	indicates no results available																	

Figure E1.5. P01, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	152	124			138	130	148	130	140		158	130	140	138	144	140	132	
W	130	130	130		124	128	136	128	136	122		160	148	134	142	140	140	
F	132	136	132		126	118	132	124	140	140		130	140	140	146	136	122	
weekly avg	138	130	131	133	129	125	139	127	139	131	158	140	143	137	144	139	131	137
% change	4%	-2%	-2%	0%	-3%	-6%	4%	-4%	4%	-2%	19%	5%	7%	3%	8%	4%	-1%	
Recovery 2 min. Diastolic																		
M	86	90			80	82	90	84	90		90	90	92	72	82	84	80	
W	80	90	74		76	72	84	80	72	74		90	84	80	72	80	80	
F	82	80	78		80	70	84	80	84	92		92	92	84	90	80	70	
weekly avg	83	87	76	82	79	75	86	81	82	83	90	91	89	79	81	81	77	83
% change	1%	6%	-7%	0%	-4%	-9%	5%	-1%	0%	1%	10%	11%	9%	-4%	-1%	-1%	-6%	
Recovery 3.5 min. Systolic																		
M	128	132			126	130	132	130	140		124	124	144	120	132	132	124	
W	120	132	125		124	122	130	124	132	116		142	138	130	140	136	124	
F	120	128	120		130	120	130	120	124	132		134	140	140	132	136	122	
weekly avg	123	131	123	125	127	124	131	125	132	124	124	133	141	130	135	135	123	129
% change	-2%	4%	-2%	0%	1%	-1%	4%	0%	5%	-1%	-1%	6%	12%	4%	7%	7%	-2%	
Recovery 3.5 min. Diastolic																		
M	84	90			80	78	82	80	86		82	84	88	78	82	84	82	
W	78	96	70		74	68	82	80	80	84		88	82	80	72	80	82	
F	92	80	78		78	70	80	82	84	80		82	90	80	84	82	70	
weekly avg	85	89	74	82	77	72	81	81	83	82	82	85	87	79	79	82	78	81
% change	3%	8%	-10%	0%	-6%	-13%	-1%	-2%	1%	-1%	-1%	3%	5%	-4%	-4%	-1%	-5%	
Recovery 4 min. Heart Rate																		
M	77	72			72	80	76	76	76		68	72	72	78	72	71	72	
W	72	72	72		72	70	76	76	72	76		72	72	75	72	80	73	
F	68	72	68		70	64	76	76	72	72		72	68	64	76	76	76	
weekly avg	72	72	70	71	71	71	76	76	73	74	68	72	71	72	73	76	74	73
% change	1%	1%	-2%	0%	0%	0%	6%	6%	3%	4%	-5%	1%	-1%	1%	3%	6%	3%	

indicates no results available

Figure E1.6. P01, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	60	70		65.00	70	70	80	80	85		90	95	80	80	85	85	85	82.08
% change	-8%	8%	~	0%	8%	8%	23%	23%	31%	~	38%	46%	23%	23%	31%	31%	31%	
BC end	19	19		19.00	23	18	22	21	27		23	19	21	25	19	26	24	22.33
% change	0%	0%	~	0%	21%	-5%	16%	11%	42%	~	21%	0%	11%	32%	0%	37%	26%	
LE max	120	120	125	121.67	140	145	155	155	170	170		175	180	180	180	180	185	167.92
% change	-1%	-1%	3%	0%	15%	19%	27%	27%	40%	40%	~	44%	48%	48%	48%	48%	52%	
LE end	21	17	19	19.00	20	20	20	23	23	21		20	21	23	24	21	22	21.50
% change	11%	-11%	0%	0%	5%	5%	5%	21%	21%	11%	~	5%	11%	21%	26%	11%	16%	
Walk Test																		
M	7.47	8.05			7.83	7.82	7.88	7.68	7.57		8.97	8.98	8.98	8.77	9.02	8.80	8.40	
W	8.13	8.17	8.02		7.93	7.58	7.75	7.85	8.47	9.02		8.88	8.82	8.67	8.90	8.82	8.32	
F	8.10	8.02	7.78		7.93	7.82	7.67	7.90	8.48	9.07		8.77	9.05	8.70	8.53	8.58	8.35	
weekly avg	7.90	8.08	7.90	7.96	7.90	7.74	7.77	7.81	8.17	9.05	8.97	8.88	8.95	8.71	8.82	8.73	8.36	8.45
% change	-1%	2%	-1%	0%	-1%	-3%	-2%	-2%	3%	14%	13%	12%	12%	9%	11%	10%	5%	
Flex Test																		
M	13.75	9.75			10.00	9.75	9.25	10.00	8.25		10.75	12.00	11.00	10.50	13.25	12.50	12.25	
W	9.25	10.75	12.00		11.00	9.25	9.25	8.00	11.00	11.00		11.25	12.00	12.75	11.50	13.75	13.00	
F	9.25	10.25	10.50		8.75	10.25	9.00	7.25	11.00	10.50		11.75	10.75	13.00	12.00	13.25	13.00	
weekly avg	10.75	10.25	11.25	10.75	9.92	9.75	9.17	8.42	10.08	10.75	10.75	11.67	11.25	12.08	12.25	13.17	12.75	10.92
% change	0%	-5%	5%	0%	-8%	-9%	-15%	-22%	-6%	0%	0%	9%	5%	12%	14%	22%	19%	
Stair Climb		9.13		9.13		8.93				10.64				9.70			8.45	9.43
% change		0%		0%		-2%				17%				6%			-7%	

indicates no results available

Figure E1.7. P01, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	7	6	6		7	6	6	6	7	7		6	7	7	7	7	6	
Positive	7	6	6		7	6	6	7	7	6		6	7	6	7	7	6	
Strong	6	2	5		6	6	6	6	7	5		6	6	6	6	6	6	
Terrific	1	7	6		7	6	6	6	7	7		7	6	7	7	6	6	
Average	5	5	6	5	7	6	6	6	7	6	~	6	7	7	7	7	6	6
Psychological distress																		
Awful	1	1	1		1	1	1	1	7	1		1	1	1	1	1	1	
Crummy	1	1	2		1	1	1	1	1	1		1	1	1	1	1	1	
Discouraged	1	1	1		1	1	6	7	1	1		6	1	7	6	1	1	
Miserable	1	1	1		1	1	1	1	1	1		1	1	1	1	1	2	
Average	1	1	1	1	1	1	2	3	3	1	~	2	1	3	2	1	1	2
Fatigue																		
Drained	3	1	2		5	4	5	5	6	6		5	6	5	5	5	5	
Exhausted	2	2	2		5	5	5	5	1	5		5	6	5	5	4	5	
Fatigued	1	1	2		5	5	5	5	2	6		5	6	5	5	4	5	
Tired	2	2	2		5	6	5	5	1	5		5	6	5	5	5	2	
Average	2	2	2	2	5	5	5	5	3	6	~	5	6	5	5	5	4	5
	indicates no results available																	

Figure E1.8. P01, Subjective Exercise Experience Scale results.

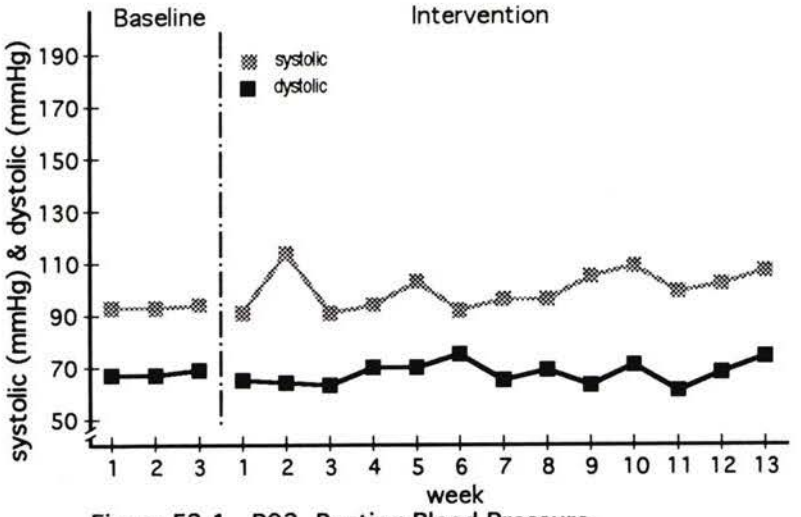

Figure E2.1. P02, Resting Blood Pressure.

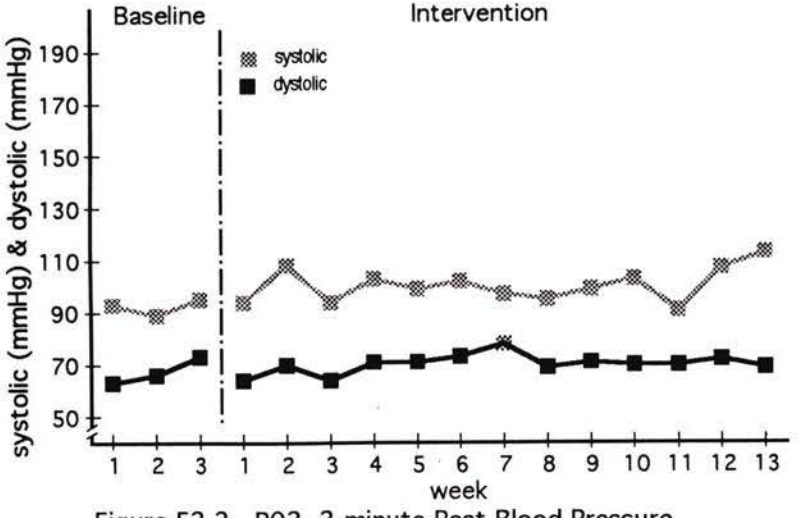

Figure E2.2. P02, 2 minute Post Blood Pressure.

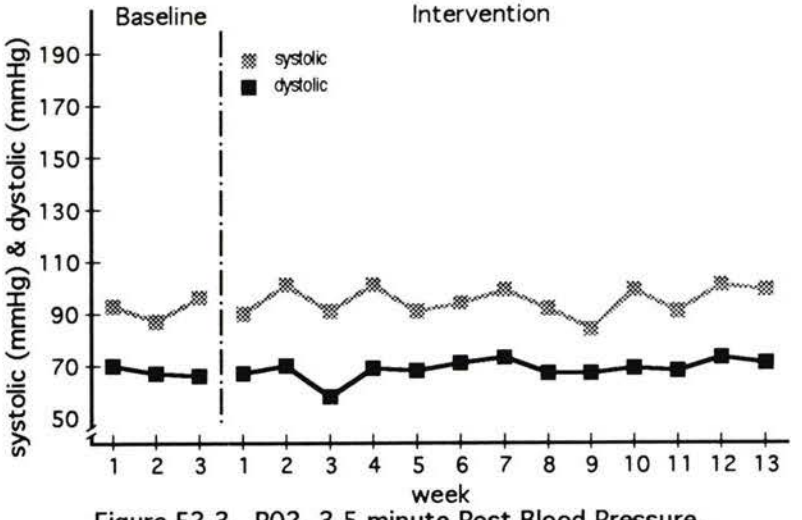

Figure E2.3. P02, 3.5 minute Post Blood Pressure.

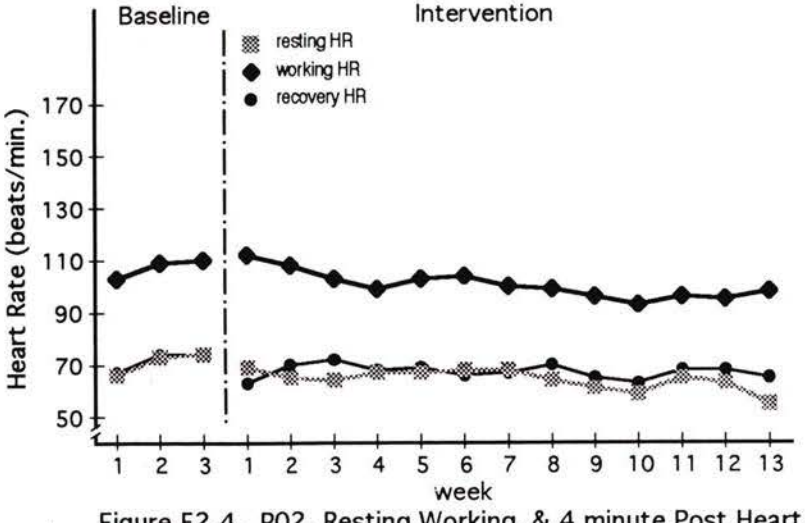

Figure E2.4. P02, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	100	98			88	118	90	90	112		90	106	108	130	96	92	110	
W	90	90	98		94		92	96	100	92	90	84	90	100	98	104	100	
F	90	90	90		90	110	92	96	96	92	108	98	116	96	104	110	110	
weekly avg	93	93	94	93	91	114	91	94	103	92	96	96	105	109	99	102	107	100
% change	0%	-1%	1%	0%	-3%	22%	-2%	1%	10%	-1%	3%	3%	12%	16%	6%	9%	14%	
Resting Diastolic																		
M	80	68			64	62	60	70	72		62	70	60	80	60	62	76	
W	60	70	74		66		60	70	70	80	62	68	64	72	62	72	70	
F	62	64	64		64	66	68	70	68	70	70	68	64	60	62	70	76	
weekly avg	67	67	69	68	65	64	63	70	70	75	65	69	63	71	61	68	74	67
% change	-1%	-1%	2%	0%	-5%	-6%	-8%	3%	3%	10%	-5%	1%	-8%	4%	-10%	0%	9%	
Resting Heart Rate																		
M	71	64			64	70	60	66	68		68	62	60	52	68	62	55	
W	64	77	80		72		68	68	68	72	72	68	63	60	60	72	55	
F	64	78	68		72	60	64	68	64	64	64	62	60	64	68	56	56	
weekly avg	66	73	74	71	69	65	64	67	67	68	68	64	61	59	65	63	55	64
% change	-7%	3%	4%	0%	-2%	-9%	-10%	-5%	-6%	-4%	-4%	-10%	-14%	-18%	-8%	-11%	-22%	
Working Heart Rate																		
M	93	108			113	106	100	105	104		100	99	100	90	94	96	99	
W	102	110	114		108		106	100	104	106	101	107	93	93	98	100	104	
F	113	110	106		116	109	103	91	100	101	99	92	96	97	96	90	92	
weekly avg	103	109	110	107	112	108	103	99	103	104	100	99	96	93	96	95	98	100
% change	-4%	2%	2%	0%	5%	0%	-4%	-8%	-4%	-4%	-7%	-7%	-10%	-13%	-11%	-11%	-8%	
	indicates no results available																	

Figure E2.5. P02, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	100	86			102	108	90	90	104		98	96	92	112	92	92	120	
W	88	90	98		90		96	108	96	110	96	92	104	100	90	110	108	
F	90	90	92		90	108	96	110	98	94	96	98	100	98	92	120	110	
weekly avg	93	89	95	92	94	108	94	103	99	102	97	95	99	103	91	107	113	100
% change	1%	-4%	3%	0%	2%	17%	2%	11%	8%	11%	5%	3%	7%	12%	-1%	17%	22%	
Recovery 2 min. Diastolic																		
M	68	56			72	72	68	70	76		80	70	70	72	68	70	70	
W	64	70	76		60		62	72	68	70	78	70	72	70	70	76	66	
F	56	72	70		60	68	62	72	70	76	76	68	72	68	72	70	70	
weekly avg	63	66	73	67	64	70	64	71	71	73	78	69	71	70	70	72	69	70
% change	-7%	-2%	9%	0%	-5%	4%	-5%	6%	6%	9%	16%	3%	6%	4%	4%	7%	2%	
Recovery 3.5 min. Systolic																		
M	98	92			90	98	88	96	100		98	90	78	96	90	92	102	
W	92	90	100		90		92	98	84	94	104	90	98	104	90	104	98	
F	90	80	92		90	104	92	108	90	94	96	96	76	96	92	108	98	
weekly avg	93	87	96	92	90	101	91	101	91	94	99	92	84	99	91	101	99	95
% change	1%	-5%	4%	0%	-2%	10%	-2%	9%	-1%	2%	8%	0%	-9%	7%	-2%	10%	8%	
Recovery 3.5 min. Diastolic																		
M	70	70			72	68	52	70	72		74	68	68	70	66	70	72	
W	72	62	70		62		62	68	62	70	72	70	64	72	68	74	70	
F	68	68	62		68	72	60	70	70	72	74	64	70	66	70	74	70	
weekly avg	70	67	66	68	67	70	58	69	68	71	73	67	67	69	68	73	71	69
% change	4%	-1%	-2%	0%	0%	4%	-14%	3%	1%	5%	9%	0%	0%	3%	1%	8%	5%	
Recovery 4 min. Heart Rate																		
M	64	70			68	68	72	68	80		67	68	62	58	66	73	60	
W	72	79	80		52		72	64	64	64	71	80	66	65	72	72	76	
F	64	74	68		68	72	72	72	64	67	64	62	66	67	67	59	60	
weekly avg	67	74	74	72	63	70	72	68	69	66	67	70	65	63	68	68	65	67
% change	-7%	4%	3%	0%	-13%	-2%	0%	-5%	-3%	-9%	-6%	-2%	-10%	-12%	-5%	-5%	-9%	

indicates no results available

Figure E2.6. P02, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	20	30		25.00	30	30	30	35	30		35	25	35	35	35	35	35	32.50
% change	-20%	20%	~	0%	20%	20%	20%	40%	20%	~	40%	0%	40%	40%	40%	40%	40%	
BC end	18	20		19.00	20	20	22	22	33		40	37	31	37	39	32	43	31.33
% change	-5%	5%	~	0%	5%	5%	16%	16%	74%	~	111%	95%	63%	95%	105%	68%	126%	
LE max	55	60	50	55.00	50	50	60	60	60	60	65	70	70	70	70	70	70	63.46
% change	0%	9%	-9%	0%	-9%	-9%	9%	9%	9%	9%	18%	27%	27%	27%	27%	27%	27%	
LE end	19	19	20	19.33	20	20	20	21	21	23	26	25	25	25	25	28	27	23.54
% change	-2%	-2%	3%	0%	3%	3%	3%	9%	9%	19%	34%	29%	29%	29%	29%	45%	40%	
Walk Test																		
M	8.27	7.70			7.30	7.33	7.55	7.53	7.63		8.33	8.45	8.30	8.55	8.70	8.68	8.08	
W	7.95	7.60	7.40		7.53		7.60	7.68	8.20	8.37	8.40	8.10	8.43	8.37	8.52	8.63	8.55	
F	7.73	6.67	7.63		7.47	7.47	7.72	7.68	8.25	8.35	8.28	8.32	8.65	8.62	8.62	8.55	8.65	
weekly avg	7.98	7.32	7.52	7.61	7.43	7.40	7.62	7.63	8.03	8.36	8.34	8.29	8.46	8.51	8.61	8.62	8.43	8.13
% change	5%	-4%	-1%	0%	-2%	-3%	0%	0%	6%	10%	10%	9%	11%	12%	13%	13%	11%	
Flex Test																		
M	29.50	28.25			28.50	27.25	30.25	30.50	29.75		30.75	31.00	31.50	31.75	32.50	32.75	31.50	
W	29.00	26.50	29.50		31.00		29.00	30.75	29.25	32.50	32.00	31.75	32.75	31.00	32.25	32.50	31.50	
F	27.50	29.50	29.25		29.50	28.50	28.75	29.25	32.00	32.25	31.50	32.00	33.00	31.50	32.50	32.00	30.00	
weekly avg	28.67	28.08	29.38	28.71	29.67	27.88	29.33	30.17	30.33	32.38	31.42	31.58	32.42	31.42	32.42	32.42	31.00	30.96
% change	0%	-2%	2%	0%	3%	-3%	2%	5%	6%	13%	9%	10%	13%	9%	13%	13%	8%	
Stair Climb		15.38		15.38		12.75				11.46				11.64			10.67	11.63
% change		0%		0%		-17%				-25%				-24%			-31%	

indicates no results available

Figure E2.7. P02, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	7	6	7		7	7	7	7	7	7	7	6	7	5	7	7	7	
Positive	7	2	7		7	7	7	7	7	7	7	6	7	7	7	7	7	
Strong	7	4	7		5	4	4	4	4	6	4	5	3	4	5	4	7	
Terrific	7	6	7		7	7	7	7	7	7	7	6	6	5	7	7	7	
Average	7	5	7	6	7	6	6	6	6	7	6	6	6	5	7	6	7	6
Psychological distress																		
Awful	1	1	1		1	1	1	1	1	1	1	6	1	1	1	1	1	
Crummy	1	1	1		1	1	1	1	1	1	1	2	1	1	1	1	1	
Discouraged	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Miserable	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Average	1	1	1	1	1	1	1	1	1	1	1	3	1	1	1	1	1	1
Fatigue																		
Drained	1	2	1		1	2	1	1	4	1	3	3	3	4	2	1	1	
Exhausted	1	1	1		1	2	4	5	4	1	2	5	3	3	2	1	1	
Fatigued	1	1	1		5	4	4	5	4	1	2	4	3	4	4	4	1	
Tired	2	2	1		5	4	4	5	4	2	3	3	4	4	4	4	1	
Average	1	2	1	1	3	3	3	4	4	1	3	4	3	4	3	3	1	3
	indicates no results available																	

Figure E2.8. P02, Subjective Exercise Experience Scale results.

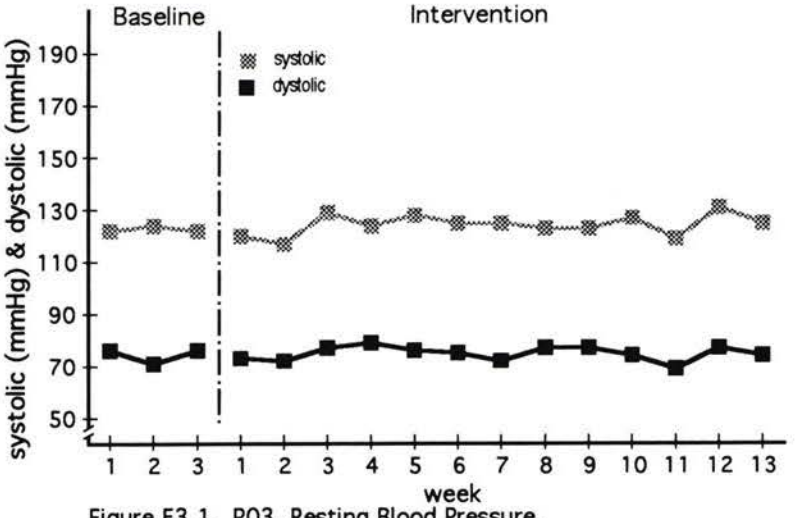

Figure E3.1. P03, Resting Blood Pressure.

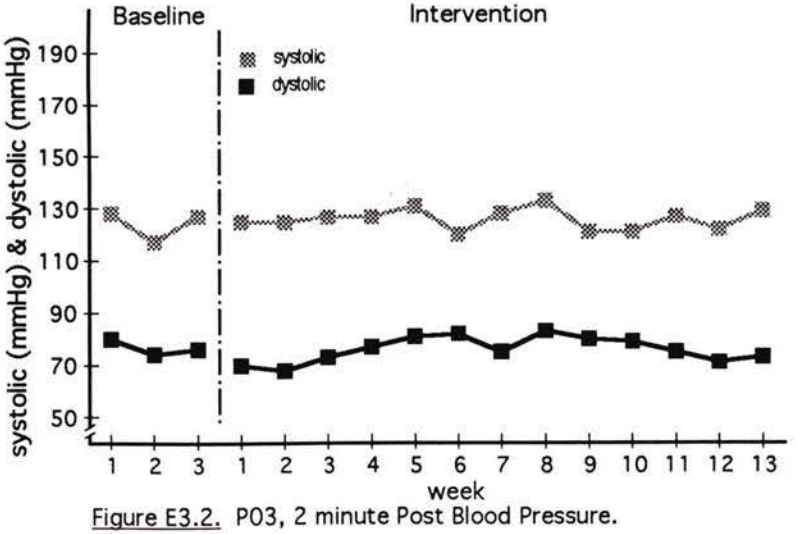

Figure E3.2. P03, 2 minute Post Blood Pressure.

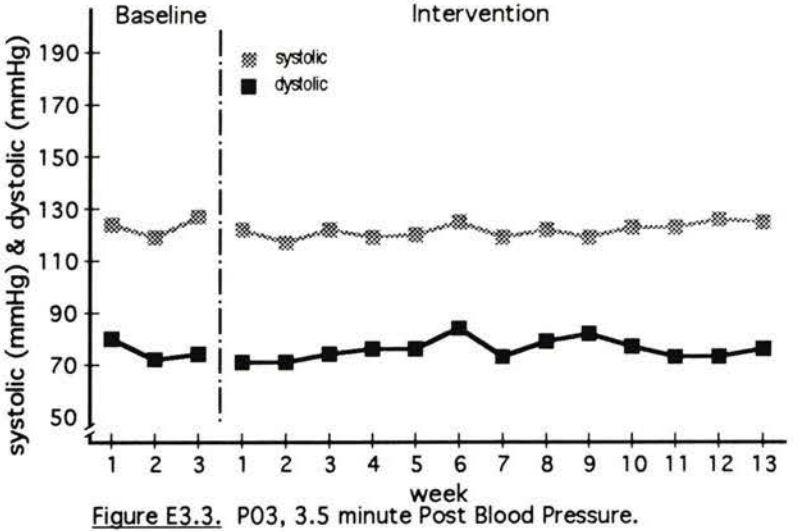

Figure E3.3. P03, 3.5 minute Post Blood Pressure.

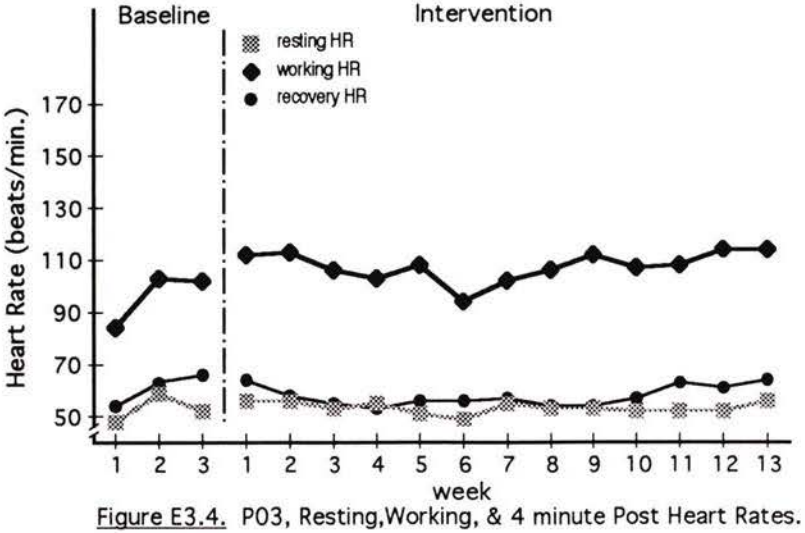

Figure E3.4. P03, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	122	132			128	118	128	120	122		130	124	120	130	120	130	122	
W		122	134		116		126	124	142	130	122	124	126	120	130	130	128	
F		118	110		116	116	132	128	120	120	124	120	124	130	106	132	124	
weekly avg	122	124	122	123	120	117	129	124	128	125	125	123	123	127	119	131	125	124
% change	-1%	1%	-1%	0%	-2%	-5%	5%	1%	4%	2%	2%	0%	1%	3%	-3%	7%	2%	
Resting Diastolic																		
M	76	70			80	72	76	76	74		72	80	78	72	70	76	74	
W		72	74		70		74	80	72	72	70	72	76	70	72	82	74	
F		72	78		70	72	80	80	82	78	74	78	76	80	66	72	74	
weekly avg	76	71	76	74	73	72	77	79	76	75	72	77	77	74	69	77	74	75
% change	2%	-4%	2%	0%	-1%	-3%	3%	6%	2%	1%	-3%	3%	3%	-1%	-7%	3%	-1%	
Resting Heart Rate																		
M	48	60			52	60	52	56	52		54	57	54	51	49	48	57	
W		60	52		52		52	56	52	48	54	51	52	53	56	54	54	
F		56	52		64	52	56	52	48	49	56	51	52	53	51	55	56	
weekly avg	48	59	52	53	56	56	53	55	51	49	55	53	53	52	52	52	56	53
% change	-9%	11%	-2%	0%	6%	6%	1%	3%	-4%	-8%	3%	0%	0%	-1%	-2%	-1%	5%	
Working Heart Rate																		
M	84	96			112	117	108	105	96		114	117	109	100	112	99	117	
W		110	99		114		99	104	126	89	94	98	120	111	99	113	104	
F		102	105		109	109	111	101	103	99	99	103	107	109	112	130	122	
weekly avg	84	103	102	96	112	113	106	103	108	94	102	106	112	107	108	114	114	108
% change	-13%	7%	6%	0%	16%	17%	10%	7%	13%	-2%	6%	10%	16%	11%	12%	18%	19%	
	indicates no results available																	

Figure E3.5. P03, Anthropometric results.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	128	120			128	128	124	130	130		128	150	122	120	124	110	128	
W		110	122		126		126	123	138	116	128	124	122	120	126	136	130	
F		120	132		120	122	132	128	124	124	128	124	120	124	130	120	130	
weekly avg	128	117	127	124	125	125	127	127	131	120	128	133	121	121	127	122	129	126
% change	3%	-6%	3%	0%	1%	1%	3%	3%	5%	-3%	3%	7%	-2%	-2%	2%	-2%	4%	
Recovery 2 min. Diastolic																		
M	80	76			70	72	70	80	82		80	90	80	82	76	72	74	
W		76	74		64		74	70	80	84	74	80	80	76	72	70	74	
F		70	78		76	64	74	80	80	80	72	80	80	80	76	70	72	
weekly avg	80	74	76	77	70	68	73	77	81	82	75	83	80	79	75	71	73	76
% change	4%	-3%	-1%	0%	-9%	-11%	-5%	0%	5%	7%	-2%	9%	4%	3%	-3%	-8%	-4%	
Recovery 3.5 min. Systolic																		
M	124	118			130	120	120	120	120		120	128	118	120	120	118	124	
W		118	130		116		120	116	120	130	116	120	118	120	120	136	124	
F		122	124		120	114	126	120	120	120	120	118	120	130	130	124	126	
weekly avg	124	119	127	123	122	117	122	119	120	125	119	122	119	123	123	126	125	122
% change	0%	-3%	3%	0%	-1%	-5%	-1%	-4%	-3%	1%	-4%	-1%	-4%	0%	0%	2%	1%	
Recovery 3.5 min. Diastolic																		
M	80	72			72	72	70	76	76		80	80	80	72	76	76	72	
W		72	70		64		76	76	76	86	70	80	78	76	72	70	86	
F		72	78		76	70	76	76	76	82	70	78	88	82	72	72	70	
weekly avg	80	72	74	75	71	71	74	76	76	84	73	79	82	77	73	73	76	76
% change	6%	-4%	-2%	0%	-6%	-6%	-2%	1%	1%	12%	-3%	5%	9%	2%	-3%	-4%	1%	
Recovery 4 min. Heart Rate																		
M	54	64			64	58	60	52	56		56	52	60	51	62	61	61	
W		60	68		64		52	52	56	56	60	54	58	61	62	60	68	
F		64	64		64	58	52	56	56	56	55	57	60	60	64	62	62	
weekly avg	54	63	66	61	64	58	55	53	56	56	57	54	59	57	63	61	64	58
% change	-11%	3%	8%	0%	5%	-5%	-10%	-12%	-8%	-8%	-6%	-11%	-3%	-6%	3%	0%	5%	

indicates no results available

Figure E3.6. P03, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	85	90		87.50	95	85	95	90	105		115	135	135	140	145	150	150	120.00
% change	-3%	3%	~	0%	9%	-3%	9%	3%	20%	~	31%	54%	54%	60%	66%	71%	71%	
BC end	25	24		24.50	21	23	25	26	33		35	43	39	38	41	38	47	34.08
% change	2%	-2%	~	0%	-14%	-6%	2%	6%	35%	~	43%	76%	59%	55%	67%	55%	92%	
LE max	220	220	170	203.3	200	205	220	230	235	245	250	255	255	255	255	255	255	239.62
% change	8%	8%	-16%	0%	-2%	1%	8%	13%	16%	20%	23%	25%	25%	25%	25%	25%	25%	
LE end	18	18	18	18.00	21	24	25	22	27	31	30	27	31	27	28	27	28	26.77
% change	0%	0%	0%	0%	17%	33%	39%	22%	50%	72%	67%	50%	72%	50%	56%	50%	56%	
Walk Test																		
M	8.27	7.60			7.00	6.98	6.98	7.00	7.12		8.03	7.90	8.00	8.02	7.55	7.98	7.50	
W		7.43	7.58		7.33		7.15	6.93	7.28	8.18	8.20	7.97	7.73	7.68	7.73	7.77	7.70	
F		7.42	7.27		7.30	7.80	6.77	6.87	7.63	7.73	7.92	7.68	7.75	7.75	7.48	7.60	7.35	
weekly avg	8.27	7.48	7.43	7.73	7.21	7.39	6.97	6.93	7.34	7.96	8.05	7.85	7.83	7.82	7.59	7.78	7.52	7.56
% change	7%	-3%	-4%	0%	-7%	-4%	-10%	-10%	-5%	3%	4%	2%	1%	1%	-2%	1%	-3%	
Flex Test																		
M	31.50	28.25			28.50	28.25	28.50	29.00	28.25		28.25	29.75	30.25	30.00	31.25	32.25	30.25	
W		29.50	28.75		28.50		29.00	28.75	29.75	31.00	28.00	29.75	29.75	31.00	32.75	30.00	31.50	
F		29.00	29.25		28.50	28.50	29.25	28.50	29.50	30.50	29.75	30.50	29.50	31.75	32.00	29.50	31.00	
weekly avg	31.50	28.92	29.00	29.81	28.50	28.38	28.92	28.75	29.17	30.75	28.67	30.00	29.83	30.92	32.00	30.58	30.92	29.80
% change	6%	-3%	-3%	0%	-4%	-5%	-3%	-4%	-2%	3%	-4%	1%	0%	4%	7%	3%	4%	
Stair Climb		7.17		7.17		6.51				6.68				6.71			6.41	6.58
% change		0%		0%		-9%				-7%				-6%			-11%	

indicates no results available

Figure E3.7. P03, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great		4	5		3	6	2	6	7	7	6	6	6	7	2	7	7	
Positive		2	2		1	7	1	7	7	7	7	7	7	7	7	7	7	
Strong		2	2		2	5	4	5	6	6	6	6	6	6	4	6	7	
Terrific		2	2		4	7	7	7	7	7	7	7	6	7	6	6	7	
Average	~	3	3	3	3	6	4	6	7	7	7	7	6	7	5	7	7	6
Psychological distress																		
Awful		3	4		3	2	2	1	1	1	1	1	1	1	1	1	1	
Crummy		2	2		1	2	2	1	1	1	1	1	1	1	2	1	1	
Discouraged		2	2		1	1	1	1	1	1	1	1	1	1	1	1	1	
Miserable		2	2		1	1	1	1	1	1	1	1	2	1	1	1	1	
Average	~	2	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1
Fatigue																		
Drained		3	4		3	2	2	4	4	4	4	4	2	5	6	4	2	
Exhausted		3	3		3	3	4	4	4	4	4	4	4	5	6	4	1	
Fatigued		2	3		2	3	3	5	4	4	5	4	4	2	4	4	1	
Tired		2	3		1	3	4	4	4	4	6	4	4	1	4	4	2	
Average	~	3	3	3	2	3	3	4	4	4	5	4	4	3	5	4	2	4
	indicates no results available																	

Figure E3.8. P03, Subjective Exercise Experience Scale results.

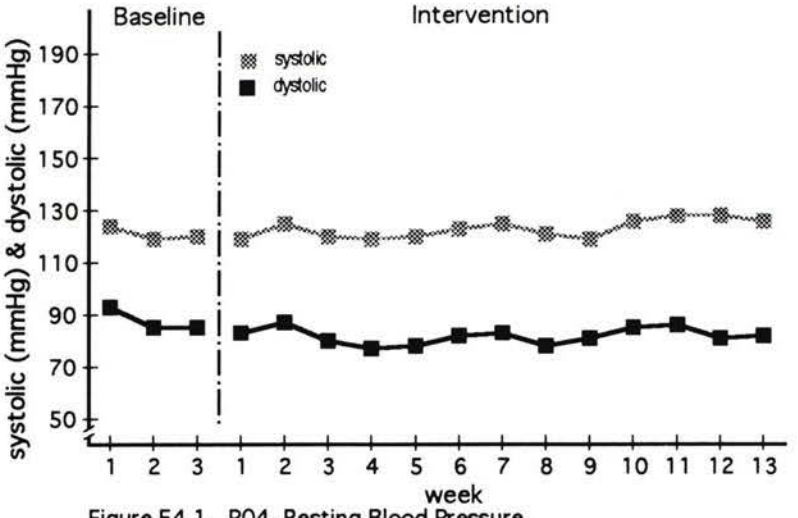

Figure E4.1. P04, Resting Blood Pressure.

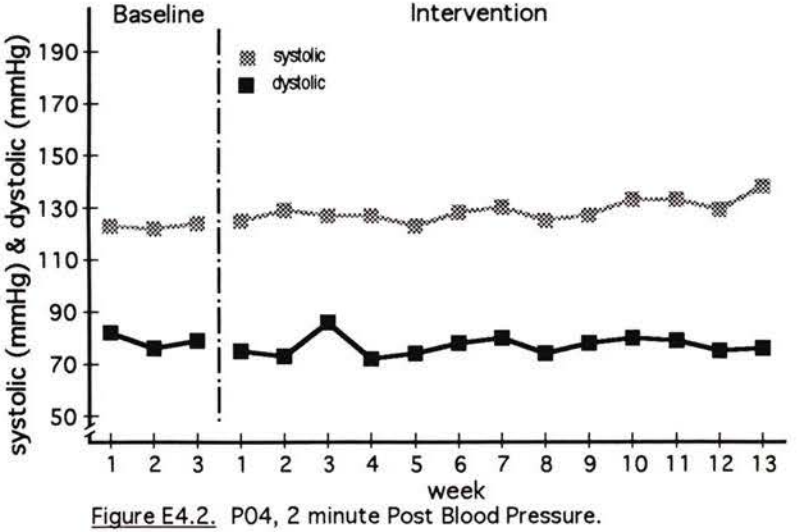

Figure E4.2. P04, 2 minute Post Blood Pressure.

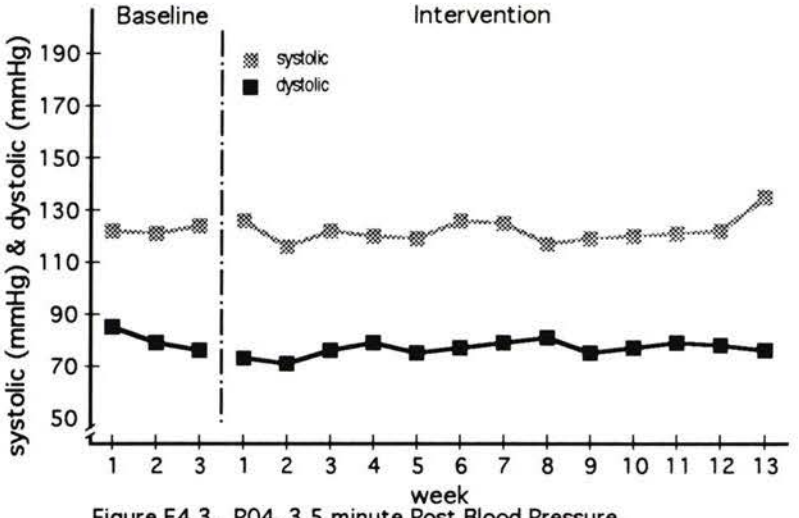

Figure E4.3. P04, 3.5 minute Post Blood Pressure.

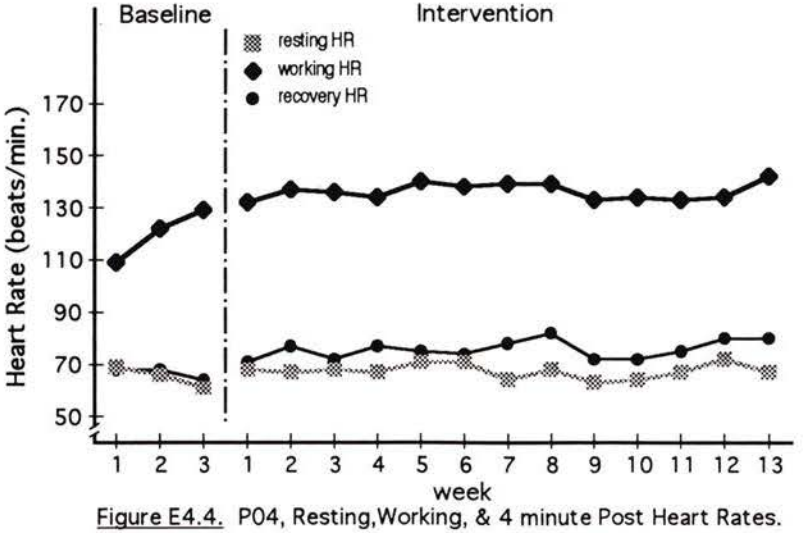

Figure E4.4. P04, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	128	118			110	128	117	122	120		124	120	120		130	124	128	
W	120	122	114		118	130		116	120	126	124	128	118	120	124	122	126	
F	124	118	126		130	118	122	120	120	120	128	116	120	132	130	138	124	
weekly avg	124	119	120	121	119	125	120	119	120	123	125	121	119	126	128	128	126	123
% change	2%	-1%	-1%	0%	-1%	3%	-1%	-1%	-1%	2%	3%	0%	-1%	4%	6%	6%	4%	
Resting Diastolic																		
M	100	84			80	90	80	78	78		84	82	72		88	80	82	
W	86	92	88		78	90		78	78	84	82	82	80	80	80	80	82	
F	92	80	82		90	80	80	76	78	80	82	70	90	90	90	84	82	
weekly avg	93	85	85	88	83	87	80	77	78	82	83	78	81	85	86	81	82	82
% change	6%	-3%	-3%	0%	-6%	-1%	-9%	-12%	-11%	-6%	-6%	-11%	-8%	-3%	-2%	-7%	-6%	
Resting Heart Rate																		
M	76	68			68	64	68	68	66		65	64	60		60	71	74	
W	68	68	60		68	68		68	74	74	61	74	64	68	62	80	62	
F	62	62	62		68	68	68	64	72	68	65	65	64	60	78	64	64	
weekly avg	69	66	61	65	68	67	68	67	71	71	64	68	63	64	67	72	67	67
% change	5%	1%	-6%	0%	4%	2%	4%	2%	8%	9%	-2%	4%	-4%	-2%	2%	10%	2%	
Working Heart Rate																		
M	111	109			135	133	138	135	137		142	136	132		134	134	141	
W	106	125	131		135	143		141	141	135	136	140	132	136	131	132	140	
F	109	131	126		127	136	133	127	142	140	138	140	135	132	135	135	144	
weekly avg	109	122	129	120	132	137	136	134	140	138	139	139	133	134	133	134	142	136
% change	-9%	2%	7%	0%	11%	15%	13%	12%	17%	15%	16%	16%	11%	12%	11%	12%	18%	

indicates no results available

Figure E4.5. P04, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	130	126			130	120	122	128	120		120	120	120		136	126	138	
W	118	120	128		120	124		126	120	128	138	136	130	130	134	124	146	
F	120	120	120		126	142	132	126	130	128	132	120	132	136	128	138	130	
weekly avg	123	122	124	123	125	129	127	127	123	128	130	125	127	133	133	129	138	129
% change	0%	-1%	1%	0%	2%	5%	3%	3%	0%	4%	6%	2%	4%	8%	8%	5%	12%	
Recovery 2 min. Diastolic																		
M	90	76			76	70	92	76	70		80	76	77		82	76	78	
W	80	74	78		74	68		70	72	78	82	72	76	78	80	76	70	
F	76	78	80		74	80	80	70	80	78	78	74	80	82	76	72	80	
weekly avg	82	76	79	79	75	73	86	72	74	78	80	74	78	80	79	75	76	77
% change	4%	-4%	0%	0%	-5%	-8%	9%	-9%	-6%	-1%	1%	-6%	-2%	1%	0%	-5%	-4%	
Recovery 3.5 min. Systolic																		
M	122	128			128	110	120	120	120		120	114	116		120	124	140	
W	120	118	128		130	115		120	118	128	132	124	122	120	120	120	134	
F	124	118	120		120	124	124	120	120	124	124	114	120	120	124	122	130	
weekly avg	122	121	124	122	126	116	122	120	119	126	125	117	119	120	121	122	135	122
% change	0%	-1%	1%	0%	3%	-5%	0%	-2%	-3%	3%	2%	-4%	-3%	-2%	-1%	0%	10%	
Recovery 3.5 min. Diastolic																		
M	100	80			72	72	72	76	80		80	84	74		80	76	72	
W	80	78	74		74	68		80	72	78	80	80	72	78	80	78	78	
F	76	78	78		74	72	80	80	72	76	78	78	80	76	76	80	78	
weekly avg	85	79	76	80	73	71	76	79	75	77	79	81	75	77	79	78	76	77
% change	7%	-2%	-5%	0%	-8%	-12%	-5%	-2%	-7%	-4%	-1%	1%	-6%	-4%	-2%	-3%	-5%	
Recovery 4 min. Heart Rate																		
M	69	68			56	78	72	72	76		72	76	80		75	80	76	
W	68	69	68		84	72		88	76	72	82	89	76	79	74	80	87	
F	68	68	60		72	80	72	72	72	76	80	80	60	64	76	79	77	
weekly avg	68	68	64	67	71	77	72	77	75	74	78	82	72	72	75	80	80	76
% change	2%	2%	-4%	0%	6%	15%	8%	16%	12%	11%	17%	22%	8%	7%	12%	19%	20%	

indicates no results available

Figure E4.6. P04, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	50	65		57.50	60	65	65	55	65		70	85	85	80	80	80	90	73.33
% change	-13%	13%	~	0%	4%	13%	13%	-4%	13%	~	22%	48%	48%	39%	39%	39%	57%	
BC end	26	29		27.50	25	22	27	26	29		31	40	34	32	36	37	36	31.25
% change	-5%	5%	~	0%	-9%	-20%	-2%	-5%	5%	~	13%	45%	24%	16%	31%	35%	31%	
LE max	120	130	130	126.67	130	140	150	155	160	165	165	165	170	170	170	175	180	161.15
% change	-5%	3%	3%	0%	3%	11%	18%	22%	26%	30%	30%	30%	34%	34%	34%	38%	42%	
LE end	20	26	31	25.67	47	31	27	36	29	35	36	33	32	30	34	31	34	33.46
% change	-22%	1%	21%	0%	83%	21%	5%	40%	13%	36%	40%	29%	25%	17%	32%	21%	32%	
Walk Test																		
M	7.22	7.53			7.00	6.83	6.82	6.85	6.85		7.68	7.70	7.60		7.60	7.60	7.55	
W	8.37	7.43	7.22		7.02	6.63		6.80	7.57	8.57	7.65	7.47	7.53	7.58	7.73	7.77	7.50	
F	7.63	7.08	7.10		6.75	6.85	6.68	7.05	7.57	7.67	7.58	7.47	7.60	7.75	7.65	7.53	7.37	
weekly avg	7.74	7.35	7.16	7.42	6.92	6.77	6.75	6.90	7.33	8.12	7.64	7.55	7.58	7.67	7.66	7.63	7.47	7.38
% change	4%	-1%	-3%	0%	-7%	-9%	-9%	-7%	-1%	9%	3%	2%	2%	3%	3%	3%	1%	
Flex Test																		
M	19.50	16.00			17.00	17.25	19.00	19.75	16.75		20.00	20.25	19.50		19.50	21.75	20.50	
W	20.50	14.50	17.00		16.75	18.00		20.00	19.25	19.25	20.50	19.25	18.00	20.00	18.50	20.75	24.50	
F	17.25	16.75	18.00		17.25	18.50	17.75	18.00	19.50	19.75	21.00	21.50	16.75	20.00	21.50	21.50	24.00	
weekly avg	19.08	15.75	17.50	17.44	17.00	17.92	18.38	19.25	18.50	19.50	20.50	20.33	18.08	20.00	19.83	21.33	23.00	19.51
% change	9%	-10%	0%	0%	-3%	3%	5%	10%	6%	12%	18%	17%	4%	15%	14%	22%	32%	
Stair Climb		12.61		12.61		12.82				8.82				10.96			9.00	10.40
% change		0%		0%		2%				-30%				-13%			-29%	

indicates no results available

Figure E4.7. P04, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	7	6	6		6	6	5	6	6	6	6	7	6	7	7	7	7	
Positive	7	7	7		7	7	7	7	7	7	7	7	6	6	7	7	7	
Strong	4	4	4		4	6	6	6	6	4	6	6	5	6	6	6	6	
Terrific	6	6	6		6	6	6	6	7	7	6	6	6	6	6	6	6	
Average	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7	7	7	6
Psychological distress																		
Awful	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Crummy	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Discouraged	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Miserable	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Average	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fatigue																		
Drained	2	3	3		3	3	4	4	3	4	4	4	4	4	4	4	2	
Exhausted	1	2	4		2	3	3	4	4	5	4	3	4	4	3	4	2	
Fatigued	3	3	3		4	3	4	4	4	5	4	4	4	4	4	4	3	
Tired	2	2	4		4	3	4	4	4	4	4	5	5	4	4	3	2	
Average	2	3	4	3	3	3	4	4	4	5	4	4	4	4	4	4	2	4
	indicates no results available																	

Figure E4.8. P04, Subjective Exercise Experience Scale results.

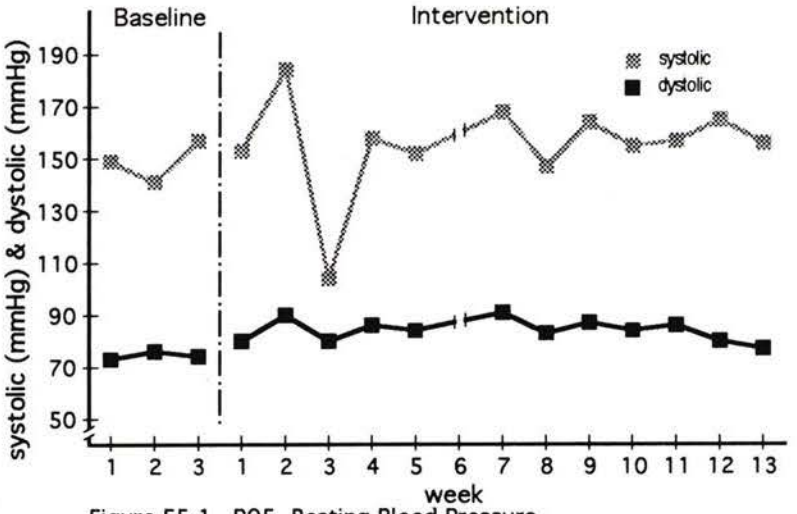

Figure E5.1. P05, Resting Blood Pressure.

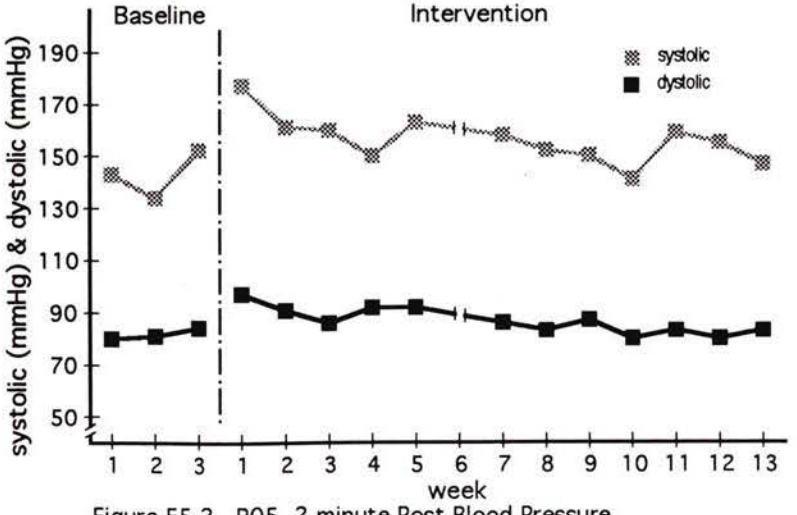

Figure E5.2. P05, 2 minute Post Blood Pressure.

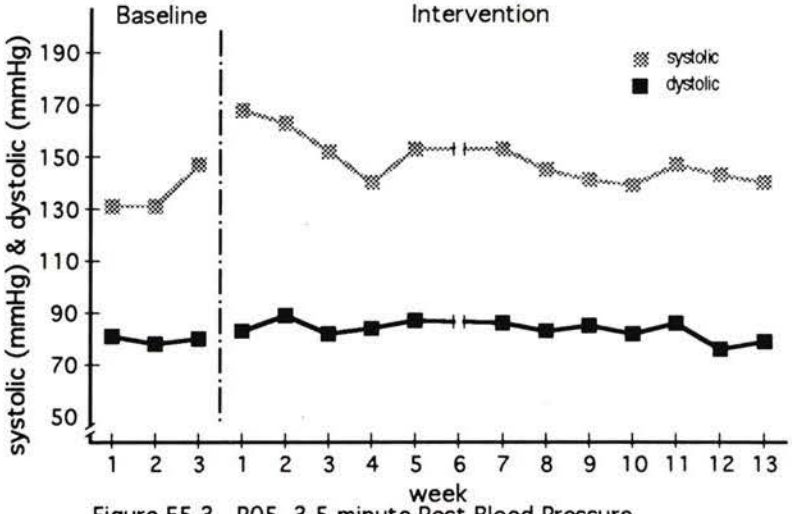

Figure E5.3. P05, 3.5 minute Post Blood Pressure.

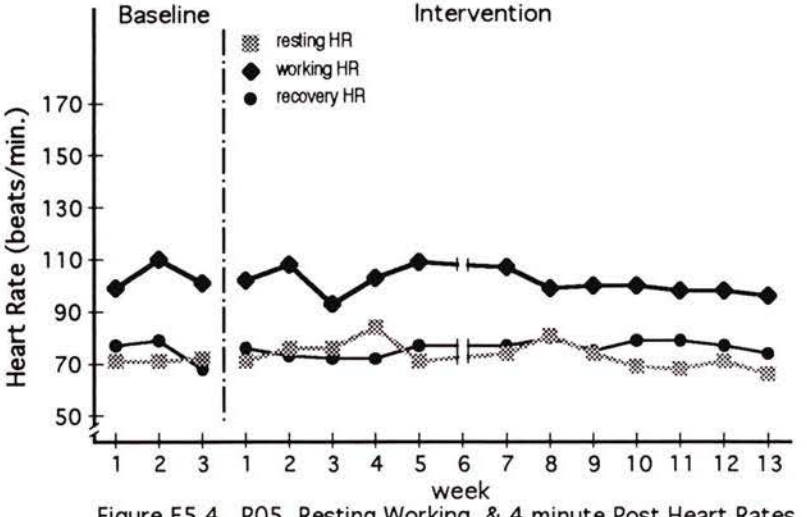

Figure E5.4. P05, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	158	136			158	180	104		130			148	150	162	144	160	160	
W	144	142	150		152	172			170		170	140	164	152	160	186	144	
F	146	144	164		150	200		158	156		165	152	178	150	166	150	164	
weekly avg	149	141	157	149	153	184	104	158	152	~	168	147	164	155	157	165	156	155
% change	0%	-6%	5%	0%	3%	23%	-30%	6%	2%	~	12%	-2%	10%	4%	5%	11%	5%	
Resting Diastolic																		
M	76	76			80	90	80		80			82	80	82	88	82	76	
W	76	80	74		80	90			82		92	86	92	88	80	82	78	
F	66	72	74		80	90		86	90		90	80	90	82	90	76	76	
weekly avg	73	76	74	74	80	90	80	86	84	~	91	83	87	84	86	80	77	84
% change	-2%	2%	0%	0%	8%	21%	8%	16%	13%	~	23%	11%	18%	13%	16%	8%	3%	
Resting Heart Rate																		
M	72	76			72	84	76		64			88	77	72	72	70	65	
W	72	68	72		72	68			76		73	78	72	72	64	72	70	
F	68	70	72		68	76		84	72		74	76	72	64	68	72	64	
weekly avg	71	71	72	71	71	76	76	84	71	~	74	81	74	69	68	71	66	73
% change	-1%	0%	1%	0%	-1%	7%	7%	18%	-1%	~	3%	13%	3%	-3%	-5%	0%	-7%	
Working Heart Rate																		
M	104	133			100	115	93		101			103	98	99	104	101	93	
W	95	98	101		103	108			120		111	92	99	100	91	96	96	
F	98	100	100		103	101		103	105		102	103	103	102	99	97	98	
weekly avg	99	110	101	103	102	108	93	103	109	~	107	99	100	100	98	98	96	101
% change	-4%	7%	-3%	0%	-1%	5%	-10%	0%	5%	~	3%	-4%	-3%	-3%	-5%	-5%	-7%	

indicates no results available

Figure E5.5. P05, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	142	124			144	150	160		160			145	140	148	140	150	150	
W	140	128	150		178	148			180		156	148	160	140	152	164	160	
F	148	150	154		210	184		150	148		160	164	150	134	186	150	130	
weekly avg	143	134	152	143	177	161	160	150	163	~	158	152	150	141	159	155	147	156
% change	0%	-6%	6%	0%	24%	12%	12%	5%	14%	~	10%	6%	5%	-2%	11%	8%	2%	
Recovery 2 min. Diastolic																		
M	90	78			84	90	86		94			84	90	80	76	76	84	
W	80	80	84		96	90			92		90	82	90	90	82	80	82	
F	70	84	84		110	94		92	90		82	84	82	70	90	84	82	
weekly avg	80	81	84	82	97	91	86	92	92	~	86	83	87	80	83	80	83	87
% change	-2%	-1%	3%	0%	19%	12%	5%	13%	13%	~	5%	2%	7%	-2%	1%	-2%	1%	
Recovery 3.5 min. Systolic																		
M	124	136			144	160	152		150			138	130	130	132	144	150	
W	138	124	140		180	164			160		156	140	142	136	144	144	140	
F	130	132	154		180	164		140	150		150	156	150	150	164	142	130	
weekly avg	131	131	147	136	168	163	152	140	153	~	153	145	141	139	147	143	140	149
% change	-4%	-4%	8%	0%	23%	20%	12%	3%	13%	~	12%	6%	3%	2%	8%	5%	3%	
Recovery 3.5 min. Diastolic																		
M	94	78			76	84	82		88			84	86	82	84	80	76	
W	78	84	80		84	88			82		90	82	86	84	80	76	80	
F	70	72	80		90	94		84	90		82	82	84	80	94	72	82	
weekly avg	81	78	80	80	83	89	82	84	87	~	86	83	85	82	86	76	79	84
% change	1%	-2%	1%	0%	5%	11%	3%	6%	9%	~	8%	4%	7%	3%	8%	-4%	0%	
Recovery 4 min. Heart Rate																		
M	77	84			68	80	72		76			88	76	81	84	80	68	
W	74	80	68		72	72			80		79	78	72	79	82	78	79	
F	80	72	68		88	68		72	76		75	74	76	76	72	72	74	
weekly avg	77	79	68	75	76	73	72	72	77	~	77	80	75	79	79	77	74	76
% change	3%	6%	-9%	0%	2%	-2%	-3%	-3%	4%	~	3%	7%	0%	6%	6%	3%	-1%	

indicates no results available

Figure E5.6. P05, Anthropometric results.

	Baseline				Intervention												
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	60	70		65.00	75	75		70	75		80	90	95	95	90	95	90	84.55
% change	-8%	8%	~	0%	15%	15%	~	8%	15%	~	23%	38%	46%	46%	38%	46%	38%	
BC end	25	26		25.50	28	30		27	32		32	36	32	29	39	41	50	34.18
% change	-2%	2%	~	0%	10%	18%	~	6%	25%	~	25%	41%	25%	14%	53%	61%	96%	
LE max	100	105	110	105.00	120	120		125	125	125	130	135	125	130	135	140	150	130.00
% change	-5%	0%	5%	0%	14%	14%	~	19%	19%	19%	24%	29%	19%	24%	29%	33%	43%	
LE end	24	32	40	32.00	46	53		55	55	56	60	61	62	63	67	70	80	60.67
% change	-25%	0%	25%	0%	44%	66%	~	72%	72%	75%	88%	91%	94%	97%	109%	119%	150%	
Walk Test																		
M	9.23	7.42			7.92	8.28	8.77		8.00			9.65	9.17	9.25	9.15	9.12	8.85	
W	8.60	7.83	8.07		7.62	8.13		8.00	9.30		9.65	9.37	9.10	8.85	9.22	9.12	9.22	
F	8.07	7.83	7.80		7.75	8.12		8.67	9.47		9.70	9.05	9.47	9.25	9.02	8.92	8.97	
weekly avg	8.63	7.69	7.94	8.09	7.76	8.18	8.77	8.34	8.92	~	9.68	9.36	9.25	9.12	9.13	9.05	9.01	8.88
% change	7%	-5%	-2%	0%	-4%	1%	8%	3%	10%	~	20%	16%	14%	13%	13%	12%	11%	
Flex Test																		
M	8.50	13.75			15.00	10.00	0.00		4.50			3.50	6.50	6.00	6.50	9.25	9.00	
W	10.25	14.25	16.00		16.75	3.50		1.50	6.25		5.50	6.25	6.75	6.50	7.25	9.00	10.50	
F	13.25	14.50	17.00		4.25	8.25		3.50	3.50		6.50	6.75	3.75	6.75	9.25	10.00	10.50	
weekly avg	10.67	14.17	16.50	13.78	12.00	7.25	0.00	2.50	4.75	~	6.00	5.50	5.67	6.42	7.67	9.42	10.00	6.43
% change	-23%	3%	20%	0%	-13%	-47%	-100%	-82%	-66%	~	-56%	-60%	-59%	-53%	-44%	-32%	-27%	
Stair Climb		10.07		10.07		10.44				9.01				8.78			7.79	9.01
% change		0%		0%		4%				-11%				-13%			-23%	

indicates no results available

Figure E5.7. P05, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	6	7	6		2	6		6	6		6	5	6	6	6	6	6	
Positive	5	6	7		2	6		6	7		6	6	5	6	6	6	6	
Strong	5	6	6		2	6		6	6		7	6	6	6	6	6	6	
Terrific	6	6	6		1	6		6	6		6	5	6	6	6	7	6	
Average	6	6	6	6	2	6	~	6	6	~	6	6	6	6	6	6	6	6
Psychological distress																		
Awful	2	2	2		5	2		1	2		2	3	2	2	2	2	2	
Crummy	1	1	1		6	3		2	2		2	2	1	2	2	2	2	
Discouraged	2	1	2		4	2		6	2		2	2	1	2	2	1	1	
Miserable	2	1	3		6	2		2	2		1	2	1	2	2	2	1	
Average	2	1	2	2	5	2	~	3	2	~	2	2	1	2	2	2	2	2
Fatigue																		
Drained	1	6	3		6	2		2	3		2	3	2	4	2	2	2	
Exhausted	4	3	3		6	2		2	3		3	3	1	2	2	2	2	
Fatigued	4	3	2		5	2		2	3		3	3	2	3	2	2	2	
Tired	3	3	2		5	2		3	3		3	3	2	2	2	2	2	
Average	3	4	3	3	6	2	~	2	3	~	3	3	2	3	2	2	2	3

indicates no results available

Figure E5.8. P05, Subjective Exercise Experience Scale results.

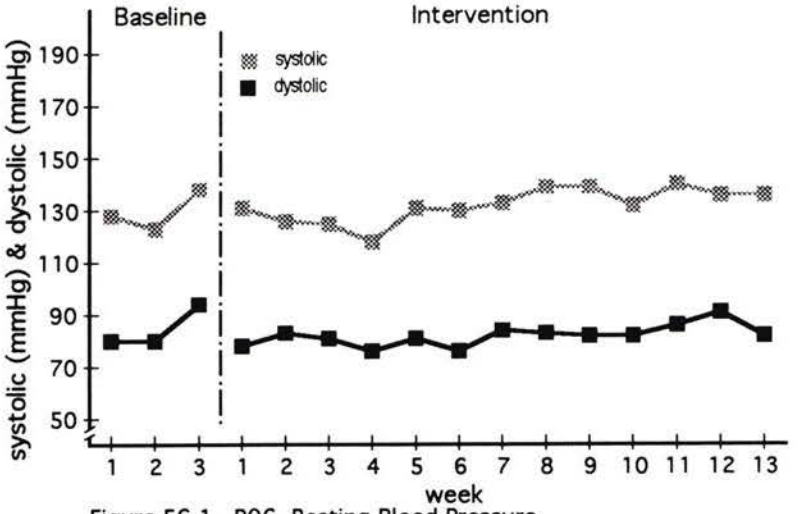

Figure E6.1. P06, Resting Blood Pressure.

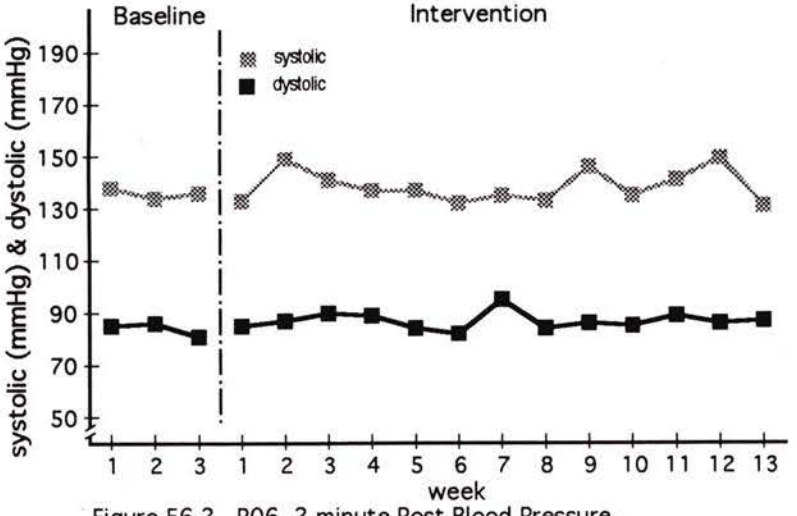

Figure E6.2. P06, 2 minute Post Blood Pressure.

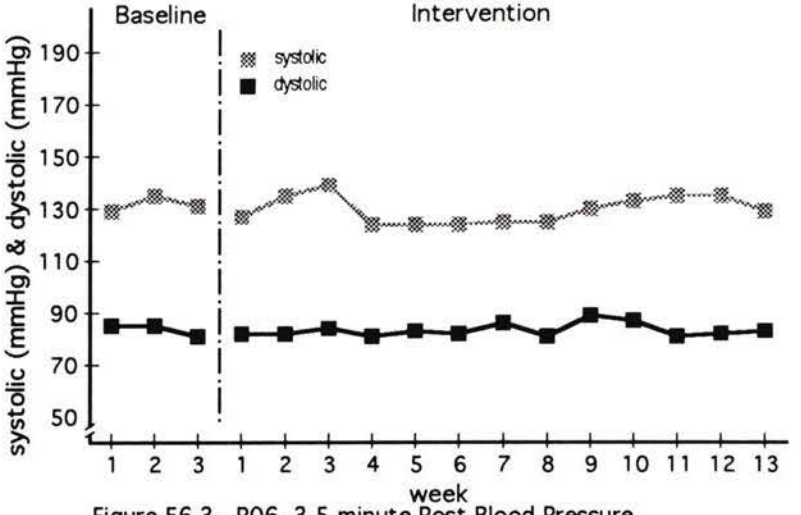

Figure E6.3. P06, 3.5 minute Post Blood Pressure.

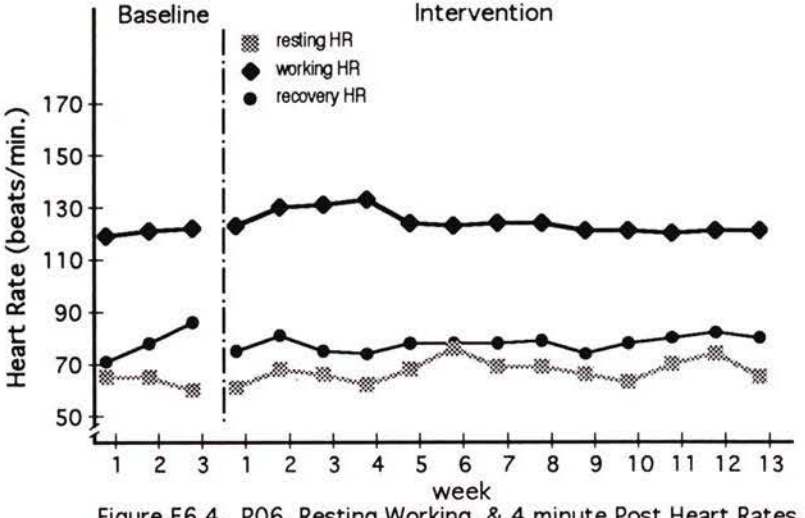

Figure E6.4. P06, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	124				136	130	124		120		130	140	140	130	132	142	132	
W	120	124	140		128	124	126	116	140		134	138	138	130	138	130	136	
F	140	122	136		130	124	124	120	132	130	136	140		136	150		140	
weekly avg	128	123	138	130	131	126	125	118	131	130	133	139	139	132	140	136	136	132
% change	-1%	-5%	6%	0%	1%	-3%	-4%	-9%	1%	0%	3%	7%	7%	2%	8%	5%	5%	
Resting Diastolic																		
M	80				80	90	80		80		80	90	82	90	76	96	86	
W	75	80	92		78	80	82	76	82		86	78	82	82	82	86	80	
F	84	80	96		76	80	82	76	80	76	86	82		74	100		80	
weekly avg	80	80	94	85	78	83	81	76	81	76	84	83	82	82	86	91	82	82
% change	-6%	-5%	11%	0%	-8%	-1%	-4%	-10%	-5%	-10%	-1%	-1%	-3%	-3%	2%	8%	-3%	
Resting Heart Rate																		
M	65				64	72	60		72		74	67	66	62	62	75	76	
W	67	64	60		60	72	72	64	68		68	78	66	66	76	72	60	
F	64	66	60		60	60	66	60	64	76	64	61		60	72		60	
weekly avg	65	65	60	63	61	68	66	62	68	76	69	69	66	63	70	74	65	67
% change	3%	2%	-5%	0%	-3%	7%	4%	-2%	7%	20%	8%	8%	4%	-1%	10%	16%	3%	
Working Heart Rate																		
M	117				120	132	132		141		127	127	122	121	121	121	120	
W	121	120	120		124	129	134	136	119		123	122	120	122	121	121	122	
F	119	121	123		124	130	127	129	111	123	122	123		121	119		121	
weekly avg	119	121	122	120	123	130	131	133	124	123	124	124	121	121	120	121	121	124
% change	-1%	0%	1%	0%	2%	8%	9%	10%	3%	2%	3%	3%	1%	1%	0%	1%	1%	

indicates no results available

Figure E6.5. P06, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	138				132	160	144		150		132	142	142	130	136	148	140	
W	135	140	154		128	136	140	130	136		140	128	150	130	142	150	124	
F	140	128	118		140	152	140	144	124	132	132	128		144	144		130	
weekly avg	138	134	136	136	133	149	141	137	137	132	135	133	146	135	141	149	131	138
% change	1%	-1%	0%	0%	-2%	10%	4%	1%	1%	-3%	-1%	-2%	7%	-1%	4%	10%	-3%	
Recovery 2 min. Diastolic																		
M	82				82	92	90		84		86	90	80	82	92	86	88	
W	82	90	84		82	88	82	98	82		110	82	92	90	90	86	86	
F	90	82	78		90	80	98	80	86	82	88	80		84	86		88	
weekly avg	85	86	81	84	85	87	90	89	84	82	95	84	86	85	89	86	87	87
% change	1%	3%	-3%	0%	1%	3%	7%	6%	0%	-2%	13%	0%	3%	2%	6%	3%	4%	
Recovery 3.5 min. Systolic																		
M	126				124	140	140		122		126	124	130	136	130	130	136	
W	130	138	144		120	136	140	124	128		128	130	130	132	138	140	118	
F	132	130	118		136	130	136	124	122	124	120	120		130	138		132	
weekly avg	129	134	131	131	127	135	139	124	124	124	125	125	130	133	135	135	129	130
% change	-2%	2%	0%	0%	-4%	3%	5%	-6%	-6%	-6%	-5%	-5%	-1%	1%	3%	3%	-2%	
Recovery 3.5 min. Diastolic																		
M	80				82	90	80		84		86	86	82	90	82	80	82	
W	84	88	90		72	82	86	80	84		86	78	96	90	80	84	84	
F	90	82	72		92	74	86	82	82	82	86	80		80	80		84	
weekly avg	85	85	81	84	82	82	84	81	83	82	86	81	89	87	81	82	83	83
% change	1%	2%	-3%	0%	-2%	-2%	1%	-3%	0%	-2%	3%	-3%	7%	4%	-3%	-2%	0%	
Recovery 4 min. Heart Rate																		
M	74				80	88	74		82		78	80	76	81	72	82	80	
W	72	80	84		70	84	74	72	76		80	78	72	76	84	81	84	
F	68	76	88		74	72	76	76	76	78	75	80		76	84		76	
weekly avg	71	78	86	78	75	81	75	74	78	78	78	79	74	78	80	82	80	78
% change	-9%	-1%	10%	0%	-5%	4%	-5%	-6%	-1%	-1%	-1%	1%	-6%	-1%	2%	4%	2%	
	indicates no results available																	

Figure E6.6. P06, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	25	30		27.50	30	35	35	35	35		35	35	40	40	40		45	36.82
% change	-9%	9%	~	0%	9%	27%	27%	27%	27%	~	27%	27%	45%	45%	45%	~	64%	
BC end	15	18		16.50	19	20	22	16	23		36	29	45	37	43		38	29.82
% change	-9%	9%	~	0%	15%	21%	33%	-3%	39%	~	118%	76%	173%	124%	161%	~	130%	
LE max	95	80	90	88.33	90	95	95		95	100	105	110	105	105	105	110	110	102.08
% change	8%	-9%	2%	0%	2%	8%	8%	~	8%	13%	19%	25%	19%	19%	19%	25%	25%	
LE end	13	13	12	12.67	14	13	13		15	15	15	15	15	15	15	14	12	14.25
% change	3%	3%	-5%	0%	11%	3%	3%	~	18%	18%	18%	18%	18%	18%	18%	11%	-5%	
Walk Test																		
M	8.87	7.85			7.85	7.58	7.45		6.80		8.53	8.50	8.35	8.43	8.40	8.47	8.42	
W	7.87	7.87	8.10		7.73	7.48	7.30	7.15	8.50		8.58	8.30	8.45	8.28	8.43	8.52	8.32	
F	7.85	7.82	7.73		7.67	7.40	7.55	7.27	8.58	8.58	8.47	8.40		8.35	8.30		8.27	
weekly avg	8.20	7.85	7.92	7.986	7.75	7.49	7.43	7.21	7.96	8.58	8.53	8.40	8.40	8.35	8.38	8.50	8.34	8.10
% change	3%	-2%	-1%	0%	-3%	-6%	-7%	-10%	0%	7%	7%	5%	5%	5%	5%	6%	4%	
Flex Test																		
M	30.25	33.25			29.25	31.50	31.50		32.00		33.00	34.25	34.25	36.70	37.50	37.25	37.50	
W	32.75	32.50	33.00		32.75	31.75	32.00	33.50	33.50		33.75	34.50	35.00	37.00	37.00	38.00	36.50	
F	32.25	33.25	30.50		34.75	33.75	33.75	33.25	30.00	31.50	34.50	34.50		36.00	37.50		39.00	
weekly avg	31.75	33.00	31.75	32.17	32.25	32.33	32.42	33.38	31.83	31.50	33.75	34.42	34.63	36.57	37.33	37.63	37.67	34.28
% change	-1%	3%	-1%	0%	0%	1%	1%	4%	-1%	-2%	5%	7%	8%	14%	16%	17%	17%	
Stair Climb		14.41		14.41		12.26				10.54				11.88			10.09	11.19
% change		0%		0%		-15%				-27%				-18%			-30%	

indicates no results available

Figure E6.7. P06, Physiological results.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	6	6	4		4	5		6	5	6	6	4	5	5	6		5	
Positive	7	6	6		6	6		7	1	7	6	6	1	5	6		6	
Strong	5	6	5		5	6		6	5	6	6	4	5	5	6		5	
Terrific	6	6	5		6	6		6	6	6	6	4	5	5	6		5	
Average	6	6	5	6	5	6	~	6	4	6	6	5	4	5	6	~	5	5
Psychological distress																		
Awful	1	1	1		1	1		1	1	1	1	1	1	1	1		1	
Crummy	1	1	1		1	1		1	1	1	1	2	1	1	1		1	
Discouraged	1	2	1		1	1		1	1	1	1	2	2	1	1		1	
Miserable	1	1	1		1	1		1	1	1	1	2	1	1	1		1	
Average	1	1	1	1	1	1	~	1	1	1	1	2	1	1	1	~	1	1
Fatigue																		
Drained	1	1	1		3	1		1	2	2	2	4	3	2	2		2	
Exhausted	1	1	2		4	1		1	2	2	1	4	2	2	2		2	
Fatigued	1	1	2		4	1		1	5	1	1	2	2	2	1		2	
Tired	2	1	2		4	2		2	2	2	2	4	2	2	2		2	
Average	1	1	2	1	4	1	~	1	3	2	2	4	2	2	2	~	2	2
	indicates no results available																	

Figure E6.8. P06, Subjective Exercise Experience Scale results.

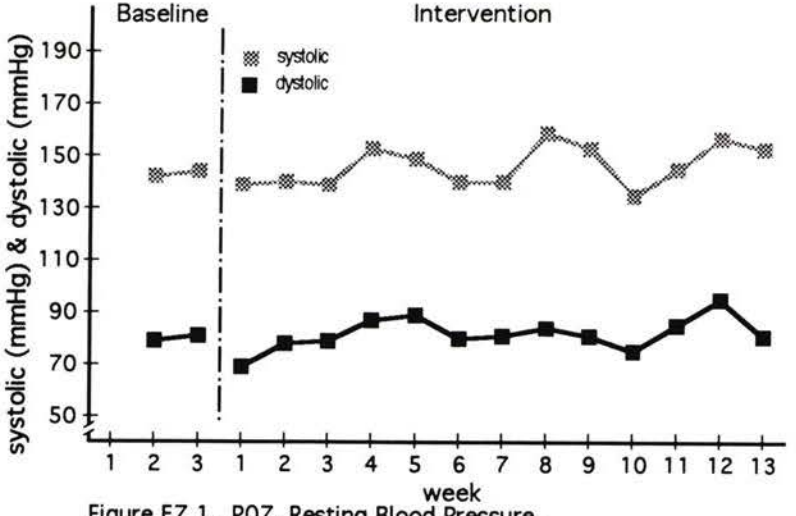

Figure E7.1. P07, Resting Blood Pressure.

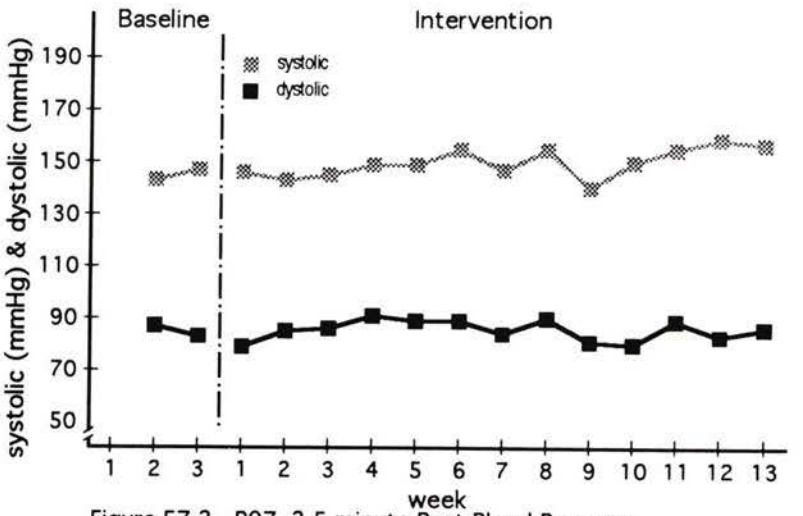

Figure E7.3. P07, 3.5 minute Post Blood Pressure.

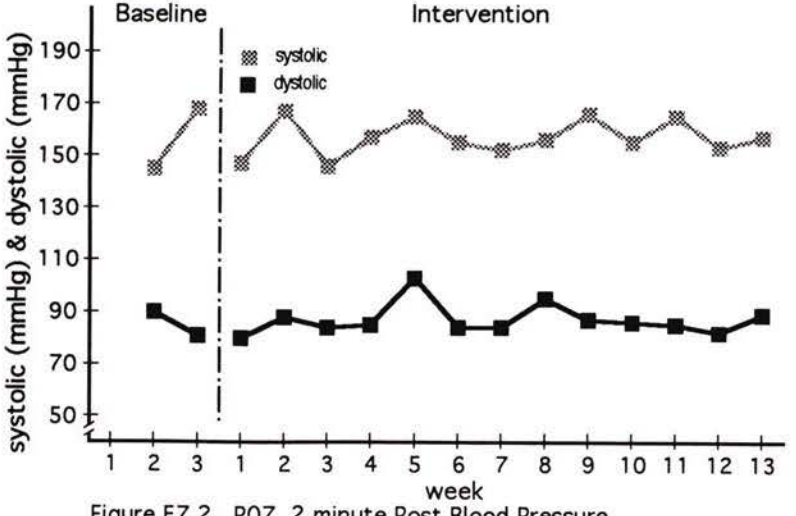

Figure E7.2. P07, 2 minute Post Blood Pressure.

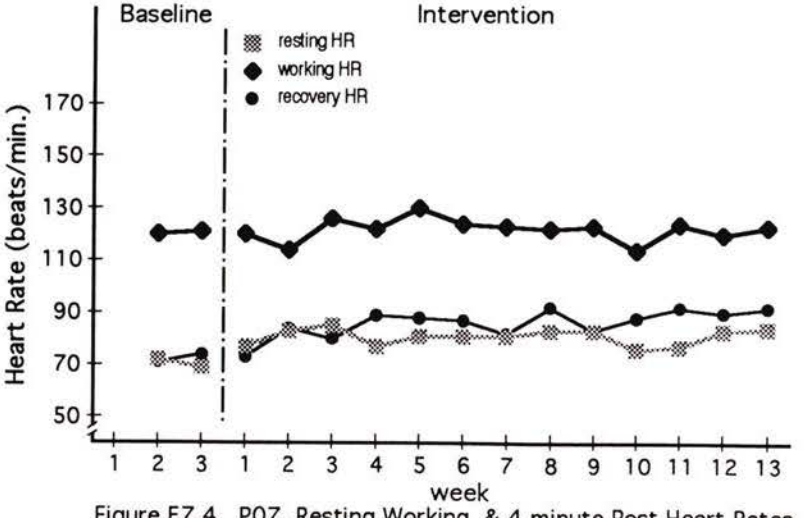

Figure E7.4. P07, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M		138			148	140	138	160	150		150	156	160	130	140	150	150	
W		132	140		130	140	138	152	138	142	164	152	160	136	140	150	150	
F		156	148		138	140	142	148	160	138	162	156	140	140	154	170	160	
weekly avg	~	142	144	143	139	140	139	153	149	140	159	155	153	135	145	157	153	147
% change	~	-1%	1%	0%	-3%	-2%	-3%	7%	4%	-2%	11%	8%	7%	-5%	1%	10%	7%	
Resting Diastolic																		
M		72			72	78	80	90	98		80	80	80	70	80	94	82	
W		76	86		64	76	78	82	80	80	84	90	78	80	82	90	78	
F		88	76		70	80	80	90	90	80	80	82	86	76	92	100	82	
weekly avg	~	79	81	80	69	78	79	87	89	80	81	84	81	75	85	95	81	82
% change	~	-1%	1%	0%	-14%	-2%	-1%	9%	12%	0%	2%	5%	2%	-6%	6%	19%	1%	
Resting Heart Rate																		
M		72			64	78	88	80	88		80	80	80	80	76	80	82	
W		72	76		84	84	84	76	76	76	86	90	92	76	70	80	87	
F		72	62		84	88	82	76	80	86	78	78	76	72	84	90	82	
weekly avg	~	72	69	71	77	83	85	77	81	81	81	83	83	76	77	83	84	81
% change	~	2%	-2%	0%	10%	18%	20%	10%	15%	15%	15%	17%	17%	8%	9%	18%	19%	
Working Heart Rate																		
M		103			131	110	130	126	128		114	122	121	115	122	121	122	
W		141	119		113	115	127	123	134	120	130	122	126	113	129	117	124	
F		115	122		115	116	120	118	128	127	124	121	123	113	121	123	123	
weekly avg	~	120	121	120	120	114	126	122	130	124	123	122	123	114	124	120	123	122
% change	~	0%	0%	0%	0%	-5%	5%	2%	8%	3%	2%	1%	3%	-5%	3%	0%	2%	

indicates no results available

Figure E7.5. P07, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M		136			160	170	154	160	170		142	152	190	150	170	150	160	
W		146	168		154	170	148	170	154	170	154	160	150	160	156	150	154	
F		152	168		128	160	136	140	170	140	160	156	158	156	168	160	156	
weekly avg	~	145	168	156	147	167	146	157	165	155	152	156	166	155	165	153	157	157
% change	~	-7%	7%	0%	-6%	7%	-7%	0%	5%	-1%	-3%	0%	6%	-1%	5%	-2%	0%	
Recovery 2 min. Diastolic																		
M		90			80	84	90	72	98		82	100	90	80	92	80	84	
W		90	82		84	90	82	94	110	84	84	96	80	92	84	76	86	
F		90	80		76	90	80	90	100	84	86	90	90	86	80	90	98	
weekly avg	~	90	81	86	80	88	84	85	103	84	84	95	87	86	85	82	89	87
% change	~	5%	-5%	0%	-6%	3%	-2%	0%	20%	-2%	-2%	12%	1%	1%	0%	-4%	4%	
Recovery 3.5 min. Systolic																		
M		138			158	148	160	146	160		138	160	124	146	166	152	156	
W		150	142		150	130	142	160	156	170	142	150	156	160	150	172	150	
F		142	152		130	150	132	142	130	140	160	156	140	144	150	154	164	
weekly avg	~	143	147	145	146	143	145	149	149	155	147	155	140	150	155	159	157	150
% change	~	-1%	1%	0%	1%	-2%	0%	3%	2%	7%	1%	7%	-4%	3%	7%	10%	8%	
Recovery 3.5 min. Diastolic																		
M		92			76	80	98	92	92		82	92	84	80	92	84	80	
W		88	82		80	90	82	90	92	94	80	96	78	80	90	74	80	
F		82	84		80	86	78	90	82	84	90	82	82	80	84	90	98	
weekly avg	~	87	83	85	79	85	86	91	89	89	84	90	81	80	89	83	86	85
% change	~	3%	-3%	0%	-8%	0%	1%	6%	4%	5%	-1%	6%	-5%	-6%	4%	-3%	1%	
Recovery 4 min. Heart Rate																		
M		72			76	88	80	96	88		81	95	84	84	92	92	88	
W		72	76		80	80	80	88	92	90	104	96	84	87	88	82	100	
F		68	72		80	84	80	82	84	84	60	86	80	93	96	96	88	
weekly avg	~	71	74	72	79	84	80	89	88	87	82	92	83	88	92	90	92	87
% change	~	-2%	2%	0%	9%	16%	11%	23%	22%	20%	13%	28%	14%	22%	27%	24%	27%	

indicates no results available

Figure E7.6. P07, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max		55		55.00	55	65	60	65	65		70	75	70	80	80	70	70	68.75
% change	~	0%	~	0%	0%	18%	9%	18%	18%	~	27%	36%	27%	45%	45%	27%	27%	
BC end		20		20.00	15	25	20	26	30		35	34	32	37	37	41	49	31.75
% change	~	0%	~	0%	-25%	25%	0%	30%	50%	~	75%	70%	60%	85%	85%	105%	145%	
LE max		90	90	90.00	100	100	105	110	115	120	125	125	125	130	130	130	135	119.23
% change	~	0%	0%	0%	11%	11%	17%	22%	28%	33%	39%	39%	39%	44%	44%	44%	50%	
LE end		20	18	19.00	17	19	18	26	18	27	29	35	23	30	27	32	32	25.62
% change	~	5%	-5%	0%	-11%	0%	-5%	37%	-5%	42%	53%	84%	21%	58%	42%	68%	68%	
Walk Test																		
M		8.77			7.92	7.92	7.47	7.37	7.65		8.72	8.58	8.48	8.82	8.43	8.43	8.58	
W		8.08	8.20		8.10	7.73	7.45	7.57	8.05	8.57	8.57	8.43	8.25	8.62	8.12	8.55	8.30	
F		8.17	7.90		8.00	7.67	7.62	7.77	8.27	8.55	8.50	8.47	8.55	8.48	8.23	8.08	8.55	
weekly avg	~	8.34	8.05	8.20	8.01	7.77	7.51	7.57	7.99	8.56	8.60	8.49	8.43	8.64	8.26	8.35	8.48	8.20
% change	~	2%	-2%	0%	-2%	-5%	-8%	-8%	-3%	4%	5%	4%	3%	5%	1%	2%	3%	
Flex Test																		
M		14.00			10.00	10.75	9.25	12.25	11.00		12.75	11.75	13.50	13.25	14.25	14.00	14.25	
W		12.50	14.50		9.25	11.25	11.00	11.25	13.25	13.50	13.50	11.50	13.25	13.00	13.00	14.75	15.00	
F		11.25	14.00		10.50	12.25	10.25	11.50	13.25	12.25	11.75	12.25	10.50	12.50	13.25	15.25	14.00	
weekly avg	~	12.58	14.25	13.42	9.92	11.42	10.17	11.67	12.50	12.88	12.67	11.83	12.42	12.92	13.50	14.67	14.42	12.38
% change	~	-6%	6%	0%	-26%	-15%	-24%	-13%	-7%	-4%	-6%	-12%	-7%	-4%	1%	9%	7%	
Stair Climb		11.58		11.58		12.30				11.83				12.27			10.42	11.71
% change		0%		0%		6%				2%				6%			-10%	

indicates no results available

Figure E7.7. P07, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great		6	6		5	6	2	5	5	3	5	5	6	6	5	5	6	
Positive		6	6		6	2	6	5	6	6	6	5	5	6	6	6	7	
Strong		5	5		4	5	5	4	5	6	6	5	4	5	5	5	6	
Terrific		6	6		6	5	4	5	5	5	5	4	5	5	5	3	6	
Average	~	6	6	6	5	5	4	5	5	5	6	5	5	6	5	5	6	5
Psychological distress																		
Awful		1	1		2	1	1	1	1	1	1	1	1	1	1	1	1	
Crummy		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Discouraged		6	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Miserable		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Average	~	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fatigue																		
Drained		5	5		3	3	3	4	4	4	4	4	4	2	3	4	3	
Exhausted		4	4		3	3	4	3	4	4	4	4	4	2	4	3	2	
Fatigued		4	4		3	4	5	3	4	4	5	4	4	2	4	4	2	
Tired		4	4		4	4	5	5	4	4	4	4	4	4	4	5	2	
Average	~	4	4	4	3	4	4	4	4	4	4	4	4	3	4	4	2	4
	indicates no results available																	

Figure E7.8. P07, Subjective Exercise Experience Scale results.

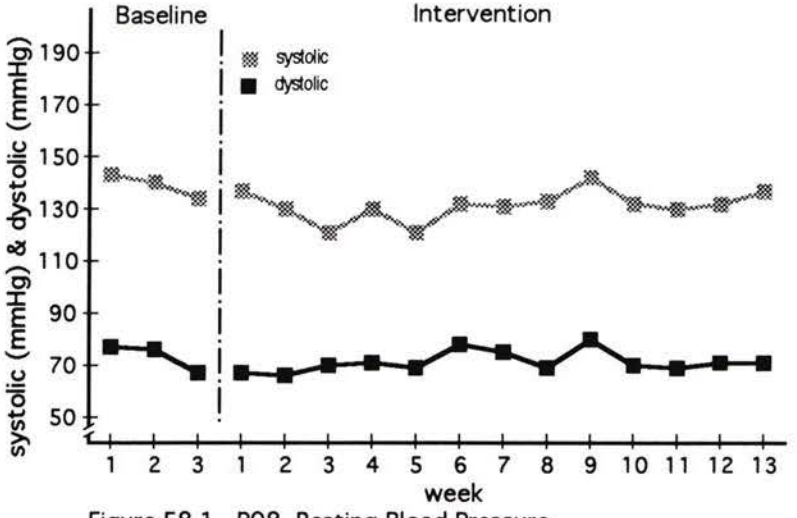

Figure E8.1. P08, Resting Blood Pressure.

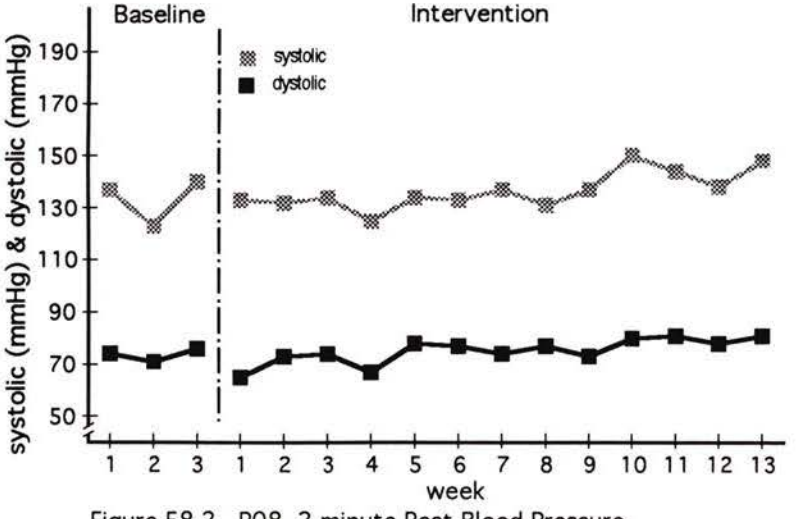

Figure E8.2. P08, 2 minute Post Blood Pressure.

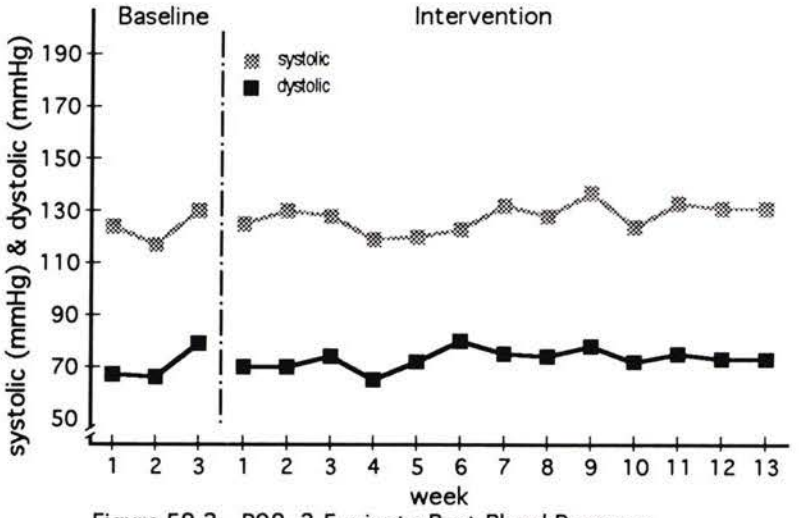

Figure E8.3. P08, 3.5 minute Post Blood Pressure.

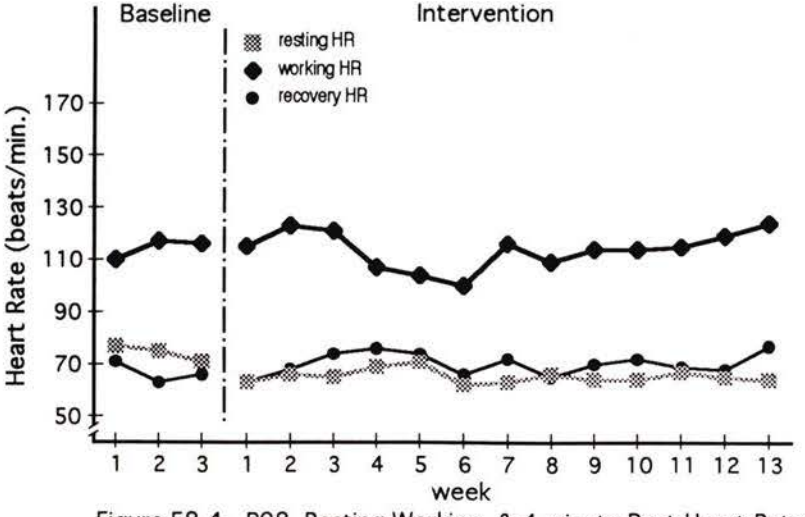

Figure E8.4. P08, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M		140			140	120		130	120		140	136	140	132	130	132	140	
W	148	140	136		140	140	122	130		134	122	134	136		130	130	134	
F	138	140	132		130		120	130	122	130	130	130	150		130	134	136	
weekly avg	143	140	134	139	137	130	121	130	121	132	131	133	142	132	130	132	137	131
% change	3%	1%	-4%	0%	-2%	-6%	-13%	-6%	-13%	-5%	-6%	-4%	2%	-5%	-6%	-5%	-2%	
Resting Diastolic																		
M		76			62	62		70	70		86	68	80	70	70	68	70	
W	78	76	72		70	70	70	70		76	70	68	80		72	70	72	
F	76	76	62		70		70	72	68	80	68	72	80		64	74	72	
weekly avg	77	76	67	73	67	66	70	71	69	78	75	69	80	70	69	71	71	71
% change	5%	4%	-9%	0%	-8%	-10%	-5%	-4%	-6%	6%	2%	-5%	9%	-5%	-6%	-4%	-3%	
Resting Heart Rate																		
M		76			64	64		72	72		64	68	64	64	68	67	64	
W	78	76	72		64	68	68	72		64	64	66	64		64	64	65	
F	76	72	70		60		62	64	70	60	60	64	64		68	64	64	
weekly avg	77	75	71	74	63	66	65	69	71	62	63	66	64	64	67	65	64	65
% change	4%	1%	-4%	0%	-16%	-11%	-12%	-7%	-4%	-16%	-16%	-11%	-14%	-14%	-10%	-12%	-13%	
Working Heart Rate																		
M		110			117	115		107	107		117	113	113	114	118	112	128	
W	114	122	116		115	131	129	108		95	122	112	110		119	115	123	
F	106	120	115		114		113	107	100	105	109	103	118		107	130	121	
weekly avg	110	117	116	114	115	123	121	107	104	100	116	109	114	114	115	119	124	114
% change	-4%	3%	1%	0%	1%	8%	6%	-6%	-9%	-12%	2%	-4%	-1%	0%	0%	4%	9%	

indicates no results available

Figure E8.5. P08, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M		120			132	130		130	136		130	130	140	150	148	140	134	
W	130	118	142		128	134	138	120		126	148	130	130		140	138	154	
F	144	132	138		140		130	126	132	140	132	134	142		144	136	156	
weekly avg	137	123	140	133	133	132	134	125	134	133	137	131	137	150	144	138	148	137
% change	3%	-8%	5%	0%	0%	-1%	0%	-6%	0%	0%	2%	-2%	3%	12%	8%	3%	11%	
Recovery 2 min. Diastolic																		
M		70			74	70		70	78		78	74	78	80	80	80	82	
W	78	62	74		50	76	76	68		74	74	70	70		80	72	80	
F	70	82	78		70		72	64	78	80	70	88	72		82	82	82	
weekly avg	74	71	76	74	65	73	74	67	78	77	74	77	73	80	81	78	81	75
% change	0%	-3%	3%	0%	-12%	-1%	0%	-9%	6%	4%	0%	5%	-1%	8%	9%	6%	10%	
Recovery 3.5 min. Systolic																		
M		122			118	130		120	120		128	130	140	124	130	138	122	
W	120	110	138		120	130	128	120		126	136	130	134		132	128	134	
F	128	120	122		136		128	118	120	120	132	124	136		138	126	136	
weekly avg	124	117	130	124	125	130	128	119	120	123	132	128	137	124	133	131	131	128
% change	0%	-5%	5%	0%	1%	5%	3%	-4%	-3%	-1%	7%	3%	10%	0%	8%	6%	6%	
Recovery 3.5 min. Diastolic																		
M		70			80	72		72	72		78	74	82	72	76	74	78	
W	70	68	80		60	68	72	62		80	76	70	80		76	78	70	
F	64	60	78		70		76	62	72	80	72	78	72		72	68	70	
weekly avg	67	66	79	71	70	70	74	65	72	80	75	74	78	72	75	73	73	73
% change	-5%	-7%	12%	0%	-1%	-1%	5%	-8%	2%	13%	7%	5%	10%	2%	6%	4%	3%	
Recovery 4 min. Heart Rate																		
M		64			64	68		76	72		73	70	69	72	72	64	72	
W	70	64	72		60	68	72	76		56	76	66	70		72	64	80	
F	72	60	60		64		76	76	76	76	67	60	72		64	77	80	
weekly avg	71	63	66	67	63	68	74	76	74	66	72	65	70	72	69	68	77	70
% change	7%	-6%	-1%	0%	-6%	2%	11%	14%	11%	-1%	8%	-2%	6%	8%	4%	3%	16%	

indicates no results available

Figure E8.6. P08, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	35	35		35.00	30	35	30	30	35		35	35	35		40	45	45	35.91
% change	0%	0%	~	0%	-14%	0%	-14%	-14%	0%	~	0%	0%	0%	~	14%	29%	29%	
BC end	10	10		10.00	15	12	15	15	24		20	26	35		40	41	34	25.18
% change	0%	0%	~	0%	50%	20%	50%	50%	140%	~	100%	160%	250%	~	300%	310%	240%	
LE max	80	80	80	80.00	85	85	85	90	90	90	90	95	95	95	85	90	90	89.62
% change	0%	0%	0%	0%	6%	6%	6%	13%	13%	13%	13%	19%	19%	19%	6%	13%	13%	
LE end	16	20	20	18.67	20	25	20	24	26	24	31	32	30	32	27	27	32	26.92
% change	-14%	7%	7%	0%	7%	34%	7%	29%	39%	29%	66%	71%	61%	71%	45%	45%	71%	
Walk Test																		
M		8.98			8.58	8.52	8.38	8.65	8.67		10.05	9.87	9.67	9.62	9.48	9.43	9.58	
W	9.90	8.92	8.63		8.67	8.38	8.35	8.75		8.78	9.75	9.60	9.58		9.68	9.83	9.28	
F	9.00	8.90	8.53		8.55		8.67	8.50	10.48	10.38	9.97	9.53	9.60		9.77	9.30	9.35	
weekly avg	9.45	8.93	8.58	8.99	8.60	8.45	8.47	8.63	9.58	9.58	9.92	9.67	9.62	9.62	9.64	9.52	9.40	9.28
% change	5%	-1%	-5%	0%	-4%	-6%	-6%	-4%	7%	7%	10%	8%	7%	7%	7%	6%	5%	
Flex Test																		
M		28.00			29.25	30.00	31.00	30.00	30.00		31.25	32.25	34.00	33	31.75	33.00	32.25	
W	28.00	29.25	29.50		31.25	31.00	33.00	32.25		27.50	32.25	32.25	27.25		31.25	33.00	33.50	
F	29.50	29.50	30.00		30.00		30.00	31.00	27.75	27.50	31.50	33.50	32.50		32.00	31.00	33.50	
weekly avg	28.75	28.92	29.75	29.14	30.17	30.50	31.33	31.08	28.88	27.50	31.67	32.67	31.25	33.00	31.67	32.33	33.08	31.16
% change	-1%	-1%	2%	0%	4%	5%	8%	7%	-1%	-6%	9%	12%	7%	13%	9%	11%	14%	
Stair Climb		16.7		16.7		14.93				20.92				22.64			18.47	19.24
% change		0%		0%		-11%				25%				36%			11%	

indicates no results available

Figure E8.7. P08, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	7	7	7		7		7	7	7	7	7	7	7		7	7	7	
Positive	7	7	7		7		7	7	7	7	7	7	7		7	7	7	
Strong	7	7	7		7		7	7	7	7	7	7	7		7	7	7	
Terrific	7	7	7		7		7	7	7	7	7	7	7		7	7	7	
Average	7	7	7	7	7	~	7	7	7	7	7	7	7	~	7	7	7	7
Psychological distress																		
Awful	1	1	1		1		1	1	1	1	1	1	1		1	1	1	
Crummy	1	1	1		1		1	1	1	1	1	1	1		1	1	1	
Discouraged	1	1	1		1		1	1	1	1	1	1	1		1	1	1	
Miserable	1	1	1		1		1	1	1	1	1	1	1		1	1	1	
Average	1	1	1	1	1	~	1	1	1	1	1	1	1	~	1	1	1	1
Fatigue																		
Drained	1	1	1		1		1	1	1	4	1	1	1		1	1	1	
Exhausted	1	1	1		2		1	1	1	1	2	1	1		1	1	1	
Fatigued	1	1	1		1		1	1	1	3	3	1	1		1	1	1	
Tired	1	1	1		2		1	1	1	3	3	1	1		2	1	1	
Average	1	1	1	1	2	~	1	1	1	3	2	1	1	~	1	1	1	1
	indicates no results available																	

Figure E8.8. P08, Subjective Exercise Experience Scale results.

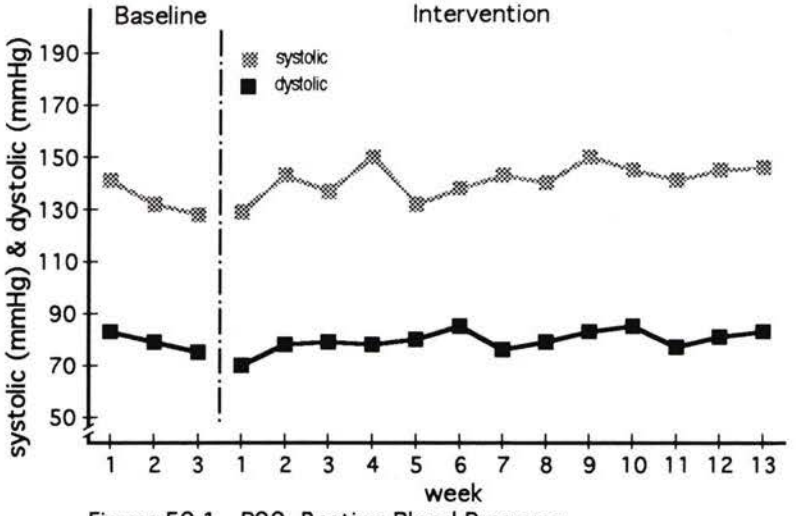

Figure E9.1. P09, Resting Blood Pressure.

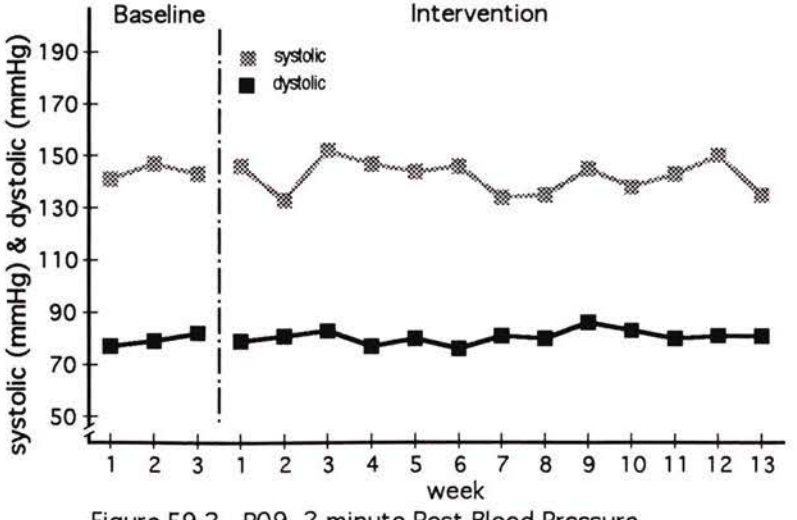

Figure E9.2. P09, 2 minute Post Blood Pressure.

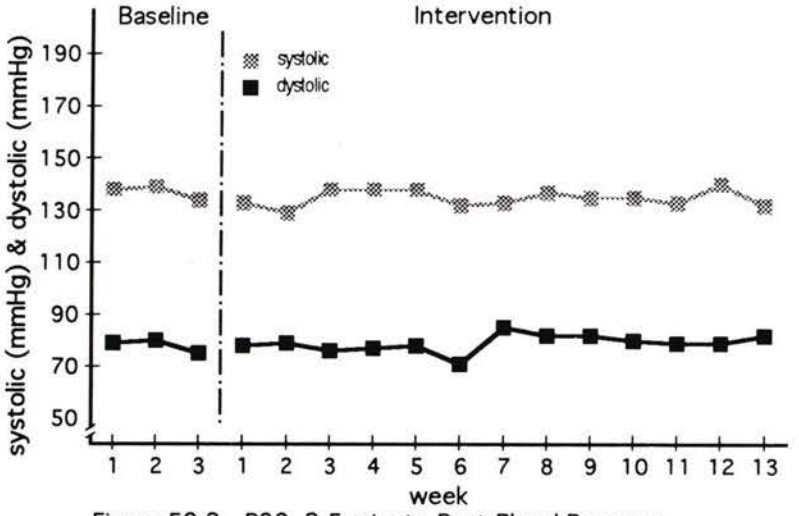

Figure E9.3. P09, 3.5 minute Post Blood Pressure.

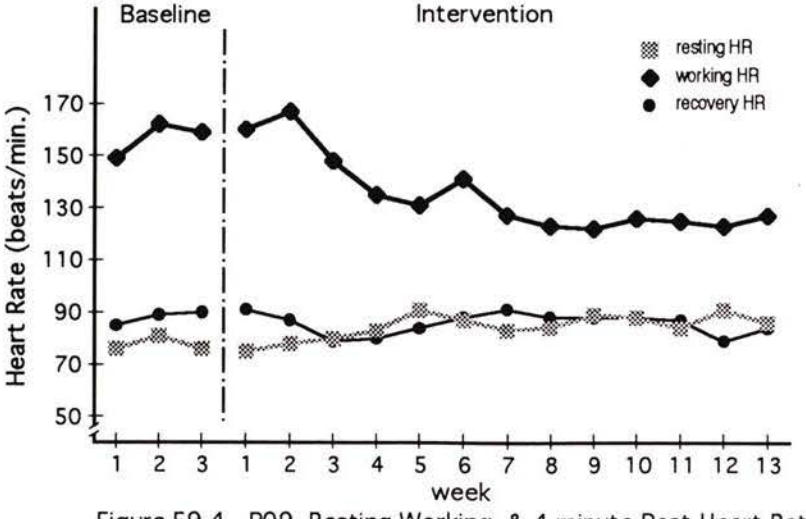

Figure E9.4. P09, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	136	130			124	148	138	142	132		150	144		140	140	140	150	
W	138	136	136		128	144	132	142		136	140	140	150	152	142	150	138	
F	149	130	120		136	136	142	166		140	140	136	150	142	140	144	150	
weekly avg	141	132	128	134	129	143	137	150	132	138	143	140	150	145	141	145	146	141
% change	5%	-1%	-4%	0%	-3%	7%	3%	12%	-1%	3%	7%	5%	12%	8%	5%	8%	9%	
Resting Diastolic																		
M	80	78			70	70	82	70	80		80	82		96	74	80	86	
W	80	88	80		68	86	82	80		90	72	76	80	90	82	84	80	
F	90	72	70		72	78	72	84		80	76	80	86	70	76	80	82	
weekly avg	83	79	75	79	70	78	79	78	80	85	76	79	83	85	77	81	83	80
% change	5%	0%	-5%	0%	-12%	-2%	-1%	-2%	1%	7%	-4%	0%	5%	8%	-2%	3%	4%	
Resting Heart Rate																		
M	72	84			76	77	76	85	91		82	83		89	82	84	89	
W	84	80	80		72	76	84	82		88	90	80	85	78	84	100	83	
F	72	80	72		76	80	80	82		85	76	90	93	96	85	90	87	
weekly avg	76	81	76	78	75	78	80	83	91	87	83	84	89	88	84	91	86	84
% change	-2%	5%	-2%	0%	-4%	0%	3%	7%	17%	11%	6%	8%	14%	13%	8%	17%	11%	
Working Heart Rate																		
M	145	160			160	171	159	134	131		126	117		126	127	121	134	
W	155	161	163		157	163	151	136		150	130	127	121	124	129	124	132	
F	147	165	154		164	166	133	136		132	125	125	123	129	120	123	116	
weekly avg	149	162	159	157	160	167	148	135	131	141	127	123	122	126	125	123	127	135
% change	-5%	4%	1%	0%	2%	6%	-6%	-14%	-16%	-10%	-19%	-21%	-22%	-19%	-20%	-22%	-19%	

indicates no results available

Figure E9.5. P09, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	148	152			150	130	148	144	144		140	130		130	140	136	132	
W	132	144	144		138	130	158	150		144	130	136	140	148	150	164	138	
F	144	144	142		150	140	150	148		148	132	140	150	136	140	150	136	
weekly avg	141	147	143	144	146	133	152	147	144	146	134	135	145	138	143	150	135	142
% change	-2%	2%	0%	0%	2%	-7%	6%	3%	0%	2%	-7%	-6%	1%	-4%	0%	4%	-6%	
Recovery 2 min. Diastolic																		
M	82	76			82	80	78	72	80		80	80		80	80	76	82	
W	72	76	80		74	80	90	78		80	80	80	80	82	80	84	80	
F	76	84	84		80	82	80	80		72	82	80	92	88	80	84	80	
weekly avg	77	79	82	79	79	81	83	77	80	76	81	80	86	83	80	81	81	81
% change	-3%	-1%	4%	0%	-1%	2%	4%	-3%	1%	-4%	2%	1%	9%	5%	1%	3%	2%	
Recovery 3.5 min. Systolic																		
M	140	138			140	126	140	140	138		128	128		136	130	130	130	
W	136	138	136		130	130	132	136		132	136	140	130	138	140	144	136	
F	138	140	132		130	132	142	138		132	134	142	140	130	130	146	130	
weekly avg	138	139	134	137	133	129	138	138	138	132	133	137	135	135	133	140	132	135
% change	1%	1%	-2%	0%	-3%	-6%	1%	1%	1%	-4%	-3%	0%	-1%	-2%	-3%	2%	-4%	
Recovery 3.5 min. Diastolic																		
M	84	80			78	84	80	72	78		80	80		82	80	76	82	
W	70	80	76		78	84	76	82		70	90	86	80	82	76	80	82	
F	84	80	74		78	70	72	76		72	86	80	84	76	80	80	82	
weekly avg	79	80	75	78	78	79	76	77	78	71	85	82	82	80	79	79	82	79
% change	2%	2%	-4%	0%	0%	2%	-3%	-2%	0%	-9%	9%	5%	5%	2%	1%	1%	5%	
Recovery 4 min. Heart Rate																		
M	76	88			96	88	88	72	84		92	88		88	88	82	82	
W	92	88	96		88	88	72	84		92	96	88	88	88	86	78	82	
F	88	90	84		88	84	76	84		84	84	88	88	88	86	78	88	
weekly avg	85	89	90	88	91	87	79	80	84	88	91	88	88	88	87	79	84	86
% change	-3%	1%	2%	0%	3%	-2%	-11%	-9%	-5%	0%	3%	0%	0%	0%	-2%	-10%	-5%	
	indicates no results available																	

Figure E9.6. P09, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	17.5	17.5		17.50	17.5	22.5	25	25	30		25	25	25	30	30	30	30	26.25
% change	0%	0%	~	0%	0%	29%	43%	43%	71%	~	43%	43%	43%	71%	71%	71%	71%	
BC end	8	19		13.50	14	15	12	18	24		24	26	29	27	28	30	34	23.42
% change	-41%	41%	~	0%	4%	11%	-11%	33%	78%	~	78%	93%	115%	100%	107%	122%	152%	
LE max	70	80	85	78.33	85	85	90	95		90	95	85	90	95	95	95	95	91.25
% change	-11%	2%	9%	0%	9%	9%	15%	21%	~	15%	21%	9%	15%	21%	21%	21%	21%	
LE end	15	13	13	13.67	16	14	17	17		15	21	14	19	20	22	20	21	18.00
% change	10%	-5%	-5%	0%	17%	2%	24%	24%	~	10%	54%	2%	39%	46%	61%	46%	54%	
Walk Test																		
M	10.43	9.75			9.50	9.30	9.80	10.15	10.82		12.48	13.62		13.07	12.63	12.28	12.55	
W	10.43	9.55	9.37		9.55	9.28	9.83	10.02		11.42	12.72	13.30	13.38	12.95	12.93	11.83	11.58	
F	11.60	9.53	9.63		9.33	9.20	10.62	10.80		12.55	12.87	13.93	13.30	12.72	13.73	12.33	12.02	
weekly avg	10.82	9.61	9.50	9.98	9.46	9.26	10.08	10.32	10.82	11.99	12.69	13.62	13.34	12.91	13.10	12.15	12.05	11.68
% change	8%	-4%	-5%	0%	-5%	-7%	1%	3%	8%	20%	27%	36%	34%	29%	31%	22%	21%	
Flex Test																		
M	27.75	28.50			26.75	27.25	26.00	28.00	27.75		28.00	29.50		31.00	31.25	30.00	30.25	
W	29.00	31.25	29.25		27.50	28.00	25.75	28.00		28.25	28.25	29.75	29.00	30.00	31.25	31.25	30.75	
F	24.75	25.25	30.00		27.50	26.75	27.50	27.75		28.25	30.00	28.75	27.00	27.75	31.25	30.50	31.00	
weekly avg	27.17	28.33	29.63	28.38	27.25	27.33	26.42	27.92	27.75	28.25	28.75	29.33	28.00	29.58	31.25	30.58	30.67	28.70
% change	-4%	0%	4%	0%	-4%	-4%	-7%	-2%	-2%	0%	1%	3%	-1%	4%	10%	8%	8%	
Stair Climb		16.84		16.84		17.42				14.45				15.71			12.96	15.14
% change		0%		0%		3%				-14%				-7%			-23%	

indicates no results available

Figure E9.7. P09, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	7	7	7		7	7	7	5			7	6	7	7	7	7	6	
Positive	7	7	7		7	7	7	7			7	7	7	7	7	7	7	
Strong	4	4	4		5	4	4	4			4	4	5	4	4	5	4	
Terrific	7	7	7		7	7	7	7			7	5	7	7	4	6	5	
Average	6	6	6	6	7	6	6	6	~	~	6	6	7	6	6	6	6	6
Psychological distress																		
Awful	1	1	1		1	1	1	1			1	1	1	1	1	1	1	
Crummy	1	1	1		1	1	1	1			1	1	1	1	1	1	1	
Discouraged	1	1	1		1	1	1	1			1	1	1	1	1	1	1	
Miserable	1	1	1		1	1	1	1			1	1	1	1	1	1	1	
Average	1	1	1	1	1	1	1	1	~	~	1	1	1	1	1	1	1	1
Fatigue																		
Drained	1	1	1		3	1	1	1			7	1	1	1	1	1	1	
Exhausted	1	1	1		4	1	1	4			4	4	1	4	1	1	1	
Fatigued	1	4	1		4	4	4	4			3	4	2	4	1	1	1	
Tired	1	4	4		4	4	4	4			5	4	4	5	4	3	4	
Average	1	3	2	2	4	3	3	3	~	~	5	3	2	4	2	2	2	3
	indicates no results available																	

Figure E9.8. P09, Subjective Exercise Experience Scale results.

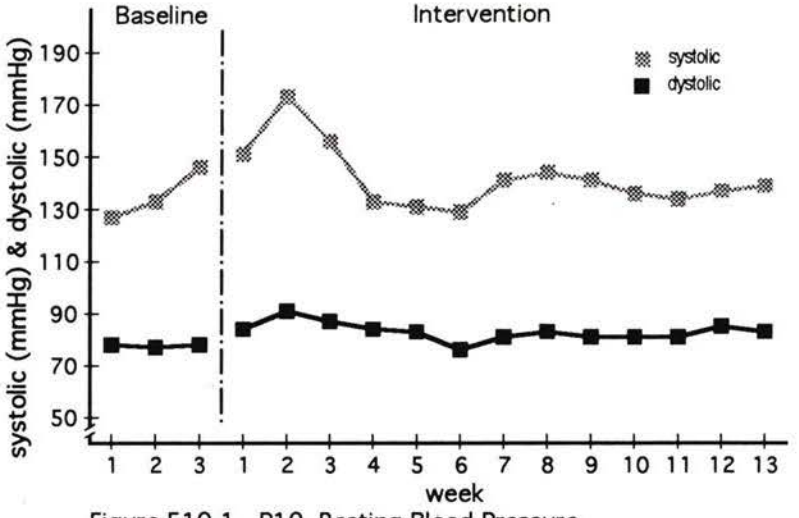

Figure E10.1. P10, Resting Blood Pressure.

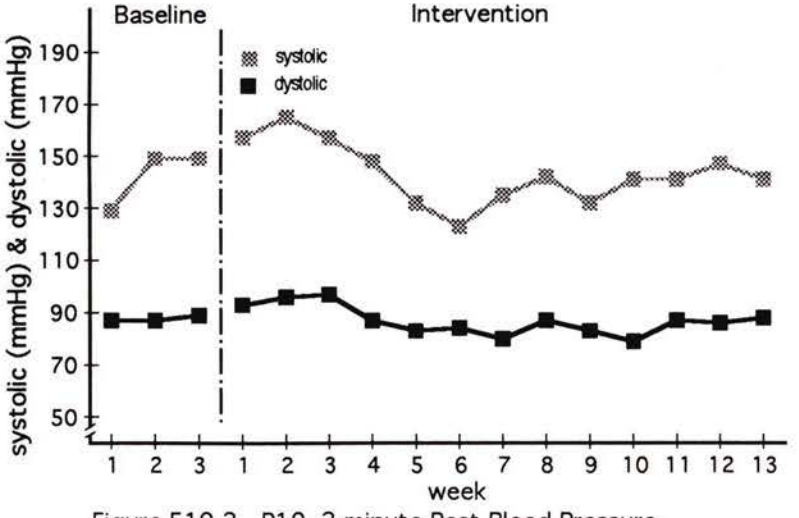

Figure E10.2. P10, 2 minute Post Blood Pressure.

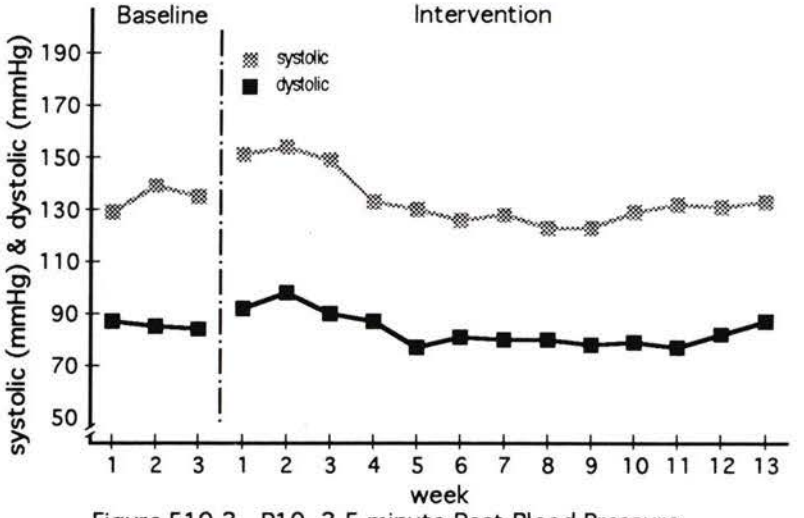

Figure E10.3. P10, 3.5 minute Post Blood Pressure.

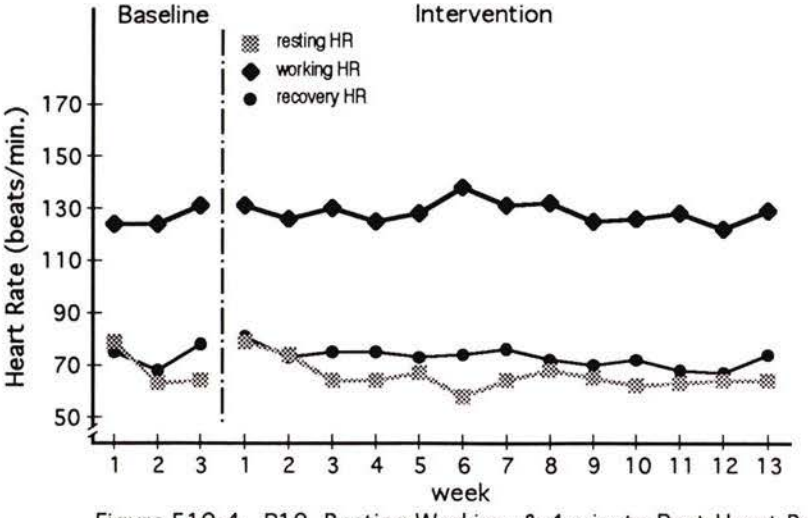

Figure E10.4. P10, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	122	118			152	150	160	148	132		136	150	148	144	136	140	144	
W	132	140	148		152	196	160	118	130	126	130	130	134	134	130	132	132	
F	126	140	144		148	174	148	134	132	132	156	152	140	130	136	140	142	
weekly avg	127	133	146	135	151	173	156	133	131	129	141	144	141	136	134	137	139	142
% change	-6%	-2%	8%	0%	12%	28%	15%	-1%	-3%	-5%	4%	7%	4%	1%	-1%	2%	3%	
Resting Diastolic																		
M	82	80			78	90	84	92	80		82	90	82	86	80	84	84	
W	82	74	78		88	98	88	80	80	72	82	74	76	76	80	84	80	
F	70	76	78		86	84	90	80	88	80	80	84	86	80	82	86	84	
weekly avg	78	77	78	78	84	91	87	84	83	76	81	83	81	81	81	85	83	83
% change	1%	-1%	1%	0%	8%	17%	13%	8%	7%	-2%	5%	7%	5%	4%	4%	9%	7%	
Resting Heart Rate																		
M	80	72			80	78	64	64	64		64	68	64	62	64	66	62	
W	84	58	60		80	72	64	64	68	56	67	72	66	60	64	62	70	
F	72	60	68		78	72	64	64	68	60	60	64	64	64	60	64	60	
weekly avg	79	63	64	69	79	74	64	64	67	58	64	68	65	62	63	64	64	66
% change	15%	-8%	-7%	0%	16%	8%	-7%	-7%	-3%	-16%	-7%	-1%	-6%	-10%	-9%	-7%	-7%	
Working Heart Rate																		
M	123	128			132	129	127	123	126		130	138	123	124	129	113	128	
W	124	120	131		130	125	133	130	128	132	133	128	129	126	129	128	131	
F	124	124	130		131	125	130	121	131	143	131	129	123	129	126	126	129	
weekly avg	124	124	131	126	131	126	130	125	128	138	131	132	125	126	128	122	129	129
% change	-2%	-2%	4%	0%	4%	0%	3%	-1%	2%	9%	4%	4%	-1%	0%	2%	-3%	3%	

indicates no results available

Figure E10.5. P10, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	130	136			150	164	160	148	144		140	144	132	150	142	148	148	
W	126	164	154		166	164	160	148	128	118	134	132	128	134	140	160	134	
F	132	148	144		156	168	150	148	124	128	132	150	136	138	140	134	140	
weekly avg	129	149	149	143	157	165	157	148	132	123	135	142	132	141	141	147	141	143
% change	-9%	5%	5%	0%	10%	16%	10%	4%	-7%	-14%	-5%	0%	-7%	-1%	-1%	3%	-1%	
Recovery 2 min. Diastolic																		
M	82	90			92	92	90	100	80		80	92	82	80	88	82	90	
W	90	82	90		100	92	100	80	80	88	80	82	80	80	82	90	84	
F	90	90	88		86	104	100	80	88	80	80	86	88	76	90	86	90	
weekly avg	87	87	89	88	93	96	97	87	83	84	80	87	83	79	87	86	88	87
% change	-1%	-1%	1%	0%	5%	9%	10%	-1%	-6%	-4%	-9%	-1%	-5%	-10%	-1%	-2%	0%	
Recovery 3.5 min. Systolic																		
M	128	126			144	144	160	132	134		128	120	128	136	132	130	136	
W	132	160	138		154	160	150	136	128	124	126	120	122	122	132	132	130	
F	126	130	132		156	158	138	130	128	128	130	130	120	130	132	130	134	
weekly avg	129	139	135	134	151	154	149	133	130	126	128	123	123	129	132	131	133	134
% change	-4%	3%	1%	0%	13%	15%	11%	-1%	-3%	-6%	-5%	-8%	-8%	-4%	-2%	-3%	-1%	
Recovery 3.5 min. Diastolic																		
M	82	88			92	92	90	82	80		80	82	82	88	72	82	88	
W	90	80	86		94	104	92	90	72	82	80	82	76	80	76	90	90	
F	90	88	82		90	98	88	90	78	80	80	76	76	70	82	74	82	
weekly avg	87	85	84	86	92	98	90	87	77	81	80	80	78	79	77	82	87	84
% change	2%	0%	-2%	0%	8%	15%	5%	2%	-10%	-5%	-6%	-6%	-9%	-7%	-10%	-4%	1%	
Recovery 4 min. Heart Rate																		
M	80	72			76	74	72	76	72		79	77	68	66	72	66	72	
W	72	63	80		88	72	76	76	76	72	76	71	72	71	64	64	76	
F	72	68	76		80	72	76	72	72	75	74	68	69	80	68	72	73	
weekly avg	75	68	78	73	81	73	75	75	73	74	76	72	70	72	68	67	74	73
% change	2%	-8%	6%	0%	11%	-1%	2%	2%	0%	0%	4%	-2%	-5%	-2%	-7%	-8%	0%	

indicates no results available

Figure E10.6. P10, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	35	40		37.50	45	50	45	55	50		55	50	50	60	55	55	60	52.50
% change	-7%	7%	~	0%	20%	33%	20%	47%	33%	~	47%	33%	33%	60%	47%	47%	60%	
BC end	22	18		20	20	30	22	26	27		33	30	30	34	37	37	49	31.25
% change	10%	-10%	~	0%	0%	50%	10%	30%	35%	~	65%	50%	50%	70%	85%	85%	145%	
LE max	80	80	85	81.67	90	95	95	95	100	105	105	110	110	110	115	115	120	105.00
% change	-2%	-2%	4%	0%	10%	16%	16%	16%	22%	29%	29%	35%	35%	35%	41%	41%	47%	
LE end	13	13	14	13.33	14	14	16	14	22	25	26	23	26	36	37	28	25	23.54
% change	-3%	-3%	5%	0%	5%	5%	20%	5%	65%	88%	95%	73%	95%	170%	178%	110%	88%	
Walk Test																		
M	8.45	7.80			7.63	7.72	7.73	7.65	7.47		8.13	8.13	8.12	8.13	7.95	8.07	8.03	
W	8.22	7.98	8.03		7.75	7.55	7.65	7.47	8.10	8.15	8.03	7.87	7.97	8.08	8.03	8.10	7.83	
F	7.80	7.75	7.68		7.65	7.60	7.57	7.83	8.12	8.20	8.05	8.10	8.20	8.00	7.88	7.95	8.03	
weekly avg	8.16	7.84	7.86	7.95	7.68	7.62	7.65	7.65	7.90	8.18	8.07	8.03	8.10	8.07	7.95	8.04	7.96	7.92
% change	3%	-1%	-1%	0%	-3%	-4%	-4%	-4%	-1%	3%	1%	1%	2%	1%	0%	1%	0%	
Flex Test																		
M	14.25	13.50			16.25	20.75	15.50	15.00	17.00		17.50	19.25	15.00	16.75	17.75	19.00	20.00	
W	16.50	15.00	16.00		18.25	16.50	16.50	18.25	16.00	18.00	17.25	16.25	16.75	16.25	18.75	18.75	19.00	
F	19.00	18.00	16.00		16.75	16.50	16.75	17.25	16.50	18.00	18.50	17.50	17.00	18.50	20.00	23.50	20.00	
weekly avg	16.58	15.50	16.00	16.03	17.08	17.92	16.25	16.83	16.50	18.00	17.75	17.67	16.25	17.17	18.83	20.42	19.67	17.72
% change	3%	-3%	0%	0%	7%	12%	1%	5%	3%	12%	11%	10%	1%	7%	18%	27%	23%	
Stair Climb		9.77		9.77		9.15				8.78				7.97			7.14	8.26
% change		0%		0%		-6%				-10%				-18%			-27%	

indicates no results available

Figure E10.7. P10, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	6	6	6		6	6	6	6	7	7	7	7	7	7	7	7	7	
Positive	7	7	7		7	7	7	7	7	7	7	7	7	7	7	7	7	
Strong	5	4	5		5	5	5	5	6	6	5	6	5	5	5	5	6	
Terrific	6	7	6		6	6	6	6	7	7	7	7	7	7	6	7	6	
Average	6	6	6	6	6	6	6	6	7	7	7	7	7	7	6	7	7	6
Psychological distress																		
Awful	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Crummy	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Discouraged	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Miserable	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Average	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Fatigue																		
Drained	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Exhausted	1	2	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
Fatigued	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2	
Tired	2	2	2		2	2	2	2	2	3	2	2	2	2	2	2	2	
Average	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	indicates no results available																	

Figure E10.8. P10, Subjective Exercise Experience Scale results.

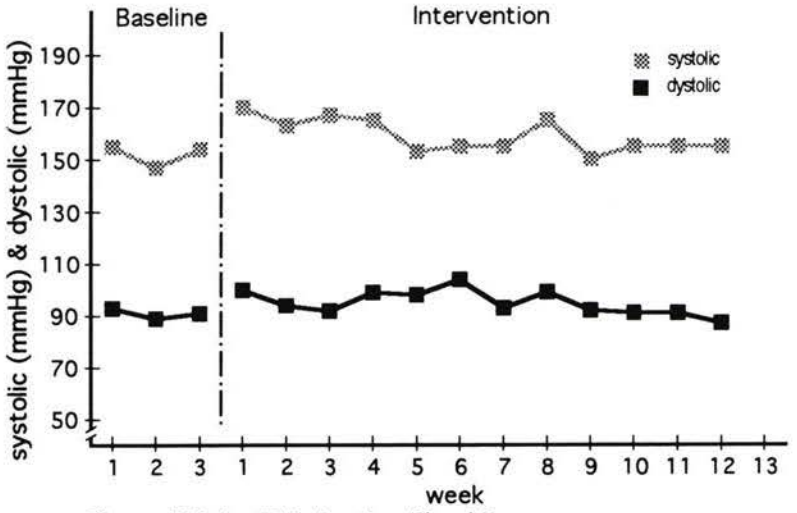

Figure E11.1. P11, Resting Blood Pressure.

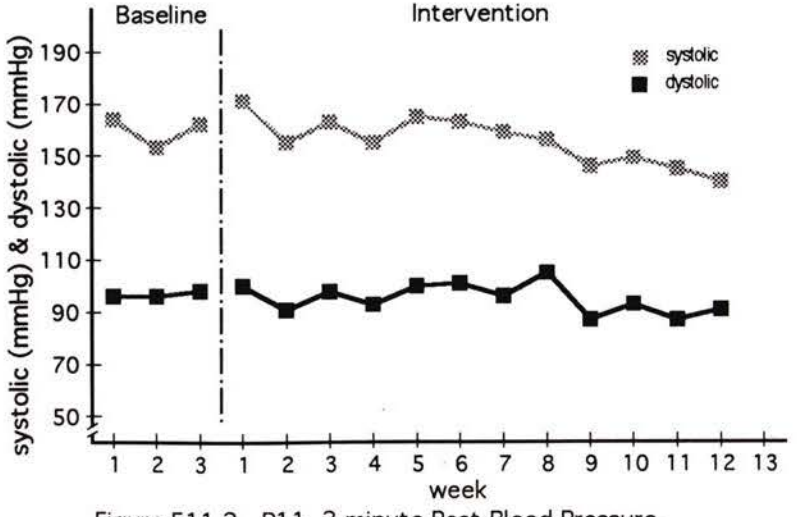

Figure E11.2. P11, 2 minute Post Blood Pressure.

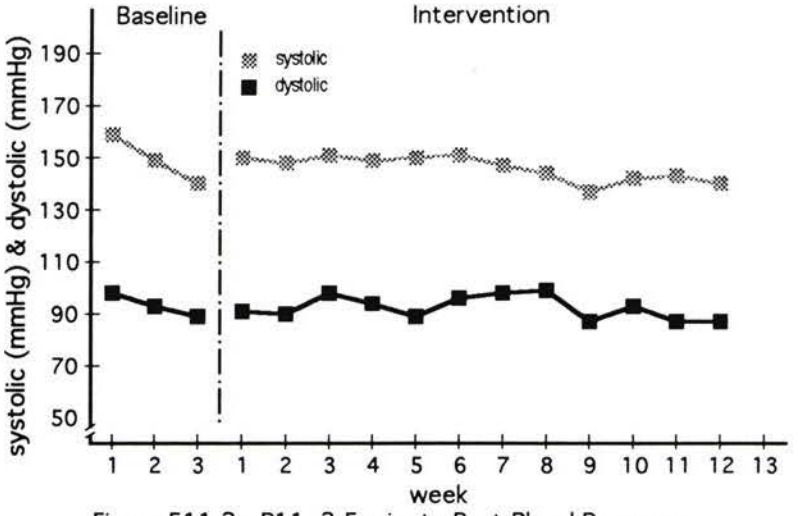

Figure E11.3. P11, 3.5 minute Post Blood Pressure.

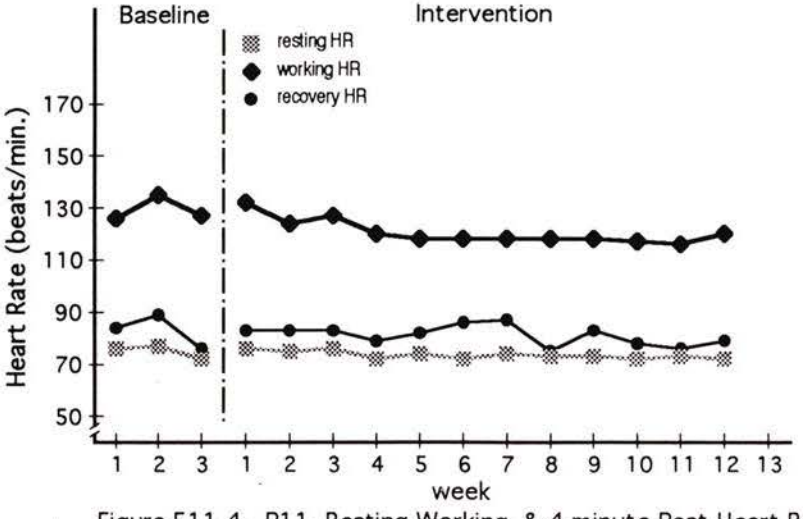

Figure E11.4. P11, Resting,Working, & 4 minute Post Heart Rates.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Resting Systolic																		
M	164	152			170	160	150	158	168		160	166	150	160	150	150		
W	160	150	150		170	160	176	190	138	170	160	170	150	156	160	160		
F	142	140	158		170	170	176	148		140	145	160	150	150	156			
weekly avg	155	147	154	152	170	163	167	165	153	155	155	165	150	155	155	155	~	159
% change	2%	-3%	1%	0%	12%	7%	10%	9%	1%	2%	2%	9%	-1%	2%	2%	2%	~	
Resting Diastolic																		
M	100	88			100	100	80	88	96		100	96	92	92	90	84		
W	100	88	90		100	90	96	110	100	104	90	100	84	92	92	90		
F	80	90	92		100	92	100	100		104	90	100	100	88	90			
weekly avg	93	89	91	91	100	94	92	99	98	104	93	99	92	91	91	87	~	95
% change	3%	-3%	0%	0%	10%	3%	1%	9%	8%	14%	3%	8%	1%	0%	0%	-4%	~	
Resting Heart Rate																		
M	72	80			76	76	80	72	76		75	68	72	72	72	72		
W	72	80	72		76	72	75	72	72	72	72	76	72	72	72	72		
F	84	72	72		76	76	72	72		72	76	76	74	71	76			
weekly avg	76	77	72	75	76	75	76	72	74	72	74	73	73	72	73	72	~	73
% change	1%	3%	-4%	0%	1%	-1%	1%	-4%	-1%	-4%	-1%	-2%	-3%	-5%	-2%	-4%	~	
Working Heart Rate																		
M	129	139			133	108	138	121	118		118	117	121	116	121	124		
W	125	136	132		132	134	122	120	118	116	119	119	113	117	112	115		
F	125	130	122		130	130	122	118		119	118	119	119	117	115			
weekly avg	126	135	127	129	132	124	127	120	118	118	118	118	118	117	116	120	~	120
% change	-2%	4%	-2%	0%	2%	-4%	-2%	-8%	-9%	-9%	-9%	-9%	-9%	-10%	-10%	-8%	~	

indicates no results available

Figure E11.5. P11, Anthropometric results.

	Baseline				Intervention												
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Recovery 2 min. Systolic																		
M	158	156			168	160	160	150	160		168	160	160	158	156	140		
W	168	154	160		184	164	150	156	170	166	154	158	140	130	140	140		
F	166	148	164		160	142	178	158		160	156	150	138	160	140			
weekly avg	164	153	162	160	171	155	163	155	165	163	159	156	146	149	145	140	~	156
% change	3%	-4%	2%	0%	7%	-3%	2%	-3%	3%	2%	0%	-2%	-8%	-6%	-9%	-12%	~	
Recovery 2 min. Diastolic																		
M	100	98			90	100	100	92	90		90	110	90	88	90	96		
W	100	98	98		110	92	90	94	110	110	102	108	86	100	92	86		
F	88	92	98		100	82	104	92		92	96	98	84	90	80			
weekly avg	96	96	98	97	100	91	98	93	100	101	96	105	87	93	87	91	~	95
% change	-1%	-1%	1%	0%	3%	-6%	1%	-4%	3%	4%	-1%	9%	-10%	-4%	-10%	-6%	~	
Recovery 3.5 min. Systolic																		
M	160	154			142	162	160	150	150		142	150	152	148	144	140		
W	160	150	140		142	152	142	156	150	162	150	152	130	142	140	140		
F	156	144	140		166	130	150	140		140	150	130	130	136	144			
weekly avg	159	149	140	149	150	148	151	149	150	151	147	144	137	142	143	140	~	146
% change	6%	0%	-6%	0%	0%	-1%	1%	0%	0%	1%	-1%	-4%	-8%	-5%	-4%	-6%	~	
Recovery 3.5 min. Diastolic																		
M	100	90			90	96	110	90	88		90	94	90	88	90	90		
W	104	98	90		90	90	92	94	90	100	112	108	86	100	82	84		
F	90	90	88		94	84	92	98		92	92	94	84	90	90			
weekly avg	98	93	89	93	91	90	98	94	89	96	98	99	87	93	87	87	~	92
% change	5%	-1%	-5%	0%	-2%	-3%	5%	1%	-5%	3%	5%	6%	-7%	-1%	-6%	-7%	~	
Recovery 4 min. Heart Rate																		
M	72	88			82	80	88	84	80		88	76	90	78	78	80		
W	88	92	80		88	82	84	80	84	84	88	80	78	72	72	78		
F	92	88	72		80	88	76	72		88	84	68	80	84	78			
weekly avg	84	89	76	83	83	83	83	79	82	86	87	75	83	78	76	79	~	81
% change	1%	7%	-9%	0%	0%	0%	-1%	-5%	-1%	3%	4%	-10%	-1%	-6%	-9%	-5%	~	

indicates no results available

Figure E11.6. P11, Anthropometric results.

	Baseline				Intervention													
week	1	2	3	avg	1	2	3	4	5	6	7	8	9	10	11	12	13	avg
BC max	85	90		87.50	80	80	85	85	90		95	95	80	85	90	95		87.27
% change	-3%	3%	~	0%	-9%	-9%	-3%	-3%	3%	~	9%	9%	-9%	-3%	3%	9%	~	
BC end	16	20		18	17	20	15	16	18		23	25	20	19	25	22		20.00
% change	-11%	11%	~	0%	-6%	11%	-17%	-11%	0%	~	28%	39%	11%	6%	39%	22%	~	
LE max	90	95	95	93.33	95	100	100	100	105	105	105	110	110	110	110	110		105.00
% change	-4%	2%	2%	0%	2%	7%	7%	7%	13%	13%	13%	18%	18%	18%	18%	18%	~	
LE end	25	25	21	23.67	22	25	23	29	27	26	31	29	29	26	30	25		26.83
% change	6%	6%	-11%	0%	-7%	6%	-3%	23%	14%	10%	31%	23%	23%	10%	27%	6%	~	
Walk Test																		
M	9.67	8.53			8.57	8.42	8.33	8.98	9.23		11.02	10.53	10.50	10.53	10.57	10.57		
W	8.85	8.40	8.47		8.38	8.27	9.28	9.22	10.37	11.17	10.88	10.57	10.68	10.53	10.87	10.62		
F	8.53	8.40	8.50		8.58	8.27	9.30	9.47		10.68	10.85	10.63	10.53	10.60	10.67			
weekly avg	9.02	8.44	8.49	8.65	8.51	8.32	8.97	9.22	9.80	10.93	10.92	10.58	10.57	10.55	10.70	10.60		9.97
% change	4%	-2%	-2%	0%	-2%	-4%	4%	7%	13%	26%	26%	22%	22%	22%	24%	23%	~	
Flex Test																		
M	33.75	34.75			34.25	34.00	33.00	34.00	33.75		34.00	31.75	34.00	35.25	34.75	35.25		
W	35.25	34.75	36.25		33.50	34.00	34.50	33.00	34.00	33.25	34.00	32.00	35.25	34.50	35.25	34.75		
F	33.75	33.75	36.50		32.00	34.25	33.50	34.75		34.50	33.75	32.75	34.50	33.25	36.00			
weekly avg	34.25	34.42	36.38	35.01	33.25	34.08	33.67	33.92	33.88	33.88	33.92	32.17	34.58	34.33	35.33	35.00		34.00
% change	-2%	-2%	4%	0%	-5%	-3%	-4%	-3%	-3%	-3%	-3%	-8%	-1%	-2%	1%	0%	~	
Stair Climb		13.20		13.20		11.10				12.25				13.59			11.89	12.21
% change		0%		0%		-16%				-7%				3%			-10%	

indicates no results available

Figure E11.7. P11, Physiological results.

	Baseline				Intervention													
week	1	2	3	avg.	1	2	3	4	5	6	7	8	9	10	11	12	13	avg.
Positive well-being																		
Great	5	5	5		4	4	4	4		4	5	4	4	4	5	4		
Positive	6	4	5		4	4	5	4		4	4	4	4	4	6	5		
Strong	6	5	4		4	4	4	4		4	4	4	4	3	4	4		
Terrific	5	5	4		4	4	4	4		4	4	4	4	3	4	4		
Average	6	5	5	5	4	4	4	4	~	4	4	4	4	4	5	4	~	4
Psychological distress																		
Awful	1	1	3		2	2	3	2		2	2	3	2	5	2	1		
Crummy	2	1	1		2	1	4	2		2	1	2	2	2	1	1		
Discouraged	1	1	2		2	1	3	4		2	2	4	2	4	1	1		
Miserable	1	1	1		2	4	4	2		2	2	2	2	3	1	1		
Average	1	1	2	1	2	2	4	3	~	2	2	3	2	4	1	1	~	2
Fatigue																		
Drained	2	3	3		4	4	4	4		4	4	3	4	4	4	4		
Exhausted	2	2	2		2	3	5	3		3	3	3	4	4	4	4		
Fatigued	2	3	3		4	4	4	4		4	3	4	4	4	4	4		
Tired	1	4	3		4	4	4	4		4	4	4	4	4	4	4		
Average	2	3	3	3	4	4	4	4	~	4	4	4	4	4	4	4	~	4
	indicates no results available																	

Figure E11.8. P11, Subjective Exercise Experience Scale results.

Appendix F

Considerations

in the

Successful Implementation

of an

Exercise Program

for

Older Persons

Considerations recommended in the successful implementation of an exercise program for an older person include:

1. Affirmative support. Always let the individual know they are a welcome part of the program. Let the participants know it is good to see them. Confirm with the participant that everyone in the program is working towards a common goal (health).

2. Individual respect and self worth. An understanding of the fact that everyone has lived differently and that everyone from all walks of life has the potential to improve self.

3. Variability in exercise prescription. Constant monitoring and adjusting of exercise prescription should be practiced to reflect the variability of daily physical and psychological states, in order to maintain a comfort level which encourages the participant to continue with the program.

4. Fun and enthusiasm. Make the program fun as well as challenging. Greet an individual's appreciation of exercise and/or improvement in performance with enthusiasm.

5. Confidence in leadership. This requires a sound knowledge base of exercise and the elderly. Develop a confidence within each participant towards the guidance given by the instructor.

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