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COMBINING EXERCISE PRESCRIPTION & A PEDOMETER-BASE PROGRAM TO REDUCE CVD RISK FACTORS IN MIDDLE-AGED ADULTS

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COMBINING EXERCISE PRESCRIPTION & A PEDOMETER-BASE PROGRAM

TO REDUCE CVD RISK FACTORS IN MIDDLE-AGED ADULTS

By

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CVD Risk Factor Analysis in Middle-Aged Adults

Steven Gaskill, PhD.

Background: Cardiovascular disease (CVD) is one of the leading causes of death in the United States. A majority of the risk factors for cardiovascular disease are modifiable through drug therapy, diet, and exercise. **Purpose:** To determine if the student-run stress testing and exercise prescription program 1) resulted in subsequent lifestyle changes and in reduced CVD risk, 2) if the addition of pedometer-base exercise prescription in conjunction with weekly phone calls added to the student prescription would differentially reduce CVD risk, and 3) to determine if either of these interventions in middle-aged adults improves quality of life (QOL). **Methods:** Forty-two participants (21 males, 21 females) were randomly assigned to one of two groups. Both groups received individualized exercise prescription interventions designed from a student-led 12-lead ECG exercise stress test, strength testing, body composition testing, and flexibility testing. One-half of the participants additionally received a pedometer-base program (PBP) that tracked daily step totals and included a weekly phone call. **Results:** In the 19 participants who completed the 6 month study, overall HDL cholesterol increased (54.6 to 62.8 mg/dL), LDL cholesterol decreased (121.5 to 104.2 mg/dL), and resting systolic blood pressure (SBP) decreased (126.7-120.2 mmHg) at an alpha level of ≤ 0.05. Heart rate, body mass index, fasted blood glucose, and rating of perceived exertion did not significantly change from baseline values ($p \leq 0.05$). Subjects reported improvements in physical limitations, emotional well-being, and overall QOL was improved ($p \leq 0.05$). There were some differences between the two exercise interventions, but the small sample size who completed the testing limited the power of the analysis. **Conclusion:** Blood lipids, resting SBP, and QOL were significantly improved. The improvements in cardiac risk profiles, QOL, and participant evaluation forms suggest that positive lifestyle changes were made as a result of the intervention.

Keywords: individualized exercise prescription, pedometer-base program, cardiovascular disease, fasted blood glucose, body mass index, systolic blood pressure, rating of perceived exertion, high-density lipoprotein, low-density lipoprotein, electrocardiogram, quality of life.

Dedication:

I would like to dedicate this thesis to the memory of my Grandpa, Rexford Applebury. He passed away at the early age of 54 from cardiovascular complications. He was the only one on both sides of my family that earned a Masters Degree. Although he is not here to answer my thesis questions, his work continues to motivate me, especially on the days when quitting seems all too easy.

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CHAPTER I: INTRODUCTION

Cardiovascular diseases and strokes are estimated to annually cost the United States $503.2 billion, with coronary heart disease (CHD) attributing $177.1 billion. In 2010, CHD was estimated to be prevalent in 785,000 Americans' lives (42). Although these figures are worrisome, research conducted between 1980 and 2000 reported a 44% decline in CHD mortality. The decrease in CHD mortality and risk factors is attributed mainly to improved medications and technology and to a smaller degree, lifestyle modifications (42).

Cardiovascular disease (CVD) risk factors include: age, family history, smoking, inactivity, hypertension, dyslipidemia, obesity, and diabetes (including pre-diabetes, Type I and Type II Diabetes Mellitus) (40). Modifiable CVD risk factors include all of the above except age, family history, and Type 1 Diabetes Mellitus. All modifiable risk factors are alleviated by increasing physical activity and adjusting diet (10-14, 16-18, 31, 40). Previous studies have shown that a single bout of aerobic exercise can decrease blood pressure in moderately hypertensive individuals, help normalize blood sugars and decrease triglycerides for several hours (9, 10, 39). Additionally, chronic physical activity has a positive effect on obesity, dyslipidemia, hypertension and normalizing blood glucose. Thus, lifestyle may possibly have a major impact on reducing CVD and improving quality of life.

There is general agreement in the literature about the positive health benefits and improved physiological parameters, such as improved blood lipid profiles and insulin sensitivity, which result from regular exercise. However, the optimal exercise frequency, intensity, mode, and duration for specific populations remain controversial (13-22, 27-

33). Aerobic capacities vary across individuals; therefore, individually designed exercise programs specific to the physical ability of an individual will yield more compliance, be safer, and return greater health benefits. An exercise stress test is the most common method to evaluate CVD and is often used to prescribe an exercise program. However, it is unknown if a pedometer-base exercise program, developed from the results of an exercise stress test, will effectively reduce risk factors or symptoms of CVD.

A variety of pedometer-base interventions have been reported in the literature, and most have successfully increased physical activity or steps/day (1-8). Also, a few of the pedometer-based studies have shown decreased blood pressure, lowered body mass index (BMI), improved lipid profiles, and increased insulin sensitivity (1-7). In a recent systematic review of 18 observational pedometer studies and 8 randomized controlled trials, Bravata and colleagues reported a pedometer program associated health benefits in many adult populations, including but not limited to, sedentary women, overweight adults, arthritic adults, and diabetic adults (39). Tudor-Locke and colleagues affirmed the convergent and construct validity of pedometers as a physical activity measuring tool in two systematic reviews of 25 and 29 published articles, respectively. Tudor-Locke and colleagues also found a significant relationship between pedometer-determined physical activity and the following improved health-related outcomes: blood pressure, blood glucose, and lipid profiles (35, 36).

Pedometer-base interventions have had the most success as a behavior modification tool when subjects were not covertly monitored, when realistic goals were set, and when a daily step log was kept (1-8). Therefore, the attention of pedometer-base studies should focus on the subjects' quality of life (QOL) before and after the program

to establish a greater mental as well as physical understanding of structured physical activity.

To date, this author is unaware of any studies comparing an individualized exercise prescription (IEP) with a pedometer-base program (PBP), on QOL in middle-aged adults. QOL changes have been measured across a variety of regular exercise interventions and have shown significant improvement when physical fitness also improves (23-26). However, there is limited evidence that a relationship exists between improved QOL from increased physical fitness and reduced CVD risk factors. Thus, the aim of the present study is to determine if an individual exercise prescription (IEP) designed from an exercise stress test, or exercise prescription in conjunction with a pedometer-base program (PBP) for 6 months, effectively reduces CVD risk factors and improves quality of life. It is hypothesized, according to the majority of previous research, that the two exercise programs, IEP and PBP, will both reduce CVD risk factors and improve QOL, with the greatest benefits expected when both the IEP and PBP are implemented together.

Statement of Problem:

In the Health and Human Performance Lab, we have offered free stress tests with fitness testing to over 300 Missoula community members including 150 faculty and staff from the University of Montana. Following the stress, flexibility, strength, and body composition tests, students have met with the participants and designed individualized exercise prescriptions and behavior change programs to help each individual lower their risk for CVD. While this is an excellent learning environment for undergraduate students,

it is unknown if the program is having a positive benefit for participants and if there are simple additions, such as the use of a pedometer, that might make the program more successful.

Thus, the objectives of the present study are three fold: 1) To determine if exercise and the subsequent lifestyle change following the exercise stress and other testing is helping individuals in changing their behaviors and resulting in reduced CVD risk, 2) If the addition of pedometer-base exercise prescription in conjunction with weekly phone calls added to the student prescription will differentially reduce cardiovascular risk, and 3) To determine if either of these interventions in middle-aged adults improves their quality of life.

Research Hypothesis:

The two exercise programs, exercise prescription and pedometer-base, will improve cardiovascular risk factors and quality of life, with the greatest improvements expected when both exercise prescription and pedometer-base programs are implemented.

Significance of Study:

This study combines laboratory measures with field data collection to ultimately promote health to middle-aged adults in the Missoula, Montana community. This study is generated from a unique program, using student service-learning to provide stress testing and individualized behavior change patterns. The data collection from past years has yet to be examined, thus the effectiveness of the program on behavior change is not yet known. Therefore, this study will statistically evaluate 6 month outcomes of the current

program and also evaluate if the addition of a pedometer and step program will further enhance CVD risk reduction and quality of life.

Rationale of Study:

The present study combines methods from both qualitative and quantitative data in a non-invasive design that will evaluate a student service-learning program designed to both enhance student learning while providing a service to help community members reduce CVD risk factors. The service learning program has been provided by the Health and Human Performance Department for several years. This study may also have a positive effect on community members in Missoula, Montana by helping to reduce CVD risk factors in a portion of the population. Lowering CVD risk is important as coronary artery disease (CAD) is the leading cause of mortality among Missoula residents (44). The aim of this study is to reduce cardiovascular diseases, such as CAD, by promoting an increase in physical activity and encouraging the participants to change their unhealthy lifestyle behaviors, such as poor nutrition. Student feedback suggests that the current program is a valuable learning tool, which alone, provides strong rationale for the program. Furthermore, this study is justified if even one subject improves health, quality of life, or behavior change. Findings from the current study have the opportunity to provide future direction for the program.

Limitations and delimitations:

1. The participants were all volunteers, recruited mainly from the faculty and staff population at the University of Montana via email, recruitment flyers and

brochures, public service announcements, and by "word of mouth." Therefore, this is not a random sample and results may not be generalizable.

2. The sample size is relatively small and mostly middle-aged Caucasians, which also effects population generalizability.
3. The inclusion criterion for participants in the pedometer-base group requires that the participants be ambulatory, thus individuals with disabilities were not evaluated.
4. The participants had to be willing to self-monitor and self-report their steps per day.
5. Participant retention is voluntarily based.
6. Different researchers will be collecting the data for pre- and post- measurements, so measurement consistency is disrupted.
7. The participants were not expected to keep a dietary journal, so changes in dietary intake were not assessed; thus, potential changes in CVD risk factors such as blood pressure, lipids, or body composition, cannot be attributed to exercise alone.
8. Medications are being used by many of the participants and could affect the exercise response.
9. The impact of the seasons, fall and winter, could influence the participants' willingness to walk outside.
10. The study is relatively short and the long-term effect of the intervention is unknown.
11. The number of steps reported by the pedometer each day does not reflect intensity

12. Overestimation and underestimation errors may occur due to improperly waist-mounted pedometers, or the physical activity mode may amplify/underestimate actual steps.
13. The study population was delimited to individuals willing to participate in a service-learning project without regard to the number of risk factors at baseline. Thus the population includes both healthy and at-risk individuals.

Definition of Terms:

- **Accelerometer:** a small instrument worn around the waist-line, wrist, or ankle that measures proper acceleration per time frame and can be used to determine energy expenditure.
- **Aerobic capacity**: the maximal amount of oxygen one can consume and utilize per minute during exercise.
- **Body composition:** for this study, body composition is determined as fat mass or % body fat (%BF) and fat-free mass components of the human body.
- **Body mass index (BMI):** a standard measurement that uses weight in kilograms divided by height in meters squared to estimate over-weightiness and risk for some chronic diseases.
- **Construct validity:** the extent to which measurements can be shown to correspond with measures of theoretically related parameters (36).
- **Convergent validity:** the extent to which an instrument's output correlates with measurements from similar instruments hypothesized to measure the same exposure of interest (36).
- **Covertly Monitoring:** a study design that prohibits its subjects from being aware that their activity levels are getting evaluated.
- **Duration/Time of exercise**: how long each bout of exercise lasts, usually measured in minutes.

- **Dyslipidemia as a risk factor for cardiovascular disease**: this study considered a low-density lipoprotein cholesterol $\geq$130 mg·dL^{-1} or a high-density lipoprotein cholesterol <40 mg·dL^{-1}, or if one was on lipid-lowering medication; also, if total serum cholesterol was $\geq$200 mg·dL^{-1} a risk for CVD was decided (41).
- **Exercise Stress Test:** a progressive exercise test to evaluate cardiovascular health of an individual.
- **Exercise:** a subset of physical activity that is planned, organized, repetitive, and provides meaning in the sense that improvement or maintenance of physical fitness is the goal (34).
- **Family history as a risk factor for cardiovascular disease**: Family history is considered to be a risk factor for CVD when first degree relatives have had myocardial infarction, coronary revascularization, or sudden death before 55 years of age in male first-degree relative, or before 65 years of age in first-degree relative (41).
- **Frequency of exercise**: how often exercise is performed, usually number of days per week.
- **Hypertension as a risk factor for cardiovascular disease**: hypertension is a risk factor for CVD when a person's systolic blood pressure is $\geq$140 mm Hg and/or diastolic blood pressure $\geq$90 mm Hg on measurements of at least two separate occasions; those on anti-hypertensive medication are also considered at risk for CVD (41).
- **Individualized Exercise Prescription (IEP)**: a combination of aerobic training, resistance training, balance, and flexibility exercises engineered according to an individual's weaknesses, goals, health screening, health measures, and an exercise stress-test.
- **Inactivity (sedentary lifestyle) as a risk factor for cardiovascular disease**: inactivity is considered a risk factor for CVD when a lifestyle does not include at least 30 minutes of moderate intensity physical activity on at least three days of the week for at least three months (41).

- **Insulin sensitivity:** refers to the muscle cell's insensitivity to the hormone, insulin, resulting in reduced or no glucose uptake from the blood to muscles and high blood glucose.
- **Intensity of exercise**: the amount of energy expenditure that it takes to perform a bout of exercise, usually measured as light (1-3 METs), moderate (3-6 METs), or vigorous (>6 METs).
- **Metabolic equivalent (MET):** a physiological unit expressing the energy cost of physical activities; 1 MET is defined as the amount of energy it takes to quietly rest in a lying or seated position, and it is conventionally considered to equal 3.5 mL $O_2 \cdot kg^{-1} \cdot min^{-1}$ or about 1 $kcal \cdot kg^{-1} \cdot min^{-1}$.
- **Mode/Type of exercise**: the way the exercise is performed, such as walking, jogging, biking, swimming, weight-lifting etc.
- **Myocardial Ischemia**: decreased oxygen supply to cardiac muscle due to lack of coronary blood flow; recognized on an electrocardiogram (ECG) as ST segment depression >2 mm and commonly manifested as angina pectoris (41).
- **Obesity as a risk factor for cardiovascular disease**: a body mass index $\geq$30 $kg \cdot m^2$ or waist girth >102 cm for men and >88 cm for women.
- **Pedometer-base program (PBP)**: a system of exercise prescription that uses a pedometer, which is a small, electronic, step counting device.
- **Physical activity**: any bodily movement produced by skeletal muscles and results in energy expenditure beyond resting expenditure (34).
- **Physical fitness**: involves a combination of cardiorespiratory fitness, strength, flexibility, coordination, and balance ability that people exhibit during the ordinary and extraordinary demands of life
- **Pre-diabetes as a risk factor for cardiovascular disease**: also called impaired fasting glucose (IFG) is established by an 8-hour fasting blood glucose $\geq$100 $mg \cdot dL^{-1}$ and $\leq$ 126 $mg \cdot dL^{-1}$ confirmed by measurements on at least two separate occasions (41).
- **Quality of Life (QOL):** one's personal outlook or opinion about life related to health

- **Randomized controlled trial:** a process in research that allows each participant or subject to have an equal chance of being in either the control group, IEP, or the experimental group, IEP + PBP.
- **Reliability:** a measure of the extent to which an instrument, such as a pedometer, is free of measurement error.
- **Smoking as a risk factor for cardiovascular disease**: smoking tobacco cigarettes is considered to be a risk for CVD when a person is either a current cigarette smoker or has quit within the previous six months; also if a person is exposed to environmental tobacco smoke (41).

CHAPTER II: REVIEW OF LITERATURE

Heart Disease at the Forefront

Heart disease research dates back to the 1950s. Morris and Crawford, in the London Bus Drivers and Conductors study, analyzed occupational health data from which they reported that males with higher physical demanding occupations had fewer histories of heart disease (43). Much research to date has focused on the etiology of heart disease and the role of physical activity in heart disease prevention. Diseases in any form, especially heart disease with its high mortality rate, inhibit activities of daily living and diminish quality of life. This review of current literature aims to examine the literature related to how physical activity mediates physiological parameters, such as blood pressure, insulin sensitivity, blood lipid profiles, or signs of ischemia, and improves quality of life. A second portion of this review evaluates the effectiveness of exercise interventions, such as pedometer-base programs.

Coronary heart disease (CHD) is a form of cardiovascular disease (CVD) that occurs when plaque accumulates in the arteries, interrupting blood supply to the heart. The plaque narrows the arteries over time in a process called atherosclerosis. CHD is the most common form of heart disease, and is the leading cause of death in the United States. It is estimated that in 2010, the cost of CHD in the United States will be 177.1 billion dollars (42). However, as a result of medications, dietary interventions and increased physical activity, researchers have reported a declining trend in CHD mortality since 1980 (42).

The CVD risk factors include: age, family history, cigarette smoking, inactivity, hypertension, obesity, high cholesterol, pre-diabetes and diabetes (41). Lifestyle modifications that include habitual physical activity (PA) have been shown to reduce CVD risk factors and the incidence of CAD (30). Examples of simple PA lifestyle modifications may include: using the stairs instead of the elevator, walking or riding a bike short distances rather than driving, seeking further parking spaces at the store, or the development and maintenance of a physical activity program. Physical activity interventions using purposeful activity several times a day have been shown to be effective and possible, especially when compared to more difficult lifestyle modifications such as smoking cessation, a 25% caloric intake reduction, or beginning a formal exercise program (14, 15).

Exercise is a form of physical activity that is planned, structured, repetitive, and involves goals aimed at health enhancement. Physical exercise and physical activity have both been shown to be effective behaviors to improve health when individuals meet frequency, intensity and duration guidelines. However, because physical activity is defined as any bodily movement produced by skeletal muscles above resting expenditure, it is necessary to clearly define the required intensity (34). The American College of Sports Medicine (ACSM) and the American Heart Association (AHA) recommend 30 minutes of moderate physical activity on five days of the week or to accumulate 150 minutes per week in at least ten minute bouts of sustained physical activity. These recommendations have shown to promote and maintain health and significantly reduce the risk for CAD (26, 30, 40). Exercise recommendations are slightly changing to fit the needs of different populations, but the current ACSM and AHA literature has not

revealed significant changes to the recommendations. Exercise, especially during ages 45 and older, has the greatest impact on reducing the risk for heart disease (27).

The Physiological Parameters

Blood Pressure

There is strong evidence in the literature that exercise is an effective treatment for hypertension. Fagard and Cornelissen (2007) constructed a comprehensive meta-analysis of 72 randomized controlled trials involving dynamic aerobic endurance training and its effect on systolic (SBP) and diastolic blood pressure (DBP). The studies of both normotensive and hypertensive groups resulted in significant decreases in resting blood pressures (SBP/DBP, normotensive reduction = 1.9/1.6 mmHg and hypertensive reduction of 6.9/4.9 mmHg, $p<0.0001$). Other similar data has been reported in a review of 44 randomized controlled trials, which found a 2.6/1.8 mmHg decrease in normotensive subjects and a 7.4/5.8 mmHg decrease in hypertensive subjects (38, 40). These decreases in blood pressure from aerobic exercise training are attributed to a reduction in systemic vascular resistance due to the favorable involvement of the sympathetic nervous system and the renin-angiotensin system (38).

Ambulatory blood pressure, a technique that compares blood pressure during activities of daily living, was found to stay lowered 24 hours after an aerobic exercise session of 40 minutes on a cycle ergometer at 60% of their heart-rate reserve in 50 hypertensive patients (9). Therefore, even a single bout of exercise has been shown to lower blood pressure for hours following exercise.

Exercise interventions lasting 6 months have also shown to have significant effects on blood pressure. Blumenthal and colleagues (2000) found a 4 mmHg SBP and DBP reduction after an aerobic exercise intervention for 6 months in 133 sedentary and overweight men and women (10). Lifestyle interventions, which included increased physical activity, educational information, and dietary changes for 6 months were shown to decrease blood pressure and overall CHD risk in 810 relatively healthy adults (12). Another 6 month aerobic exercise and weight loss program compared 9 sedentary, hypertensive obese men to 8 normotensive, sedentary lean men. With just 3-4 days of exercise per week, blood pressures in both hypertensive and normotensive men were decreased. Greater blood pressure reductions were correlated with greater weight-loss and significant improvements in cardiovascular fitness and improved glucose and lipoprotein metabolism (11).

Blood Glucose

Diabetes and insulin insensitivity, which are CVD risk factors, are an increasing concern, but the literature has revealed increased insulin sensitivity and diabetes maintenance with exercise implementation. Insulin sensitivity refers to the body's ability to metabolize excess glucose via insulin, a hormone which is released by β-cells located in the pancreas. Rhéaume et al. (2002) studied 10 hypertensive subjects and compared them to 10 normotensive subjects. After a 30 minute cycle ergometer ride at 50% of VO_{2peak}, an intravenous glucose tolerance test determined that the single bout of exercise significantly increased insulin sensitivity in hypertensive adults (15). It was also determined by Slentz and colleagues (2009) that an inactive control group experienced a

significant increase in fasting glucose in a study involving 387 sedentary, overweight adults randomly assigned to three different training groups and one control group (13). The physiological mechanism for increased insulin sensitivity due to increased physical activity is still unknown, but it is suggested that exercise improves β-cell functioning (13).

Other researchers have looked at larger populations and the effects of lifestyle modifications. They have found evidence linking physical activity to a lower incidence of diabetes. A randomly controlled trial of 3,234 non-diabetic persons with elevated fasting and post-load plasma glucose concentrations were either assigned to a placebo or a lifestyle-modification group with the goals of at least a 7% weight loss and at least 150 minutes of physical activity per week. Both interventions decreased cases of diabetes, but the lifestyle-modification intervention was more effective (14). Lindström and colleagues (2006) did a randomly controlled trial that involved a 7-year follow-up on 522 adults at high risk for type 2 diabetes; it was concluded that those in the active lifestyle intervention group resulted in sustained lifestyle interventions and reduced diabetes incidence (16).

Obesity

Diabetes researchers have consistently found a connection between increased type 2 diabetes mellitus and obesity. Obesity is a rising epidemic, and the World Health Organization estimates that globally over 700 million people will be obese by 2015 (42). Although many overweight people may never become obese, the CVD risk factors, including obesity, are elevated in overweight individuals. Lefever et al. (2009) performed a 6 month study on calorie restriction and calorie restriction with exercise, which

involved 36 overweight subjects randomized into four groups. A greater reduction in 10-year CVD risk was observed in the groups that involved calorie restriction with exercise and intense calorie restriction to rapidly achieve 15% of weight loss (17).

The literature on obesity reveals the importance of physical activity in populations more susceptible to obesity. Thompson and colleagues (2004) used a 7 day pedometer intervention with 80 middle-aged women and reported that women with more recorded steps had a lower percent body fat, waist circumference, hip circumference, and waist-to-hip-ratio (19). A prospective cohort study of 38,987 women showed that 30 minutes of daily activity effectively reduced BMI. The same study stressed the importance to be lean and physically active in order to reduce CVD risk factors (20). Although obesity has been attributed to the over consumption of food and genetics, another key component is a lack of physical activity.

Larson-Meyer and colleagues (2010) used a similar study design as Lefever et al. (2009), except the focus was on fat mass and visceral abdominal mass reduction. The overweight participants in the calorie restriction and exercise groups lost more fat mass. Further, it was observed that the groups with exercise included into the intervention decreased DBP, decreased low-density lipoprotein (LDL) levels, and improved insulin sensitivity (18). Obesity research suggests that overweight, middle-aged men and women can decrease body and fat mass, improve insulin sensitivity, and improve lipids and lipoproteins with increased physical activity (18, 21).

Blood Lipid Profiles

Commonly used language refers to cholesterols as “bad” lipoproteins, (LDL), and “good” high-density lipoproteins (HDL). Triglycerides are commonly measured in

conjunction with the cholesterols. Triglycerides are derived from glycerol and fatty acids formed together in an ester bond. Individuals who are sedentary and/or overweight are likely to have a greater prevalence of LDL and triglycerides and a lower prevalence of HDL. Moderate-intensity exercise has been shown to sustain lowered LDL and triglyceride levels for up to 15 days post exercise training, and 30 minutes per day of vigorous exercise can increase plasma HDL cholesterol (23). Leon and colleagues (2000) found that an acute bout of aerobic exercise can significantly reduce plasma triglycerides for 24 to 48 hours, consistent with previous research (22).

Myocardial Ischemia and Heart Rate Changes

Myocardial ischemia and heart rate changes are other variables that may be considered when evaluating CVD. Myocardial ischemia, which is low oxygen supply to cardiac muscle resulting from the lack of coronary blood flow, can result in reduced heart function, congestive heart failure, and, if sustained, a myocardial infarction. A favorable effect on blood flow was reported in 7 patients with documented coronary heart disease when exercise training 4 days per week for an hour each day was implemented. Subjects also had lowered resting heart rates (32). It has been reported that lower resting heart rates, normal sinus rhythms, and a heart rate recovery of greater than 12 beats per minute during the first minute of recovery suggests a healthy prognosis (41). Exercise has been shown to benefit post-infarction patients as well. Lee et al. (2008) studied 39 post-infarction patients. Twenty of the patients were prescribed exercise 3 days per week for 3 months; perfusion reserve was significantly improved in both the infarcted and remote myocardium compared to the non-exercise group (30).

Long-term studies on exercise as a preventative tool against myocardial ischemia have been conducted. A prospective cohort study of 11,914 Danes, all older than 20 without pre-existing IHD (ischemic heart disease), were followed for 20 years and found to have low hazard ratios of both IHD and all-cause mortality when greater than 4 hours of light physical activity per week were reported (31). Also, Pigozzi et al. (2005) followed 88 male subjects, all aged above 66 years, for 4 years, and determined that exercise can reduce the cardiovascular risk factors and decrease the overall incidence of heart disease, such as positive ST segment depression during the initial 12-lead ECG testing (33). Although research suggests that physical activity improves oxygen supply to the myocardium, which improves the ability to perform activities of daily living (ADLs) and decrease depression, extreme caution must be taken for exercise prescription and doctor referral is necessary if myocardial ischemia is observed (25, 30-33).

Physical Activity and Quality of Life

Diseases that interrupt activities of daily living (ADL) have an impact on quality of life. The literature supports the popular notion that regular physical activity aids in the prevention of cardiovascular diseases (11, 12, 17, 27-29, 33, 34, 39-43). Therefore, the connection between improved QOL and increased physical activity through an exercise program has received interest. Authors of a study that involved 175,850 adults reported that participants who met the recommended levels of physical activity were associated with better overall health-related quality of life and perceived health status. Häkkinen and colleagues (2010) used the RAND SF-36 in a cross-sectional study on 727 men and determined that health-related physical fitness promotes health-related quality of life

(26). A randomized controlled trial on 430 sedentary, postmenopausal women with elevated SBP suggested that 6 months of higher doses of exercise were associated with improvements in mental and physical aspects of QOL (23). The physical benefits from exercise programs, such as simply walking 30 minutes per day, can lengthen the human lifespan, but dually significant, is the importance of improved happiness from exercise during a longer life.

Pedometer Base Physical Activity Programs

The pedometer is a validated instrument to measure steps, and it encourages increased physical activity effecting health and health-related quality of life (35, 36). Pedometers allow ambulatory populations to track their steps, which influences motivation through goal-setting. Clemes et al. (2009) observed better compliance and more accumulated steps in the subjects treated with unsealed pedometers and a daily step-recording log (1). The actual subject steps taken per day increased in a study by Basset and colleagues resulting in self-achievement and increased energy expenditure (3). The combination of having step goals and immediate feedback was effective in increasing physical activity levels in 26 overweight and obese women (4). Zoellner et al. (2010) reported that steps per day significantly increased in 83 African Americans during a pedometer-base program, and when the importance of setting realistic and personalized weekly goals was prioritized (7). The current literature supports the health promotion benefit from pedometers; however, reductions in CVD risk factors due to pedometer-base programs need continued evaluation.

Walking briskly on level ground for 30 minutes, which is equivalent to moderately-intense exercise, or accumulating 30 minutes daily, in at least 10 minute segments, can promote health (41). Moderately-intense exercise is recognized as 3-6 METs or 50-60% of maximum oxygen uptake. The Honolulu Heart Program began monitoring 8006 men of Japanese ancestry in 1965. From 1991 to 1993, a sample of 2678 men in the study, then aged 71-93, was examined for distance walked. The CHD risk in these elderly men was reduced relative to distance walked (28). Nemoto and colleagues (2007) used a randomly controlled trial to monitor 60 men and 186 women with an accelerometer and a pedometer. They reported that the group with more steps performed at a higher intensity and improved peak oxygen uptake and reduced blood pressures (SBP dropped 9 mmHg and DBP dropped 5 mmHg) (6). In summary, the ability of pedometer-base programs to improve health outcomes from lengthened walking time and distance are well documented (1-8, 35, 36, 39).

CHAPTER III: METHODOLOGY

Research Setting & Design

This study was approved by the Institutional Review Board at the University of Montana and informed consent was obtained from all participants before any testing proceeded (A-2, pp50-53). The participants were recruited by informational brochures, "word of mouth," and via email. Initial participant screening included information about the exercise stress testing program, preparation for the exercise stress test, a health screening questionnaire, and directions to the lab. All the initial and final measurements were obtained in a controlled environment at the University of Montana. Participants were required to meet on 3 separate occasions: first, for the exercise stress testing, second, for anthropometric, hydrostatic weighing, strength, and flexibility measurements, and third, for an exercise program overview and concise instructions for their new exercise program. If requested, students often met with clients for one or more additional meetings to help clients learn how to perform exercises or to refine the individual programs. The first two meetings occurred from 6:00 am to 8:00 am on Monday, Wednesday, or Friday in McGill Hall labs (rooms 131 & 116), on the University of Montana Campus. The final meeting(s) occurred at a public location convenient to each participant. This study was designed to combine both lab and field feedback for descriptive analysis.

Participants

The participants included 42 adults, mostly aged 55 and older, and they were recruited through emails and a 'stress-test brochure' (A-4, pp73). They voluntarily enrolled in an

exercise testing program at the University of Montana. Each participant went through a pre-screening process to determine the number of health risk factors (A-1, pp48-49). Participants aged 55 and older were encouraged to enroll, but there were no biases toward age (younger participants were allowed if they requested the testing), race, religion, gender, economical status, or current health status.

Procedures

Sample Selection:

From the forty-two participants recruited, half were randomly assigned by a computerized number generator to one of two groups. The experimental group received individualized exercise prescription (IEP) and pedometer-base program (PBP) interventions. The control group received the IEP intervention only. After the exercise testing and data collection, the experimental group was assigned an unsupervised, well-rounded exercise program that included strength training, aerobic activity, a dietary guide, a free pedometer, a daily step-log, and a weekly phone call for three to four months. The control group was provided with just the unsupervised, well-rounded exercise program that included strength training, aerobic activity, a dietary guide, and a monthly phone call for six months. Each group was administered a validated quality of life survey (RAND SF-36 QOL Survey) prior to both exercise stress tests. The initial tests were in October-November, 2010, and final tests were conducted in March-April, 2011.

Measurements:

On the day of the exercise stress test, participants arrived to the lab fasted for 8-12 hours before all measurements began. The dependent variables included: weight, height, waist to hip ratio, fasted blood glucose, total cholesterol, high-density lipoprotein, low-density lipoprotein, triglycerides, blood pressure, heart rate, body mass index, percent body fat, rating of perceived exertion, ischemia based on 3 main factors: T-wave inversion, ST segment depression, and ST segment elevation, bench press, leg press, handgrip strength, flexibility (sit and reach), and quality of life. The dependent variables were gathered twice for pre- and post-measurements. The independent variables were the exercise prescription programs (individualized exercise prescription or pedometer-base program in conjunction with the individualized exercise prescription). The pre- measurements and 6 month post- measurements were compared for between-group interactions and overall main effects.

Instrumentation:

The participants' weights were recorded in kilograms and measured with a digital scale with load cells, and their heights were determined with a standard meter ruler. BMI was then calculated by dividing the weight in kilograms by the height in meters squared. Blood glucose ($mg \cdot dL^{-1}$) was measured following an overnight fast with the One-Touch® Ultra-Mini Blood Glucose Meter. The lipid profile ($mg \cdot dL^{-1}$) and triglyceride ($mg \cdot dL^{-1}$) measurements were collected with the Cardio Chek® P.A. requiring a 25uL of blood from a finger prick. Exercise stress tests were performed on a calibrated treadmill using the Bruce Ramp treadmill protocol (A-5, pp68). A 12-lead electrocardiograph (ECG), blood pressure (mmHg), rating of perceived exertion (RPE) based on the 6-20 BORG

scale, and angina (0-4 scale) and dyspnea (0-4 scale) were recorded at the end of each stage.

The Bruce Ramp treadmill protocol consisted of a warm-up stage (53.2 meters•min^{-1}, 0% grade) and up to four progressive exercise stages, and a cool-down stage (53.2 meters•min^{-1}, 0% grade). Tests were terminated based on the ACSM Guidelines (A-6, pp74) for test termination. In general, tests were terminated at 80% of estimated maximal heart rate or signs of ischemia. Low risk participants were allowed to continue to higher intensities if they desired and had no indications to stop the test.

Blood pressures were obtained through a standard sphygmomanometer and stethoscope to hear the Korotkoff sounds. The 12-lead ECG and heart rate was monitored continuously using the Cardio Card® Computer Software.

Hydrostatic weighing was measured with the ElectroTech® strain gauge load cell underwater scale hardware and software. The scale was calibrated prior to each test. Calculation of body density used estimated residual volume and 0.1 L gastrointestinal gas. Body composition (% fat and % lean body mass) was calculated using gender and age specific formulas of Lehman.

Daily pedometer step totals (W4L classic Walk4Life®) were self recorded by participants. Quality of life was evaluated using the RAND SF-36 health survey, which uses a Likert scale to measure 8 different dimensions: general health, physical functioning, role limitation physical, role limitation emotional, vitality, mental health, social functioning, and bodily pain (26) (A-9, pp77-78).

Statistical Analysis

All data were analyzed with Microsoft Excel® and SPSS® computer software. Descriptive data were expressed as mean ± SD. A repeated measures, mixed model (time by treatment), ANOVA was used to examine pre- and post-study between group differences in BMI, FBG, total cholesterol, HDL, LDL, resting SBP, resting HR, or HR and RPE at stage 2 of the Bruce Ramp treadmill protocol. The 8 dimensions and total quality of life scores were compared with a paired samples t-test to determine the main effects. A repeated measures, mixed model (time by treatment) ANOVA then compared interaction effects on quality of life between the groups. A Bonferroni confidence interval adjustment was used on estimated marginal means for between-group interactions. Any comparison that yielded a Cook's D score >1 was considered an influential case and was appropriately accounted for. Comparisons were considered statistically significant at an alpha level of 0.05 for both the analysis of variance and t-test statistics.

The participants in the current study were encouraged to record their steps daily, but the logs included a footnote stating that although it is important to track daily steps, it is also understandable when a few days are missed (A-8, pp76). The steps recorded in the pedometer group were used as anecdotal evidence for physical activity. Thus, actual step values were not statistically analyzed.

CHAPTER IV: RESULTS

Participant Retention & Descriptive Statistics

Of the 42 participants from the initial testing, 25 (13 males, 12 females) followed up with the final testing. Due to voluntary dropout and incomplete data, pre- and post-data for 19 (11 males, 8 females) participants were statistically analyzed and reported on. The average age of the 19 participants who completed the study was 52.4 ±11.6 years (28 to70 years). The overall pre- and post- descriptive statistics are shown in table 1.

DEPENDENT VARIABLES	**PRE**			**POST**		
	N	Mean	STDEV	N	Mean	STDEV
Age	19	52.4	11.6	19	52.4	11.6
Body Mass Index	19	23.9	3.6	19	24.1	3.6
Fasted Blood Glucose	19	95.8	9.9	19	99.4	10.8
Total Cholesterol	19	197.6	50.9	19	192.8	49.2
High-Density Lipoprotein	19	54.6	15.5	19	62.8	18.3
Low-Density Lipoprotein	19	121.5	42.3	19	104.2	40.8
Resting Systolic Blood Pressure	19	126.7	9.7	19	120.2	5.5
Resting Heart Rate	19	68.8	16.2	19	68.2	10.8
Heart Rate @ Stage 2	19	125.8	23.6	19	123.2	18.5
Rating of Perceived Exertion @ Stage 2	19	11.6	1.8	19	11.4	2.4
Overall Quality of Life	18	640.4	134.1	18	676.6	90.8

Table 1: Descriptive statistics (PRE- and POST- intervention) of all measured (dependent) variables for the whole group (N=19). Data are represented as the Mean ± Standard Deviation (STDEV).

Nine of the initial 21 participants (42.9%) in the IEP group accounted for 21.4% of the total participant retention, and 16 of the 21 initial participants (76.2%) with both the IEP and PBP accounted for 38.1% of the total participant retention. Thus, the total participant retention for the program was 25 out of the initial 42 participants (59.5%), with greater compliance observed in the group that received a weekly phone call and participated in the pedometer-base program. Six of the returning participants had missing data or unanalyzed data because their final testing was completed after the cut-off date for inclusion.

Changes in CVD Risk Factors

In the following sections, results of the intervention on each risk factor are shown. The overall change for all participants, the change for each group, and the interaction between groups are analyzed. The small sample size supports evaluation for only the main effect; however, for the purpose of this thesis, groups and interaction results are shown. The full statistical data can be found in the appendix (A-3, pp54-72).

Body Mass Index (BMI)

There was no significant overall change observed between the participants' BMI values for the pre- and post- interventions, as demonstrated by figure 1 (Pre=23.9 ±3.6, Post=24.1 ±3.6 kg/m^2, p=0.417). Also, there were no within-group changes, as shown in table 2 (p=0.585).

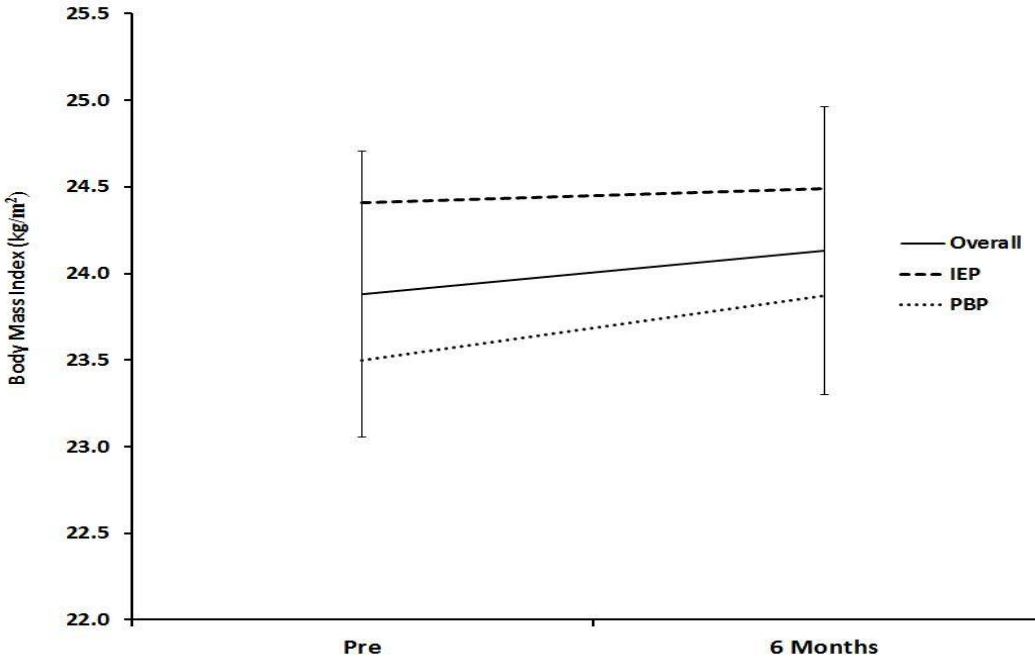

Figure 1: Body mass index (kg/m^2) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions for all figures: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Standard error bars are on the overall scores only.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	.453	1	.453	.693	.417	.039
	Greenhouse-Geisser	.453	1.000	.453	.693	.417	.039
	Huynh-Feldt	.453	1.000	.453	.693	.417	.039
	Lower-bound	.453	1.000	.453	.693	.417	.039
Time * Treatment	Sphericity Assumed	.203	1	.203	.310	.585	.018
	Greenhouse-Geisser	.203	1.000	.203	.310	.585	.018
	Huynh-Feldt	.203	1.000	.203	.310	.585	.018
	Lower-bound	.203	1.000	.203	.310	.585	.018
Error(Time)	Sphericity Assumed	11.115	17	.654			
	Greenhouse-Geisser	11.115	17.000	.654			
	Huynh-Feldt	11.115	17.000	.654			
	Lower-bound	11.115	17.000	.654			

Table 2: The Time row demonstrates the overall BMI main effect. Time * Treatment shows if there is significant BMI interaction between the groups (IEP or PBP +IEP).

Fasted Blood Glucose (FBG)

There was no significant overall change observed between the participants' FBG values for the pre- and post- interventions, as demonstrated by figure 2 (Pre=95.8 ±9.9,Post=99.4 ±10.8 mg/dL, p=0.264). Also, there were no within-group changes, as shown in table 3 (p=0.814).

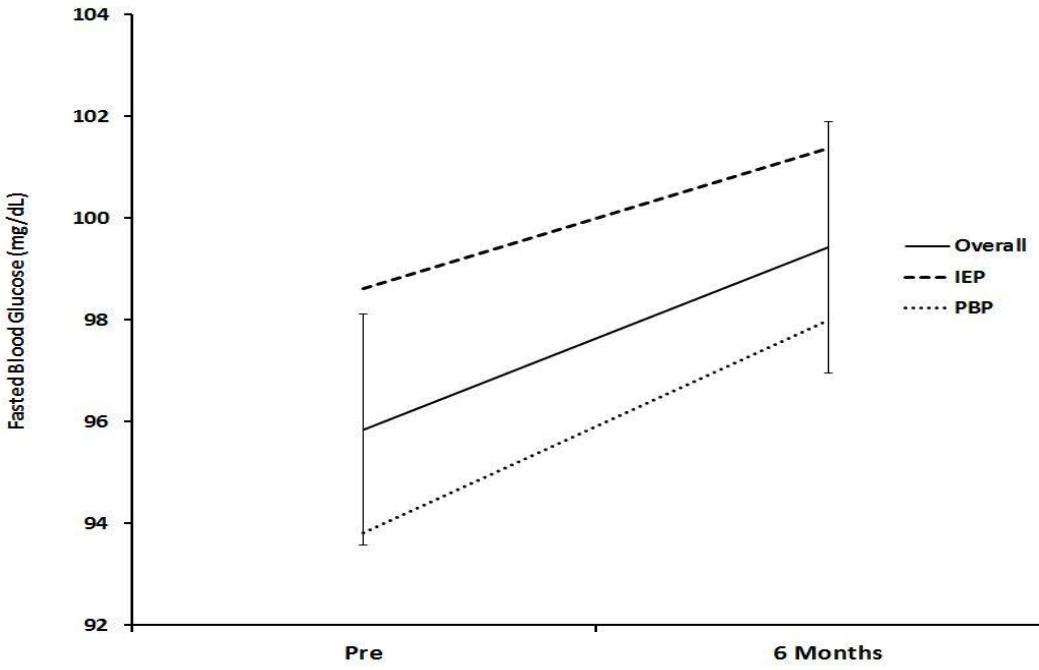

Figure 2: Fasted blood glucose (mg/dL) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions for all figures: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	111.274	1	111.274	1.334	.264	.073
	Greenhouse-Geisser	111.274	1.000	111.274	1.334	.264	.073
	Huynh-Feldt	111.274	1.000	111.274	1.334	.264	.073
	Lower-bound	111.274	1.000	111.274	1.334	.264	.073
TIME * Treatment	Sphericity Assumed	4.748	1	4.748	.057	.814	.003
	Greenhouse-Geisser	4.748	1.000	4.748	.057	.814	.003
	Huynh-Feldt	4.748	1.000	4.748	.057	.814	.003
	Lower-bound	4.748	1.000	4.748	.057	.814	.003
Error(TIME)	Sphericity Assumed	1417.568	17	83.386			
	Greenhouse-Geisser	1417.568	17.000	83.386			
	Huynh-Feldt	1417.568	17.000	83.386			
	Lower-bound	1417.568	17.000	83.386			

Table 3: The Time row demonstrates the overall FBG main effect. Time * Treatment shows if there is significant FBG interaction between groups (IEP or PBP +IEP).

Total Cholesterol (TotChol)

Total cholesterol did not change overall, as shown by figure 3 (Pre=197.6 ±50.9, Post=192.8 ±49.2 mg/dL, p=0.287). However there was a between-group interaction (p=0.047), with the IEP group improving 20.4 mg/dL and the IEP+PBP worsened 6.6 mg/dL.

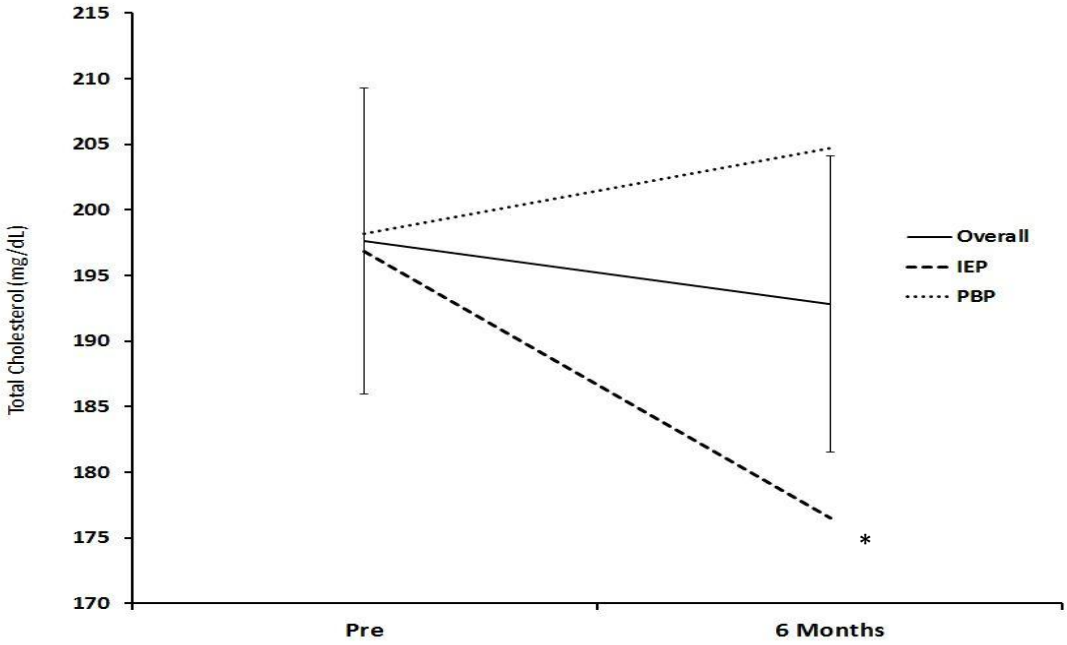

Figure 2: Total cholesterol (mg/dL) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Asterisk denotes statistical significance ($p \leq 0.05$) between IEP vs. PBP scores. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	442.909	1	442.909	1.207	.287	.066
	Greenhouse-Geisser	442.909	1.000	442.909	1.207	.287	.066
	Huynh-Feldt	442.909	1.000	442.909	1.207	.287	.066
	Lower-bound	442.909	1.000	442.909	1.207	.287	.066
TIME * Treatment	Sphericity Assumed	1678.278	1	1678.278	4.572	.047	.212
	Greenhouse-Geisser	1678.278	1.000	1678.278	4.572	.047	.212
	Huynh-Feldt	1678.278	1.000	1678.278	4.572	.047	.212
	Lower-bound	1678.278	1.000	1678.278	4.572	.047	.212
Error(TIME)	Sphericity Assumed	6240.301	17	367.077			
	Greenhouse-Geisser	6240.301	17.000	367.077			
	Huynh-Feldt	6240.301	17.000	367.077			
	Lower-bound	6240.301	17.000	367.077			

Table 4: The Time row demonstrates the overall TotChol main effect. Time * Treatment shows if there is significant TotChol interaction between groups (IEP or PBP +IEP).

High-Density-Lipoprotein (HDL)

There was a significant overall change observed between the participants' HDL values for the pre- and post- interventions, shown by figure 4 (Pre=54.6 ±15.5, Post=62.8 ±18.3 mg/dL, p=0.005). Also, there was a significant within-group interaction, as shown in table 5 (p=0.038).

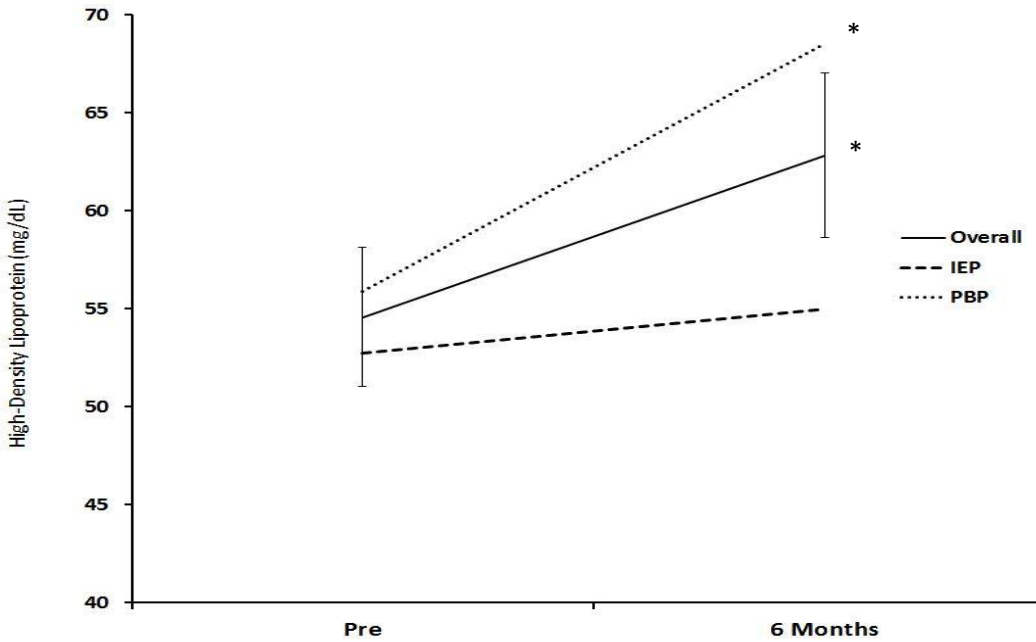

Figure 4: High-density lipoprotein (mg/dL) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Asterisk denotes statistical significance ($p \leq 0.05$) between the overall group scores and IEP vs. PBP HDL scores. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	513.188	1	513.188	10.448	.005	.381
	Greenhouse-Geisser	513.188	1.000	513.188	10.448	.005	.381
	Huynh-Feldt	513.188	1.000	513.188	10.448	.005	.381
	Lower-bound	513.188	1.000	513.188	10.448	.005	.381
Time * Treatment	Sphericity Assumed	249.819	1	249.819	5.086	.038	.230
	Greenhouse-Geisser	249.819	1.000	249.819	5.086	.038	.230
	Huynh-Feldt	249.819	1.000	249.819	5.086	.038	.230
	Lower-bound	249.819	1.000	249.819	5.086	.038	.230
Error(Time)	Sphericity Assumed	835.023	17	49.119			
	Greenhouse-Geisser	835.023	17.000	49.119			
	Huynh-Feldt	835.023	17.000	49.119			
	Lower-bound	835.023	17.000	49.119			

Table 5: The Time row demonstrates the overall HDL main effect. Time * Treatment shows if there is significant HDL interaction between groups (IEP or PBP +IEP).

Low-Density Lipoprotein

A significant overall change was observed between the participants' LDL values for the pre- and post- interventions, shown by figure 5 (Pre=121.5 ±15.5, Post=104.2 ±18.3 mg/dL, p=0.018). However, there was not a significant within-group interaction, as shown in table 5 (p=0.256).

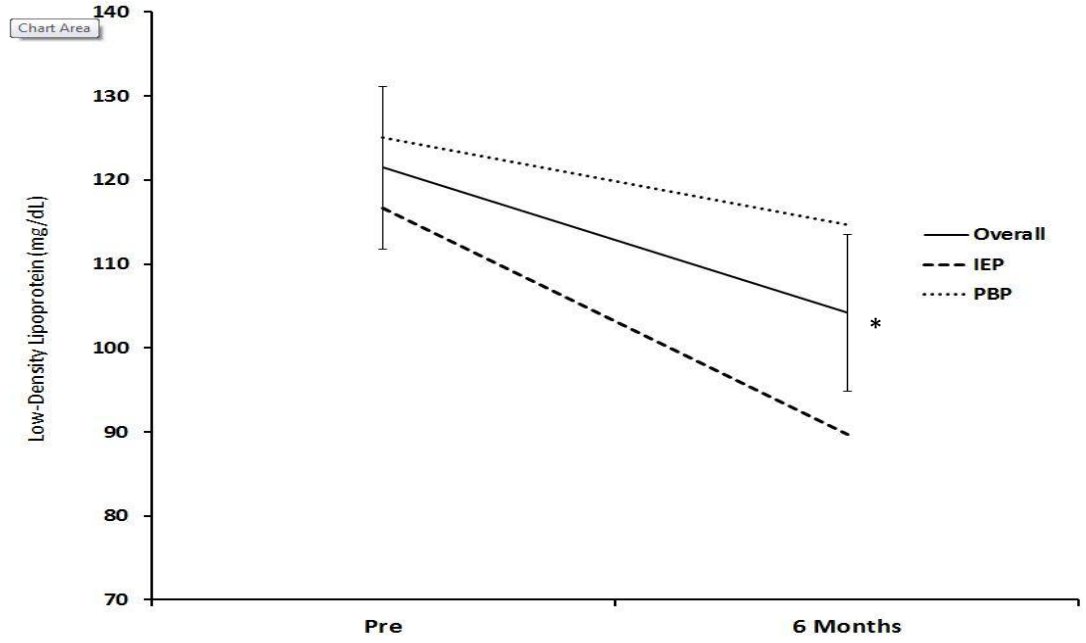

Figure 5: Low-density lipoprotein (mg/dL) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Asterisk denotes statistical significance ($p \leq 0.05$) the overall change in LDL. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	3199.985	1	3199.985	6.911	.018	.289
	Greenhouse-Geisser	3199.985	1.000	3199.985	6.911	.018	.289
	Huynh-Feldt	3199.985	1.000	3199.985	6.911	.018	.289
	Lower-bound	3199.985	1.000	3199.985	6.911	.018	.289
Time * Treatment	Sphericity Assumed	640.238	1	640.238	1.383	.256	.075
	Greenhouse-Geisser	640.238	1.000	640.238	1.383	.256	.075
	Huynh-Feldt	640.238	1.000	640.238	1.383	.256	.075
	Lower-bound	640.238	1.000	640.238	1.383	.256	.075
Error(Time)	Sphericity Assumed	7870.971	17	462.998			
	Greenhouse-Geisser	7870.971	17.000	462.998			
	Huynh-Feldt	7870.971	17.000	462.998			
	Lower-bound	7870.971	17.000	462.998			

Table 6: The Time row demonstrates the overall LDL main effect. Time * Treatment shows if there is significant LDL interaction between groups (IEP or PBP +IEP).

Resting Systolic Blood Pressure (SBP)

There was a significant overall change observed between the participants' resting SBP values for the pre- and post- interventions, shown by figure 6 (Pre=126.7 ±9.7, Post=120.2 ±5.5 mmHg, p=0.020), but there was not a significant within-group interaction, as shown in table 7 (p=0.974).

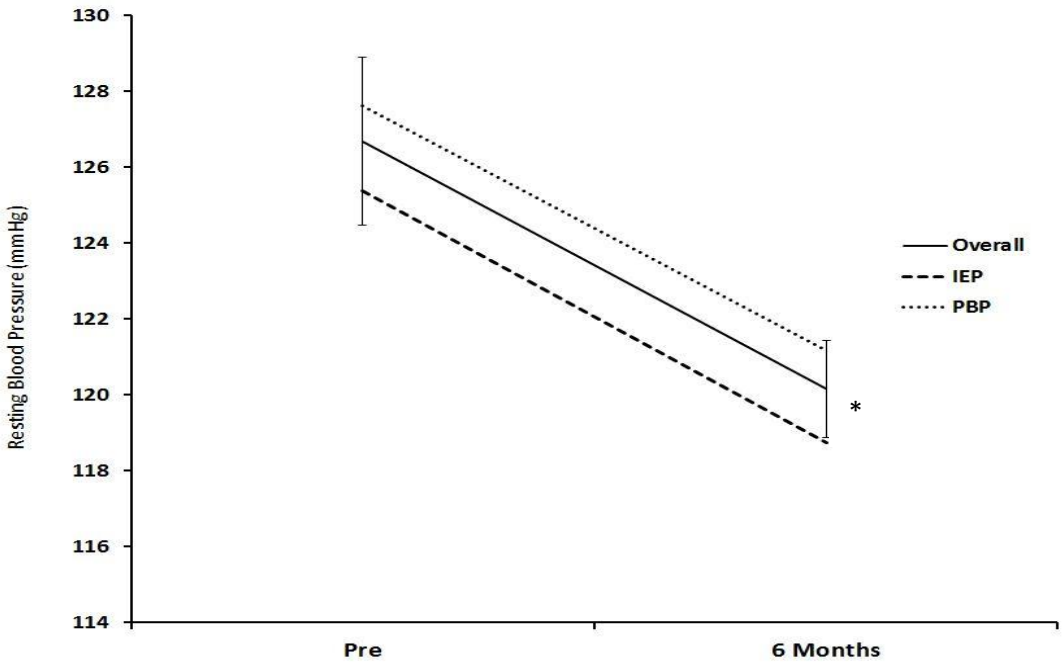

Figure 6: Resting SBP (mmHg) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Asterisk denotes statistical significance ($p \leq 0.05$) between the overall group scores. Standard error bars are on the overall scores only.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	396.173	1	396.173	6.550	.020	.278
	Greenhouse-Geisser	396.173	1.000	396.173	6.550	.020	.278
	Huynh-Feldt	396.173	1.000	396.173	6.550	.020	.278
	Lower-bound	396.173	1.000	396.173	6.550	.020	.278
Time * Treatment	Sphericity Assumed	.067	1	.067	.001	.974	.000
	Greenhouse-Geisser	.067	1.000	.067	.001	.974	.000
	Huynh-Feldt	.067	1.000	.067	.001	.974	.000
	Lower-bound	.067	1.000	.067	.001	.974	.000
Error(Time)	Sphericity Assumed	1028.301	17	60.488			
	Greenhouse-Geisser	1028.301	17.000	60.488			
	Huynh-Feldt	1028.301	17.000	60.488			
	Lower-bound	1028.301	17.000	60.488			

Table 7: The Time row demonstrates the overall resting SBP main effect. Time * Treatment shows if there is significant resting SBP interaction between groups (IEP or PBP +IEP).

Resting Heart Rate (HR)

There was no significant overall change observed between the participants' resting HR values for the pre- and post- interventions, as shown by figure 7 (Pre=68.8 ±16.2, Post=68.2 ±10.8 beats·min^{-1}, p=0.977). Also, there were no within-group changes, as shown in table 8 (p=0.248).

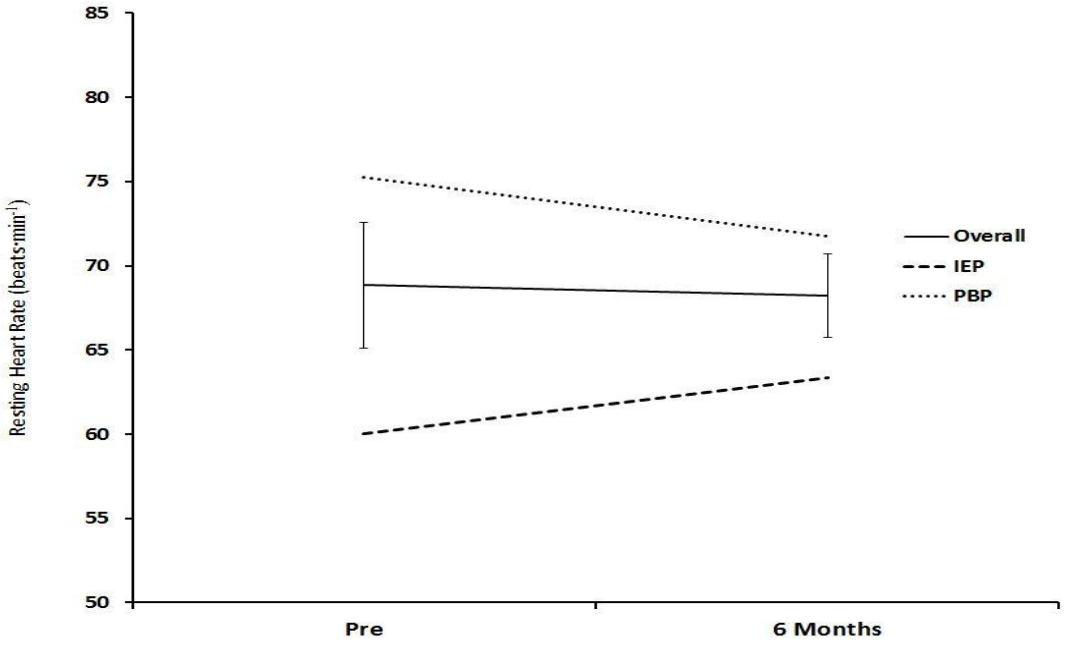

Figure 7: Resting heart rate (beats·min^{-1}) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	.067	1	.067	.001	.977	.000
	Greenhouse-Geisser	.067	1.000	.067	.001	.977	.000
	Huynh-Feldt	.067	1.000	.067	.001	.977	.000
	Lower-bound	.067	1.000	.067	.001	.977	.000
Time * Treatment	Sphericity Assumed	110.909	1	110.909	1.433	.248	.078
	Greenhouse-Geisser	110.909	1.000	110.909	1.433	.248	.078
	Huynh-Feldt	110.909	1.000	110.909	1.433	.248	.078
	Lower-bound	110.909	1.000	110.909	1.433	.248	.078
Error(Time)	Sphericity Assumed	1315.301	17	77.371			
	Greenhouse-Geisser	1315.301	17.000	77.371			
	Huynh-Feldt	1315.301	17.000	77.371			
	Lower-bound	1315.301	17.000	77.371			

Table 8: The Time row demonstrates the overall main effect of resting HR. Time * Treatment shows if there is significant resting HR interaction between groups (IEP or PBP +IEP).

Heart Rate at Stage 2 of Bruce Ramp treadmill protocol (HR@2)

The overall observed change for HR@2 was not statistically significant between the participants' pre- and post- intervention values, shown by figure 8 (Pre=125.8 ±23.6, Post=123.2 ±18.5 beats·min^{-1}, p=0.358), nor was the within-group interaction, as shown in table 9 (p=0.431).

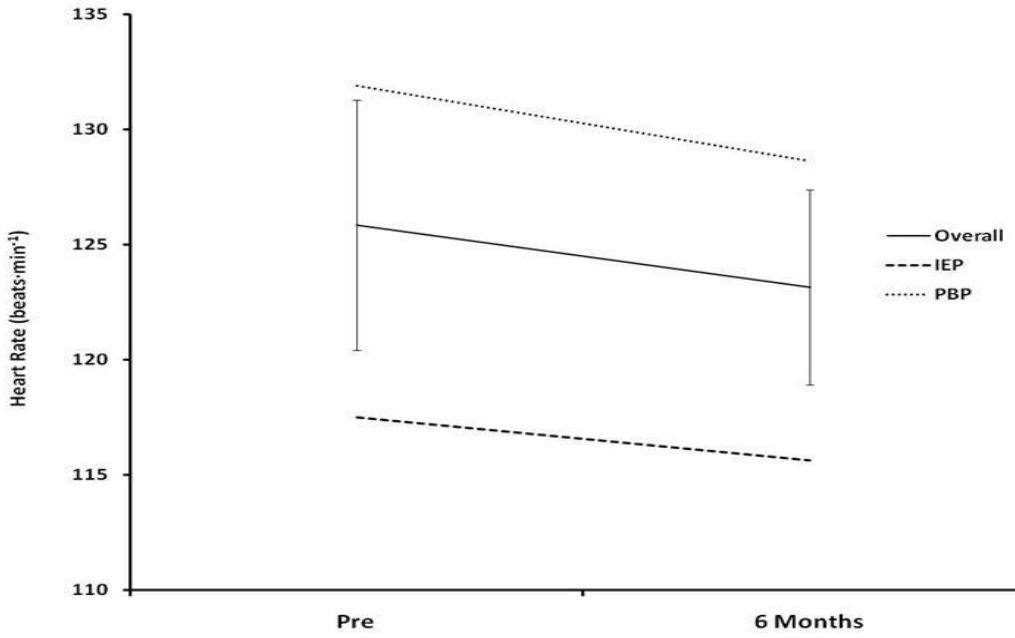

Figure 8: Heart rate at stage 2 of treadmill protocol (beats·min^{-1}) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Standard error bars are on the overall scores only.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	89.150	1	89.150	.892	.358	.050
	Greenhouse-Geisser	89.150	1.000	89.150	.892	.358	.050
	Huynh-Feldt	89.150	1.000	89.150	.892	.358	.050
	Lower-bound	89.150	1.000	89.150	.892	.358	.050
TIME * Treatment	Sphericity Assumed	64.939	1	64.939	.650	.431	.037
	Greenhouse-Geisser	64.939	1.000	64.939	.650	.431	.037
	Huynh-Feldt	64.939	1.000	64.939	.650	.431	.037
	Lower-bound	64.939	1.000	64.939	.650	.431	.037
Error(TIME)	Sphericity Assumed	1698.114	17	99.889			
	Greenhouse-Geisser	1698.114	17.000	99.889			
	Huynh-Feldt	1698.114	17.000	99.889			
	Lower-bound	1698.114	17.000	99.889			

Table 9: The Time row demonstrates the overall main effect of heart rate at stage 2 of the Bruce Protocol. Time * Treatment shows if there is significant HR@2 interaction between groups (IEP or PBP +IEP).

Rating of Perceived Exertion at Stage 2 of Bruce Ramp treadmill protocol (RPE@2)

There was no significant overall change observed between the participants' RPE@2 scores for the pre- and post- interventions, shown by figure 9 (Pre=11.6 ±1.8, Post=11.4 ±2.4, p=0.641), and there was no significant within-group interaction, as shown in table 10 (p=0.941).

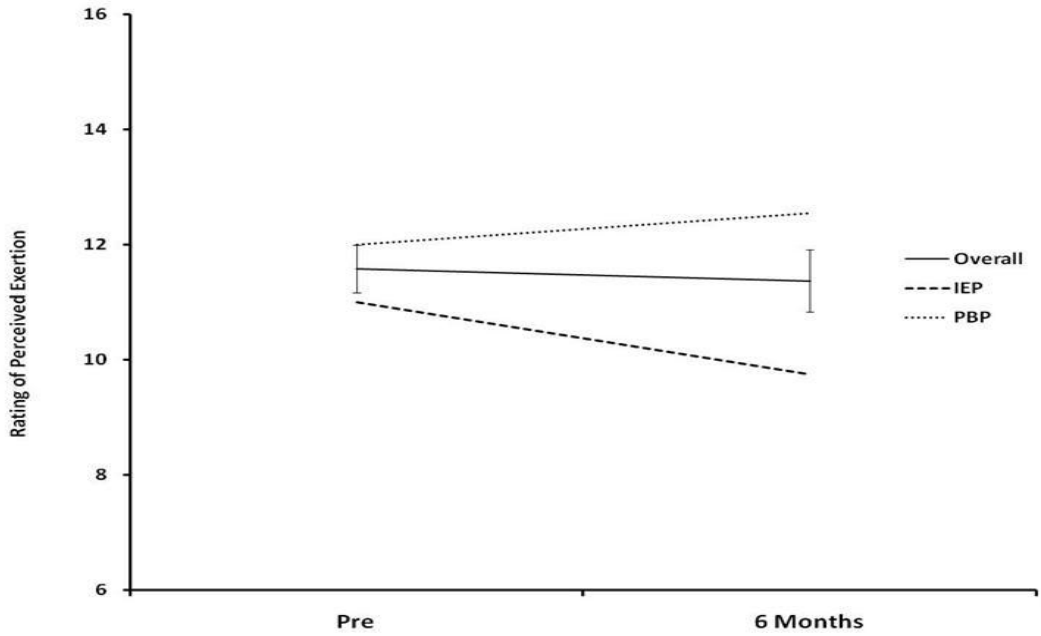

Figure 9: Rating of perceived exertion at stage 2 of the Bruce Ramp treadmill protocol (BORG 6-20) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Standard error bars are on the overall scores exclusively.

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	.432	1	.432	.225	.641	.013
	Greenhouse-Geisser	.432	1.000	.432	.225	.641	.013
	Huynh-Feldt	.432	1.000	.432	.225	.641	.013
	Lower-bound	.432	1.000	.432	.225	.641	.013
TIME * Treatment	Sphericity Assumed	.011	1	.011	.006	.941	.000
	Greenhouse-Geisser	.011	1.000	.011	.006	.941	.000
	Huynh-Feldt	.011	1.000	.011	.006	.941	.000
	Lower-bound	.011	1.000	.011	.006	.941	.000
Error(TIME)	Sphericity Assumed	32.568	17	1.916			
	Greenhouse-Geisser	32.568	17.000	1.916			
	Huynh-Feldt	32.568	17.000	1.916			
	Lower-bound	32.568	17.000	1.916			

Table 10: The Time row demonstrates the overall main effect of heart rate at stage 2 of the Bruce Protocol. Time * Treatment shows if there is significant HR@2 interaction between groups (IEP or PBP +IEP).

Quality of Life (QOL)

The RAND SF-36 survey measures eight different dimensions, which were each statistically analyzed according to the pre- and post- scores, and to the two different treatment groups (IEP or IEP+PBP). *Role limitations due to physical health* and *emotional well-being* statistically improved overall for both groups (p=0.04 and p=0.003, respectively), as shown in table 11. Also, the *overall total* quality of life statistically increased during the 6 month intervention, shown in figure 10 (p=0.039). The only interaction effects observed for quality of life were between the *energy/fatigue* scores (p=0.047), as shown in the appendix (A-3, pp70).

RAND SF-36 Dimensions	Pre Mean±SD	Post Mean±SD	TTEST
Physical Functioning	84.4±26.9	90.6±19.6	0.117
**Role Limitations due to Physical Health*	83.3±33.2	94.4±16.2	0.044
Role Limitations due to Emotional Problems	90.7±25.1	96.3±10.8	0.166
Energy/Fatigue	61.7±17.9	64.2±17.3	0.134
**Emotional Well-Being*	78.4±14.5	81.8±13.5	0.003
Social Functioning	90.3±18.5	93.1±12.3	0.215
Pain	78.2±18.2	82.1±18.6	0.066
General Health	73.3±18.9	74.2±14.4	0.402
**Overall Total*	640.4±134.1	676.6±90.8	0.039

Table 11: Descriptives for quality of life. *Denotes pre- post- intervention significance ($p \leq 0.05$).

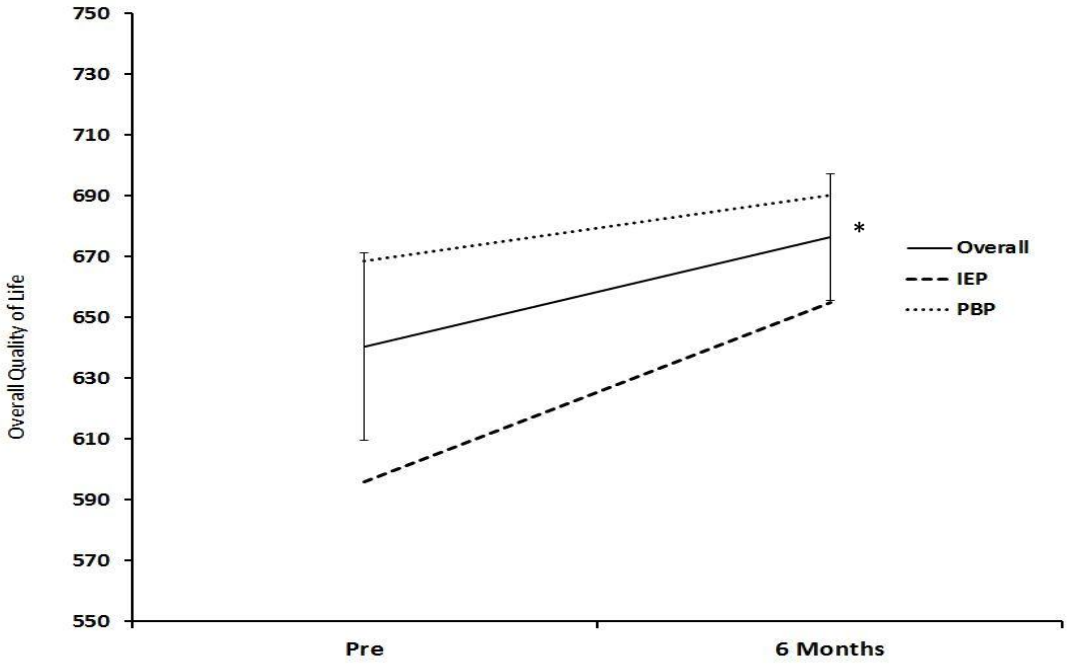

Figure 10: Quality of life (QOL) for each intervention and overall group comparison versus Pre- (Time 1) and 6 month (Time 2 or Post-) measurements. Interventions: IEP = individualized exercise prescription; PBP = pedometer-base program + IEP. Asterisk denotes statistical significance ($p \leq 0.05$) between the overall group QOL scores. Standard error bars are on the overall scores exclusively.

Cardiovascular Risk and Retention

The average number of CVD risk factors for the initial 42 participants was 1.95 ±1.51, and the average number of CVD risk factors for the 19 participants that finished the study was 1.58 ±1.07. Those participants in the initial IEP group had 1.62 ±1.12 CVD risk factors, and those in the initial IEP+PBP group had 2.29 ±1.79 CVD risk factors. Of the participant population that consisted of the one-third at highest risk for CVD, 6 participants completed the study, and 7 of the one-third at lowest risk for CVD completed the study. The average percent body fat (%BF) for 40 of the initial 42 participants was 25.3 ±8.89, and the average %BF for 14 of the 19 participants that finished the study was 27.0 ±9.79. There was no difference in study retention between those who were at highest risk vs. those at lowest risk prior to the study.

CHAPTER V: DISCUSSION

In the present study, we evaluated the efficacy of student-based exercise stress testing and CVD risk factor evaluation, coupled with two different exercise interventions that could reduce CVD risk and improve quality of life (QOL). The results of our study suggest that either of the two exercise interventions may decrease total cholesterol, increase high-density lipoproteins (HDL), decrease low-density lipoproteins (LDL), lower resting systolic blood pressure (SBP), and improve QOL. The current study did not produce significant changes in body mass index (BMI), fasted blood glucose (FBG), or exercising heart rate (HR) and rating of perceived exertion (RPE) at a fixed exercise workload (~6 METS).

Similar exercise training studies have been shown to lower BMI, FBG, and increase exercise capacity. Hui et al. found that in 19 participants, the males decreased their BMI by 0.46 kg/m^2 and the females lowered their BMI by 0.39 kg/m^2, after a walking intervention for 6 months. Also, Hui and colleagues found a 0.283 and 0.255 mmol/L reduction in the men's and women's FBG, respectively, and they reported VO_{2max} to increase with walking for 6 months, 5 days per week (45). Our overall pre- to post- measures for BMI and FBG did not significantly change as BMI slightly increased 0.2 kg/m^2 and FBG slightly increased 3.6 mg/dL.

Unlike Hui and colleague's study, our study did not include dietary restrictions or recommendations. It is not uncommon for exercise only programs to actually increase or stabilize BMI while decreasing waist circumference, and/or decrease percent body fat while increasing lean body mass. Although body composition was measured pre- and

post-intervention in the current study, the data were not used as the measurement was administered differently by different students. Future evaluations in our lab should more carefully control the body composition measurement technique.

A prospective cohort study of 38,987 women showed that 30 minutes of daily activity effectively reduced BMI and FBG (20). Slentz and colleagues (2009) determined that an inactive control group experienced a significant increase in FBG and BMI in a study involving 387 sedentary, overweight adults assigned randomly to three different training groups and one control group (13).

The lack of changes in BMI and FBG in the current study may have been attributed to a variety of variables. The exercise prescription and diet were not closely monitored throughout our study; thus, the energy expenditure might not have exceeded the energy intake significantly to reduce BMI or weight, which is closely related to changes in FBG. Also, FBG was often measured in the post-anthropometric testing, which may have resulted in higher than normal resting blood glucose values for some individuals. Future evaluations in our lab will address this issue.

The blood lipid results from our study compliment prior studies that have shown that physical activity effectively increases HDL and decreases both LDL and total cholesterol. Leon and colleagues (2000) reported that 20 weeks (5 months) of supervised exercise significantly improved HDL by 3.6% (22). Our study showed a much larger 15% overall increase in HDL for both groups. The increased HDL increase in the current study, may be attributed to: the daily exercise vs. 3 times per week in the Leon et al. study, to the self-selected exercise intensity in the current study, higher self-selected volume of exercise, or to a random effect of our smaller sample size, gender, or ethnicity

comparison differences. Larson-Meyer et al. (2010) studied an overweight population and found a 10% HDL increase and a 13% LDL decrease in their cohort, which included exercise and caloric reduction across a 6 month intervention (18). The HDL and LDL changes in the present study are more related to values observed for overweight individuals; however, the subjects in our study had a mean baseline BMI of 23.9 ±3.6, suggesting that improvements in lipoprotein metabolism, at least in the current study, were due to increased exercise, rather than weight reduction.

Resting systolic blood pressure (SBP) decreased in our study, which is consistent with previous research. Blumenthal and colleagues (2000) found a 4 mmHg SBP reduction after an aerobic exercise intervention for 6 months in 133 sedentary and overweight men and women (10). Lifestyle interventions, which included increased physical activity, educational information, and dietary changes for 6 months were shown to decrease blood pressure and overall coronary heart disease risk in 810 relatively healthy adults (12).

Hypertension is a common CVD risk factor, and our results suggest that both exercise prescription and exercise prescription with pedometer-base interventions effectively lowered overall resting SBP 6.5 mmHg (Figure 6), which is consistent with prior studies, although a number of 6 month exercise interventions have shown smaller or no improvements in SBP. It is possible that our study observed greater changes in resting SBP due to the pedometer daily log, as the participants were asked to report their steps each day, rather than only five days of the week. Therefore, the physical activity may have been increased in our study comparatively to other studies that only included five or fewer days per week of physical activity.

Heart rate (HR) during exercise and lower rating of perceived exertion (RPE) at the 2nd stage of the Bruce treadmill protocol (~6 METS) did not change in the current study; however, overall averages were slightly lowered (HR decreased by 2.4 beats·min^{-1} and RPE decreased by 0.2 Borg units). The lack in change at about 6 METS may be due to the intensity, which is most likely a higher intensity than most of the participants chose for their self-selected exercise. Specificity of training suggests that improvements generally occur within the range of chronic exercise intensity. Haskell et al. (2007) reported that 150 minutes of moderately-intense exercise per week will promote physiological parameters of health, such as lower heart rate and increase physical activity levels (41). The current American College of Sports Medicine (ACSM) physical activity recommendations were promoted in both exercise prescription groups in our study, and favorable results of heart rate and physical activity may be due in part to the study's interventions.

Previous studies have shown that exercise interventions can improve quality of life (QOL). We evaluated QOL in the current study with the RAND SF-36 health survey. Häkkinen and colleagues (2010) used the RAND SF-36 in a cross-sectional study on 727 men and determined that health-related physical fitness promotes health-related QOL (26). A randomized controlled trial on 430 sedentary, postmenopausal women with elevated SBP suggested that 6 months of higher doses of exercise were associated with improvements in mental and physical aspects of QOL (23). The pre- and post- averages showed improvements in overall QOL amongst the whole group comparisons, and although our study did not show significant improvements in all areas, two of the 8 dimensions, *role limitations due to physical health* and *emotional well-being*, showed

significant main effects for pre- and post- scores; whereas the e*nergy/fatigue* dimension was significantly improved in the individualized exercise prescription (IEP) group.

The IEP group for our study was developed by undergraduate students to meet the following criteria: 1) The frequency, intensity, type, and duration of exercise was determined uniquely for each participant depending on results from a 12-lead ECG exercise stress test and anthropometric measures; 2) Each exercise program included a minimum of 2-4 days of resistance training and 3-5 days of aerobic training per week; 3) The exercise consisted of moderate to vigorous (3 to $\geq$ 6 METS) intensity; and 4) The ACSM standards of 150 minutes of exercise per week were implemented (41). The participants in the pedometer-base program (PBP) received the IEP (above), plus a weekly phone call, and a daily step log that asked for the date, step goals, actual steps, general comments, and what was done for physical activity to be recorded (A-7, pp75).

The major difference between the two groups was the compliance, with 73% of the PBP group completing the study vs. only 43% of the IEP group. The higher retention percent for the group in the PBP may be attributed to the daily pedometer log reporting, and/or a weekly phone call from the researcher (A-8, pp76). Both exercise programs seemed to be equally effective in reducing the CVD risk for those that completed the study, but the addition of the PBP greatly improved retention in the interventions.

There were three major limitations to our study. 1) The sample size was relatively small and included mostly middle-aged Caucasians, limiting study power and population generalizability; 2) The participant retention was about 60% overall, and was unequal between the two groups, increasing the likelihood of unequal variance within groups; and 3) Different researchers collected the data for the pre- and post- measurements. The

exercise data were collected by undergraduate students with limited experience in exercise blood pressure. Additionally, the test termination was often determined by inexperienced students and thus inconsistent. We believe the resting data, blood lipids, and blood glucose data to be accurate, but exercise blood pressure measurements, and the body composition data appear inconsistent and were not used in this analysis.

The other limitations were medication changes and the absence of motivational strategies that encourage physical activity. Participation in the current study was voluntary with few physical and no monetary incentives to participate or complete the program. A number of participants were from out of town and did not perceive a benefit to complete the post testing, while others had schedule conflicts or simply chose not to complete the post-testing. Of the participants that did return, it was observed that at least two reported taking fewer medications.

The motivation to exercise is not fully understood and often participant compliance may only occur after a life-threatening event. Therefore, until other motivation factors to maintain or increase physical activity are better understood, participant compliance may never reach 100% in training studies such as this or even in clinical settings, such as cardiac rehabilitation. Hagger and colleagues (2010) reported that a lack of self-control and self-regulatory skills are associated with low adherence to exercise (46). Training studies in the future might mitigate high participant dropout rates and low exercise motivation by implementing educational classes on self-regulation and self-control or practicing effective encouragement techniques to improve self-efficacy.

In conclusion, the exercise prescription and pedometer-base interventions both reduced resting SBP and improved lipid profiles and QOL. There was no conclusive

evidence to support the hypothesis that adding the PBP to the IEP, further improved CVD risk factor reductions. However, the addition of the PBP and weekly phone calls may have improved the participant compliance. Compliance was related to being in the PBP vs. the IEP program and was not related to the number of baseline risk factors. Our study provides scientific evidence that the student-base exercise testing program at the University of Montana has a positive impact on CVD risk factors and quality of life. The stress testing program and the IEP, as performed by the HHP Exercise Science Students, was an effective program for practical learning and improving resting SBP, blood lipids, and QOL in middle-aged adults.

Future research with training studies that involve exercise prescription and/or pedometers may help researchers understand the critical role exercise plays in reducing the risk factors associated with heart disease. Study designs evaluating exercise prescription and cardiovascular disease (CVD) risk factors may want to include a control group, resistance training group, and/or a pedometer-base only group. A motivational strategy that encourages exercise and self-regulation skills may want to be included in future studies to further mitigate CVD risk factors and improve quality of life.

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Appendices

A-1: Health Screening.

PREPARTICIPATION HEALTH SCREENING QUESTIONNAIRE

Evaluation and Prescription for Physical Activity in Adults with Chronic Disease

The Human Performance Laboratory at The University of Montana – Health and Human Performance Dept.

First Name Only:_____ Date of Birth_____ Today's Date_____

Address_____ Phone (home)_____ (work)_____

_____ Age_____ Female_____ Male_____

City State Zip

ID #_____Assigned by Lab Personnel

Medical History and Risk Factors

Have you had or been diagnosed with? (x) Start Date

A heart attack or other heart trouble ( ) _____
High blood pressure ( ) _____
High cholesterol ( ) _____
Rheumatic fever ( ) _____
Artery disease or leg pain with exercise ( ) _____
Lung disease ( ) _____
Diabetes ( ) _____
Surgery ( ) _____
Injuries to back, knees, ankles, feet ( ) _____
Arthritis ( ) _____
Epilepsy ( ) _____
Drug Allergies ( ) _____
Explain_____
_____
_____
_____

Have you recently had? (x) Date

chest discomfort with exertion ( ) _____
leg pain with exercise ( ) _____
unreasonable breathlessness ( ) _____
dizziness, fainting, blackouts ( ) _____
Irregular heartbeats ( ) _____
Coughing with exertion ( ) _____
Back pain ( ) _____
Swollen, Stiff or Painful Joints ( ) _____
Fainting ( ) _____
Pregnancy ( ) _____

Family History Age Occurred Relationship

Have any of your relatives had?

Heart Attacks _____ _____ _____ _____
High Blood Pressure _____ _____ _____ _____
High Cholesterol _____ _____ _____ _____
Diabetes _____ _____ _____ _____
Congenital Heart Disease _____ _____
Other _____ _____
Explain_____
_____
_____
_____

Please complete medication on the back side

Smoking Yes No

Do you smoke? ( ) ( )
Have you ever smoked? ( ) ( )
Cigarettes ( ) ( )
Pipe ( ) ( )
Cigar ( ) ( )
Smokeless tobacco ( ) ( )
If yes to any of the above, please indicate how many a day
and for how many years.
_____
_____
At what age did you start?_____
If you have stopped, when?_____
Why did you stop?_____

Nutrition

Current Height _____feet _____inches
Current weight_____lbs Weight 1 Year Ago?_____
Are you dieting?_____
Why?_____
_____
_____
If dieting, what type of diet?_____
_____
_____
Rate your diet in relation to fat content; e.g. butter, whole

milk, cheese, ice cream, chocolate, red meat, fried foods,
baked goods:
_____Low fat _____Average Fat
_____Above average fat _____High fat
Caffeine Intake_____cups per day (Coffee, tea, cola, etc)
Alcohol Intake_____drinks per week (wine, beer, liquor)
(1 drink = 12 oz beer, 4 oz wine or 1.5 oz liquor)
How often do you eat at fast food restaurants?_____week
Do you eat processed foods (pre-prepared items such as
cracker, frozen meals, boxed noodles) more than 5 times a
week ___yes __no

Exercise

Do you participate in regular physical activity?_____
Type of activity?_____(walk, run, swim, dance)
Number of times per week?_____
Time and or distance per session?_____
Is your occupation:
_____Sedentary _____Mostly Inactive
_____Active _____Heavy Work
Any discomfort with moderate exercise not already noted?
Explain_____
_____
_____
_____
_____
_____

Stress

Rate yourself in relation to tension:
_____Usually relaxed
_____Relaxed, but occasionally tense
_____Tense more often than relaxed
_____Very tense
Rate the amount of stress experienced in your occupation:
_____Little _____Average
_____Above average _____Severe

Medications: Please complete as well as possible

____ I am not regularly taking any medications.
____ I regularly use the following medications.

Medicine Name *	This Medicine is for:	How long have you been taking this medication?

* If you do not remember the medication name please fill out the second column indicating the medication use.

Health and Human Performance Dept., 101 McGill Hall, The University of Montana, Missoula, MT 59801

A-2: Informed Consent.

SUBJECT INFORMATION AND INFORMED CONSENT
Evaluation and Prescription for Physical Activity in Adults with Chronic Disease.
PROJECT DIRECTOR: Steven Gaskill, Ph.D.
CO-DIRECTORS: Stephanie Domitrovich, MS, ATC, Bret Ralston, BS
Health & Human Performance Dept.
McGill Hall, Room 104
Email: steven.gaskill@umontana.edu
Phone: 406 243-4268
Special Instructions to the Potential Participant:
This consent form may contain words that are new to you. If you read any words that are not clear to you, please ask the person who gave you this form to explain them to you.
Purposes: 1) To evaluate physical fitness, chronic disease risk factors and the safety of exercise in individuals over 50 years old with or without known risk factors for heart and other chronic diseases or known chronic disease. 2) Provide exercise guidelines and prescription based on the fitness assessments and participant goals. 3) Provide practical clinical testing and exercise prescription for Health and Human Performance graduate and undergraduate students. 4) To determine the effectiveness of this program on reducing coronary heart disease risk factors. All testing is monitored by a trained faculty member.
Procedures-Overview:
• Read this consent form. Ask any questions that you may have. If your questions are adequately answered and you feel that you fully understand what is expected and wish to participate in this project you will be asked to sign this consent form.
• A student will contact you to schedule your testing.
• This project will require 2-4 visits to the Human Performance Laboratory for testing and evaluation along with an additional 1-2 meeting with students at a location that works for you and the students.
o The testing in the Human Performance Lab requires two hours and can be scheduled for one 2 hour visit or two 1 hour visits. All testing is done from 6:00-8:00AM. The lab testing includes a treadmill stress test, flexibility evaluation, strength evaluation, a blood lipid and glucose measurement and body composition measurement.
o The 1-2 follow-up visits with students are to discuss your results and develop a plan to reduce your risk factors (if any) for heart disease, diabetes or other chronic disease.
• Half of the subjects will randomly be assigned to receive pedometers to track steps for the six months following the testing. Subjects will also complete a simple daily physical activity log and receive a weekly phone call to see how they are doing. The other half of the subjects will receive a monthly phone call to discuss program questions.
• Subjects will complete the above tests a second time after 5 to 6 months.
Procedures-Specifics for each visit to the Human Performance Laboratory
Along with the consent form you should have received a health screening form, an overview of the project and a map to the Human Performance Lab. A student will contact you to schedule your testing. All testing is done from 6:00-8:00 AM in the Human. You have the option to schedule two separate one blocks on different days (6:00-7:15AM or 6:45-8:00AM) or one morning from 6:00 - 8:00 AM. Please read this consent form and bring it with you to your first visit to the lab. Also please fill out and complete the health screening form and bring that with you to your first visit.
Lab Testing: Requires about two hours.
• Preparation: For the first visit we ask that you abstain from vigorous physical activity the day before your visit to the lab and that you do not eat after 10:00 PM the evening prior to the test.
Please bring:
o Appropriate exercise clothes and shoes for treadmill walking with the intensity varying from light up through moderately hard.
o A swim suit for underwater weighing to determine body composition.
 Men: Light shorts or a swim suit.
 Women: T-shirt and light shorts or a swim suit.
o Risk Factor Screening Form: This comprehensive form is necessary for us to evaluate

your chronic disease risk factors and to evaluate the safety of performing an exercise test. This information, along with all other research data is confidential (see later note on confidentiality).
o This consent form
• Procedures:
o Blood lipids/glucose evaluation: If you wish to have your blood glucose and lipid profile checked (blood triglycerides, total cholesterol, HDL cholesterol, LDL cholesterol) you should not eat after 10:00 PM the evening before your testing. If you do not wish the lipid evaluation, or have recently had your blood lipids checked, a three hour fast is adequate.
• General measurements: We will measure body weight, height, waist and hip girth, resting heart rate and blood pressure.
• Aerobic Stress Test: You will walk on the treadmill and participate in a graded exercise test starting at a comfortable walking speed with increasing in speed and grade (angle) every three minutes. We will increase your intensity only up to slightly above intensities that you normally do during daily living or physical activity. You will first have monitoring electrodes placed on your chest to monitor your heart (called an electrocardiograph or ECG). Your blood pressure will also be taken periodically during the testing. During the test you will periodically be asked to indicate how hard you are working (rate of perceived exertion (RPE) and if you have any chest pain. The testing will end at a moderately hard intensity or when you indicate that you have slightly exceeded the physical activity level that you normally do or that you would like to stop. The researchers may also decide to stop the test if we believe that it is in your best interest for safety or health. You can stop the test at any time by placing both hands on the side rails of the treadmill and straddling the belt. When the test has been ended, you will be allowed a cool down period continuing to walk on the treadmill at a slower pace without incline. This is a safe way of recovering from exercise. Monitoring of your ECG, heart rate and blood pressure will continue during the cool down period. For younger individuals with low risk for heart disease, you may choose to continue the test to your volitional maximal exertion. However, you may choose to stop at any time.
• Flexibility: We will evaluate flexibility with two simple and safe flexibility tests that evaluate functional flexibility of the waist and hips (sit and reach test) and rotational flexibility of the torso (total body rotation test). We may do other flexibility tests as needed.
• Body Composition: We measure body composition (% fat and % non-fat) using the accepted underwater weighing standard. For this procedure you will be in our warm water tank and blow out as much air as possible while underwater and then hold your breath for about 3 seconds before surfacing. While not difficult it does take a few practice sessions to do this well. Please also bring a swim suit (women) or light shorts (men) for underwater weighing to determine body composition (risk factor for heart disease and diabetes).
• Strength: We will complete strength measures including: a grip strength test using a hand grip measurement tool, and submaximal strength test of your legs (leg press) and of your upper body (bench press). Other simple and safe strength tests, such as the sit-to-stand test may be administered as necessary to evaluate upper and lower body strength.
• Quality of Life Survey: You will fill out a survey containing 36 questions to determine mood state and quality of life.
- Exercise Results Visits: These visits will require about 1 hour for 2 visits.

If you wish to meet with a student to go over your data and have them recommend physical activity and lifestyle changes to reduce your future risk of chronic disease you will be given that opportunity to schedule an appointment. The meetings can take place at a location convenient for both you and the student. The first visit is generally to go over your results and to discuss goals and a possible program with the student. The student may also show you how to do safe resistance training exercises. If you wish to schedule a second meeting with the student to go over the plan that they develop, based on your first meeting, the student will be happy to meet with you once more. If you would prefer, the student can sent or deliver the program they develop.
You may also receive periodic phone calls (not more than one a week) to check up and see how you are doing, to answer any questions you may have for us, or to help you in adjusting to your

program.
This service is offered every term on a first come, first served basis until our appointment schedule is filled. If you would like to repeat the testing the following academic semester or following year please contact Dr. Gaskill (406-243-4268 or steven.gaskill@umontana.edu). Retesting will help you evaluate the success of your lifestyle changes to reduce your risk of heart disease, diabetes and other chronic diseases.

Payment or Cost for Participation:
There is no cost for this service as a part of the HHP 483/484 (Exercise, Aging and Chronic Disease) class for the lipid and blood glucose panel or strength, flexibility, stress test and body composition testing. You will not receive any compensation for your participation in this study. You will however, be provided with information on your muscular, aerobic and flexibility fitness as well as consultation(s) to develop an appropriate and safe physical activity program.

Risk/Discomforts:
Physical activity often includes some risks; however risks in this project are minimal. You will be asked to report known risk factors for heart disease (age, family history of heart disease, smoking history, physical activity history, hypertension and known diabetes), current medications and recent or current illnesses. We will measure blood pressure and monitor your ECG to evaluate the safety of moderate intensity physical activity. You will be asked to perform a walking exercise test which has a possibility of causing muscle soreness or strain and may cause shortness of breath. There is the slight potential for myocardial ischemia, angina or coronary arrhythmias during the testing, especially for older individuals and for those with multiple risk factors. All guidelines of the AMA and American College of Sports Medicine for exercise testing guidelines are being followed and risk should be minimal. In the event that you feel pain or discomfort during the walking test, which you feel is not normal, you must notify the researchers. You can choose to withdraw from the project at any time.

Benefits:
By participating in this study, you will obtain information on your level of fitness, an assessment of cardiovascular disease risk factors and analysis of your body composition. All of your individual results will be made available to you and questions will be answered. Finally, students in the Health and Human Performance Dept. under supervision of faculty members will work with you to develop a comprehensive physical activity and behavior modification plan to reduce your risk from chronic disease.

Confidentiality:
 Your records will be kept private and will not be released without your consent except as required by law.
 Only the faculty advisor and the students working directly with you will have access to your files.
 Your identification will be kept confidential. Once your testing is completed and consultations are completed we will give you all copies of your data. We assign you a subject number and keep a record of your data identified only by subject number. A separate list name and subject number is kept in a separate locked location.
 If the data are used for publication, case studies, presentations or teaching purposes, no names will be used.
 Your signed consent form will be stored in a secure location separate from your data.

Compensation for Injury:
Although we believe that the risk of taking part in this study is minimal, the following liability statement is required in all University of Montana consent forms.
"In the event that you are injured as a result of this research, you should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University or any of its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A., Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University's Claims Representative or University Legal Council". (Reviewed by University Legal Counsel, July 6, 1993)

Voluntary Participation /Withdrawal:
• Your decision to take part in this project is entirely voluntary. You may refuse to take part or withdraw from the project at any time without penalty or loss of benefits to which you are normally entitled. Choosing to participate, or to withdraw, will have no bearing on my status

with any program or association at The University of Montana. You may leave the study for any reason.
• You may be asked to leave the study for any of the following reasons:
o Failure to follow the Project Director's instructions;

Disclosure of Personal Health Information
My individual health information that may be used to conduct this research includes:
Blood lipid and glucose data, electrocardiograms, body composition data, medical history, health history and fitness data.
I authorize Steven Gaskill, Ph.D. and the researcher's staff to use my individual health information for the purpose of conducting the research project entitled "Evaluation and Prescription for Physical Activity in Adults with Chronic Disease."
Signature: _____ Date: _____

o A serious adverse reaction which may require evaluation;
o The Project Director thinks it is in the best interest of your health and welfare; or
o The study is terminated.

Questions:
If you have any questions about the research now or during the study contact:
• Steven Gaskill, Ph.D. in McGill Hall at 243-4268
email: steven.gaskill@umontana.edu
If you have any questions regarding your rights as a research subject, you may contact the Institutional Review Board Chair through the Research Office at the University of Montana at 243-6670.

Subject's Statement of Consent:
Evaluation and Prescription for Physical Activity in Adults with Chronic Disease.
I have read the above description of this research study. I have been informed of the risks and benefits involved, and all of my questions have been answered to my satisfaction. Furthermore, I have been assured that a member of the project team will also answer any future questions I may have. I voluntarily agree to take part in this study. I understand I will receive a copy of this consent form.
Printed Name of Subject: _____
Subject's Signature: _____ Date: _____

A-3: SPSS® Tables and Figures

Body Mass Index

Estimates

Measure:MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	125.881	5.646	113.968	137.794
2	122.778	4.373	113.553	132.004

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreBMI
2	PostBMI

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreBMI	EPcontrol	24.4125	3.54580	8
	EPPBex	23.5000	3.76404	11
	Total	23.8842	3.60205	19
PostBMI	EPcontrol	24.4857	3.51632	8
	EPPBex	23.8692	3.83988	11
	Total	24.1288	3.61907	19

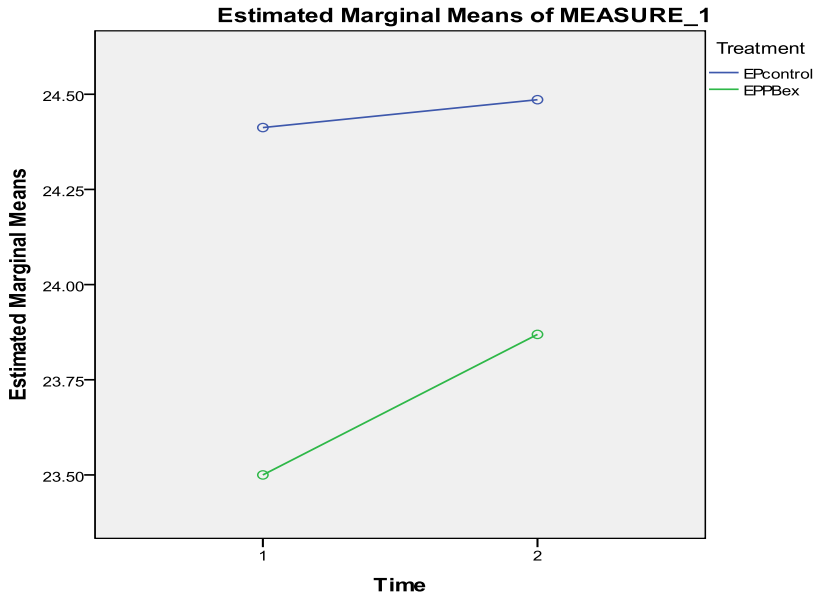
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	.453	1	.453	.693	.417	.039
	Greenhouse-Geisser	.453	1.000	.453	.693	.417	.039
	Huynh-Feldt	.453	1.000	.453	.693	.417	.039
	Lower-bound	.453	1.000	.453	.693	.417	.039
Time * Treatment	Sphericity Assumed	.203	1	.203	.310	.585	.018
	Greenhouse-Geisser	.203	1.000	.203	.310	.585	.018
	Huynh-Feldt	.203	1.000	.203	.310	.585	.018
	Lower-bound	.203	1.000	.203	.310	.585	.018
Error(Time)	Sphericity Assumed	11.115	17	.654			
	Greenhouse-Geisser	11.115	17.000	.654			
	Huynh-Feldt	11.115	17.000	.654			
	Lower-bound	11.115	17.000	.654			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Fasted Blood Glucose

Estimates

Measure:MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	96.222	2.294	91.381	101.062
2	99.688	2.541	94.326	105.049

Within-Subjects Factors

Measure:MEASURE_1

TIME	Dependent Variable
1	PreFBG
2	PostFBG

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreFBG	EPcontrol	98.6250	10.28088	8
	EPPBex	93.8182	9.57933	11
	Total	95.8421	9.90097	19
PostFBG	EPcontrol	101.3750	10.86196	8
	EPPBex	98.0000	10.99091	11
	Total	99.4211	10.76680	19

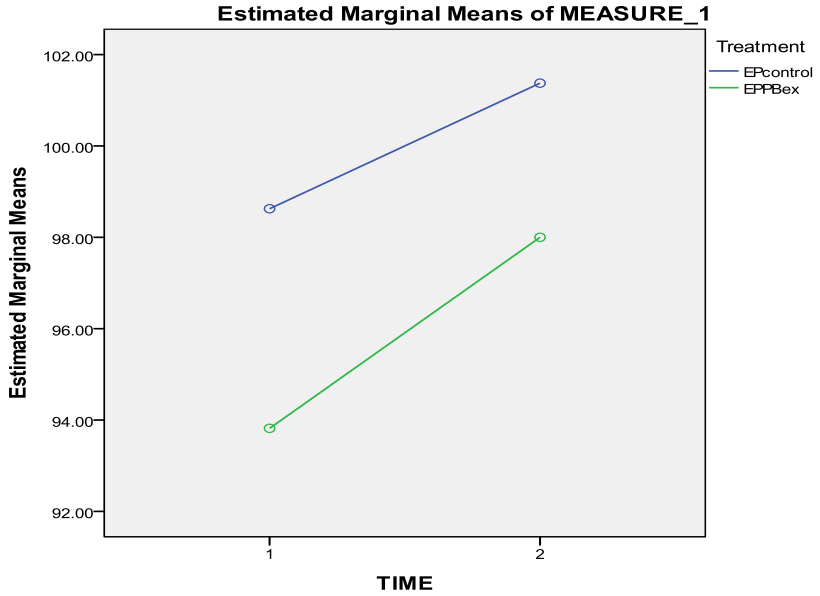
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	111.274	1	111.274	1.334	.264	.073
	Greenhouse-Geisser	111.274	1.000	111.274	1.334	.264	.073
	Huynh-Feldt	111.274	1.000	111.274	1.334	.264	.073
	Lower-bound	111.274	1.000	111.274	1.334	.264	.073
TIME * Treatment	Sphericity Assumed	4.748	1	4.748	.057	.814	.003
	Greenhouse-Geisser	4.748	1.000	4.748	.057	.814	.003
	Huynh-Feldt	4.748	1.000	4.748	.057	.814	.003
	Lower-bound	4.748	1.000	4.748	.057	.814	.003
Error(TIME)	Sphericity Assumed	1417.568	17	83.386			
	Greenhouse-Geisser	1417.568	17.000	83.386			
	Huynh-Feldt	1417.568	17.000	83.386			
	Lower-bound	1417.568	17.000	83.386			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Total Cholesterol

Estimates

Measure:MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	197.528	12.163	171.867	223.189
2	190.614	11.252	166.874	214.354

Within-Subjects Factors

Measure:MEASURE_1

TIME	Dependent Variable
1	PreTotChol
2	PostTotChol

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreTotChol	EPcontrol	196.8750	34.03963	8
	EPPBex	198.1818	62.03196	11
	Total	197.6316	50.88026	19
PostTotChol	EPcontrol	176.5000	38.65599	8
	EPPBex	204.7273	54.23669	11
	Total	192.8421	49.19718	19

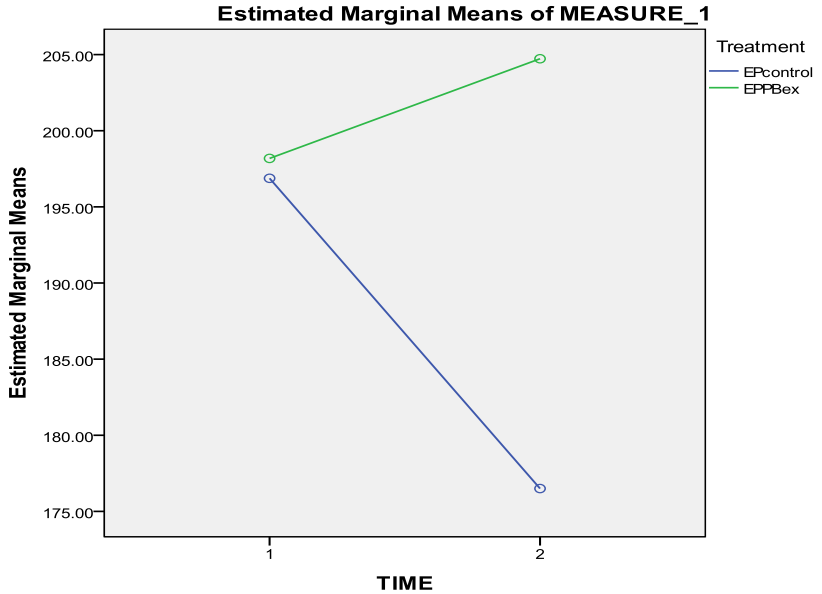
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	442.909	1	442.909	1.207	.287	.066
	Greenhouse-Geisser	442.909	1.000	442.909	1.207	.287	.066
	Huynh-Feldt	442.909	1.000	442.909	1.207	.287	.066
	Lower-bound	442.909	1.000	442.909	1.207	.287	.066
TIME * Treatment	Sphericity Assumed	1678.278	1	1678.278	4.572	.047	.212
	Greenhouse-Geisser	1678.278	1.000	1678.278	4.572	.047	.212
	Huynh-Feldt	1678.278	1.000	1678.278	4.572	.047	.212
	Lower-bound	1678.278	1.000	1678.278	4.572	.047	.212
Error(TIME)	Sphericity Assumed	6240.301	17	367.077			
	Greenhouse-Geisser	6240.301	17.000	367.077			
	Huynh-Feldt	6240.301	17.000	367.077			
	Lower-bound	6240.301	17.000	367.077			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

High-Density Lipoprotein

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	54.330	3.680	46.566	62.093
2	61.773	4.050	53.227	70.318

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreHDL
2	PostHDL

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreHDL	EPcontrol	52.7500	12.54421	8
	EPPBex	55.9091	17.78457	11
	Total	54.5789	15.47513	19
PostHDL	EPcontrol	55.0000	11.71080	8
	EPPBex	68.5455	20.51031	11
	Total	62.8421	18.28255	19

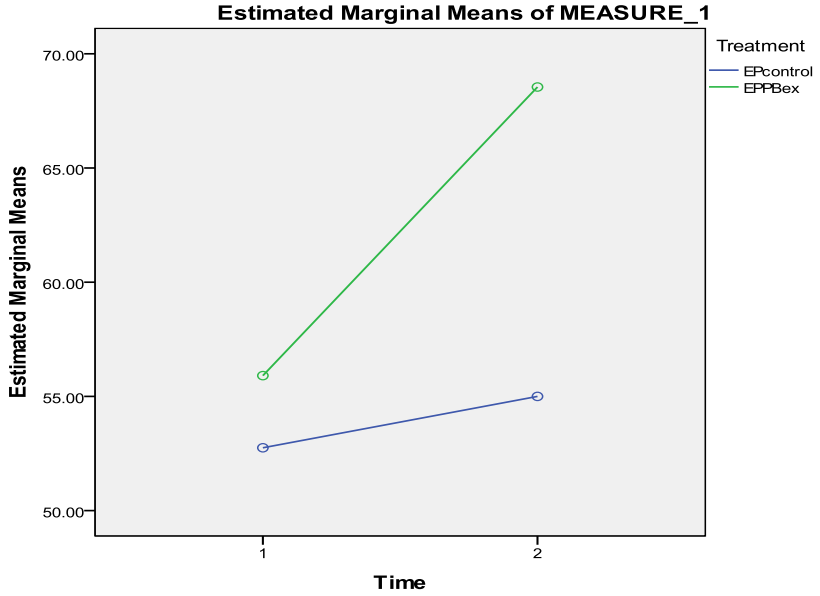
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	513.188	1	513.188	10.448	.005	.381
	Greenhouse-Geisser	513.188	1.000	513.188	10.448	.005	.381
	Huynh-Feldt	513.188	1.000	513.188	10.448	.005	.381
	Lower-bound	513.188	1.000	513.188	10.448	.005	.381
Time * Treatment	Sphericity Assumed	249.819	1	249.819	5.086	.038	.230
	Greenhouse-Geisser	249.819	1.000	249.819	5.086	.038	.230
	Huynh-Feldt	249.819	1.000	249.819	5.086	.038	.230
	Lower-bound	249.819	1.000	249.819	5.086	.038	.230
Error(Time)	Sphericity Assumed	835.023	17	49.119			
	Greenhouse-Geisser	835.023	17.000	49.119			
	Huynh-Feldt	835.023	17.000	49.119			
	Lower-bound	835.023	17.000	49.119			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Low-Density Lipoprotein

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	120.813	10.067	99.573	142.052
2	102.226	9.278	82.651	121.801

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreLDL
2	PostLDL

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreLDL	EPcontrol	116.6250	22.90313	8
	EPPBex	125.0000	53.14697	11
	Total	121.4737	42.32332	19
PostLDL	EPcontrol	89.7250	34.75842	8
	EPPBex	114.7273	43.19049	11
	Total	104.2000	40.82924	19

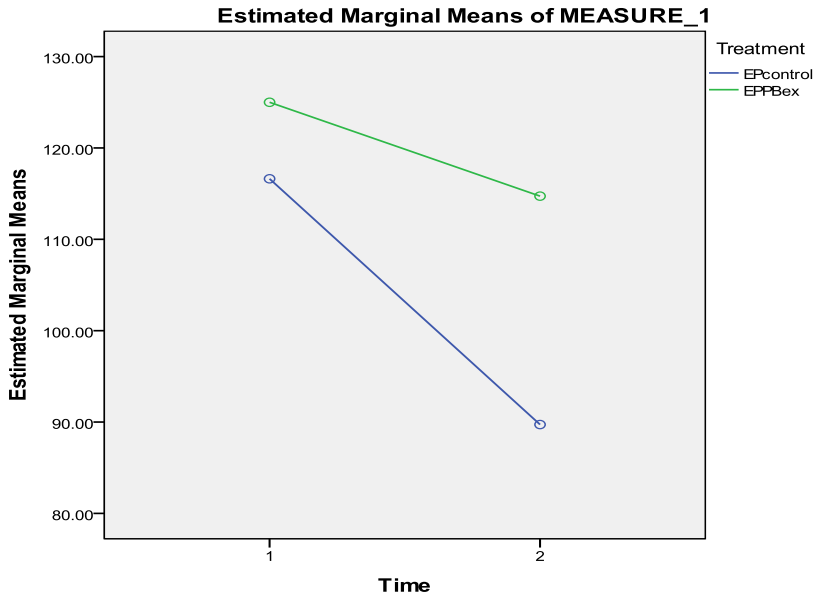
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	3199.985	1	3199.985	6.911	.018	.289
	Greenhouse-Geisser	3199.985	1.000	3199.985	6.911	.018	.289
	Huynh-Feldt	3199.985	1.000	3199.985	6.911	.018	.289
	Lower-bound	3199.985	1.000	3199.985	6.911	.018	.289
Time * Treatment	Sphericity Assumed	640.238	1	640.238	1.383	.256	.075
	Greenhouse-Geisser	640.238	1.000	640.238	1.383	.256	.075
	Huynh-Feldt	640.238	1.000	640.238	1.383	.256	.075
	Lower-bound	640.238	1.000	640.238	1.383	.256	.075
Error(Time)	Sphericity Assumed	7870.971	17	462.998			
	Greenhouse-Geisser	7870.971	17.000	462.998			
	Huynh-Feldt	7870.971	17.000	462.998			
	Lower-bound	7870.971	17.000	462.998			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Resting Systolic Blood Pressure

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	126.506	2.295	121.664	131.347
2	119.966	1.291	117.242	122.690

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreSBP_rest
2	PostSBP_rest

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreSBP_rest	EPcontrol	125.3750	13.87637	8
	EPPBex	127.6364	5.57266	11
	Total	126.6842	9.66697	19
PostSBP_rest	EPcontrol	118.7500	7.14643	8
	EPPBex	121.1818	4.09434	11
	Total	120.1579	5.54039	19

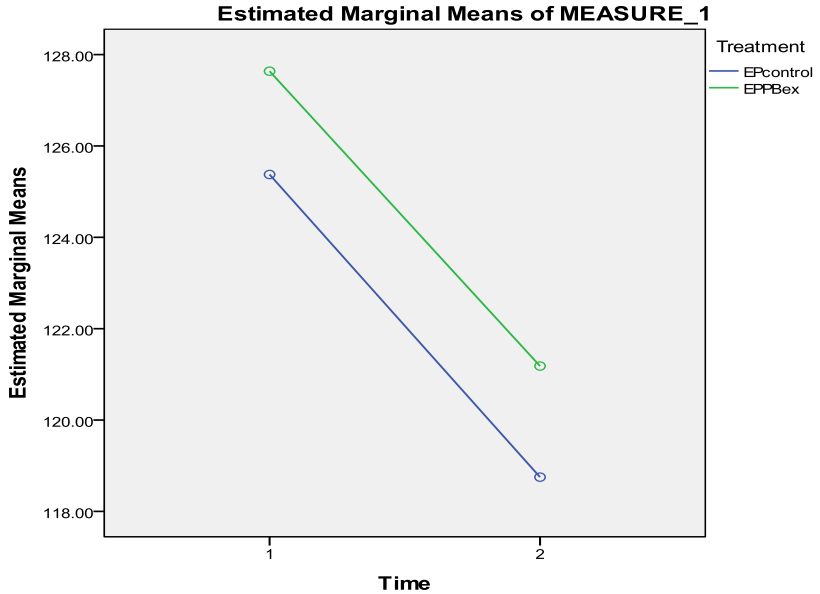
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	396.173	1	396.173	6.550	.020	.278
	Greenhouse-Geisser	396.173	1.000	396.173	6.550	.020	.278
	Huynh-Feldt	396.173	1.000	396.173	6.550	.020	.278
	Lower-bound	396.173	1.000	396.173	6.550	.020	.278
Time * Treatment	Sphericity Assumed	.067	1	.067	.001	.974	.000
	Greenhouse-Geisser	.067	1.000	.067	.001	.974	.000
	Huynh-Feldt	.067	1.000	.067	.001	.974	.000
	Lower-bound	.067	1.000	.067	.001	.974	.000
Error(Time)	Sphericity Assumed	1028.301	17	60.488			
	Greenhouse-Geisser	1028.301	17.000	60.488			
	Huynh-Feldt	1028.301	17.000	60.488			
	Lower-bound	1028.301	17.000	60.488			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Resting Heart Rate

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	67.636	3.396	60.471	74.801
2	67.551	2.375	62.541	72.561

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreHR_rest
2	PostHR_rest

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreHR_rest	EPcontrol	60.0000	9.03960	8
	EPPBex	75.2727	17.49338	11
	Total	68.8421	16.18045	19
PostHR_rest	EPcontrol	63.3750	6.63190	8
	EPPBex	71.7273	12.11686	11
	Total	68.2105	10.79907	19

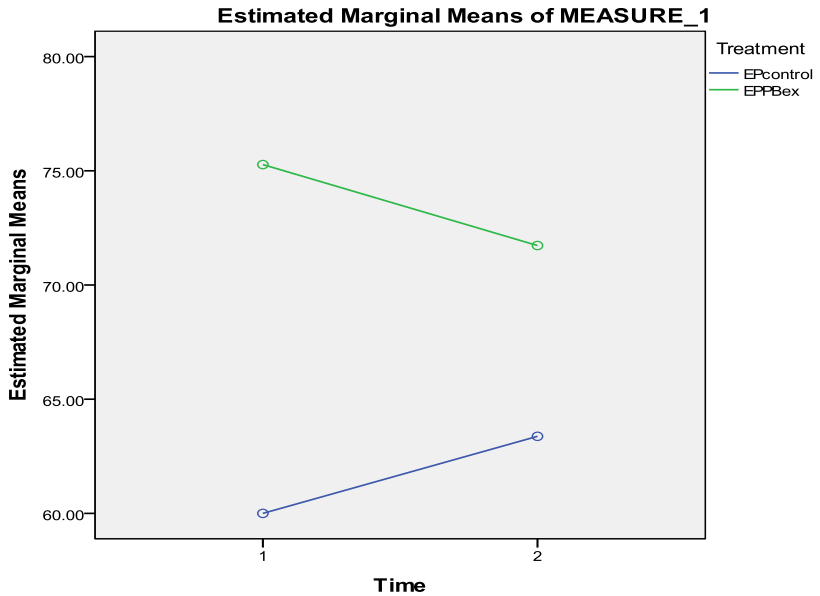
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	.067	1	.067	.001	.977	.000
	Greenhouse-Geisser	.067	1.000	.067	.001	.977	.000
	Huynh-Feldt	.067	1.000	.067	.001	.977	.000
	Lower-bound	.067	1.000	.067	.001	.977	.000
Time * Treatment	Sphericity Assumed	110.909	1	110.909	1.433	.248	.078
	Greenhouse-Geisser	110.909	1.000	110.909	1.433	.248	.078
	Huynh-Feldt	110.909	1.000	110.909	1.433	.248	.078
	Lower-bound	110.909	1.000	110.909	1.433	.248	.078
Error(Time)	Sphericity Assumed	1315.301	17	77.371			
	Greenhouse-Geisser	1315.301	17.000	77.371			
	Huynh-Feldt	1315.301	17.000	77.371			
	Lower-bound	1315.301	17.000	77.371			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Heart Rate at Stage 2 of Bruce Protocol

Estimates

Measure:MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	125.881	5.646	113.968	137.794
2	122.778	4.373	113.553	132.004

Within-Subjects Factors

Measure:MEASURE_1

TIME	Dependent Variable
1	PreHRat2
2	PostHRat2

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreHRat2	EPcontrol	126.1250	23.95494	8
	EPPBex	125.6364	24.54495	11
	Total	125.8421	23.62029	19
PostHRat2	EPcontrol	120.3750	16.42244	8
	EPPBex	125.1818	20.33135	11
	Total	123.1579	18.45193	19

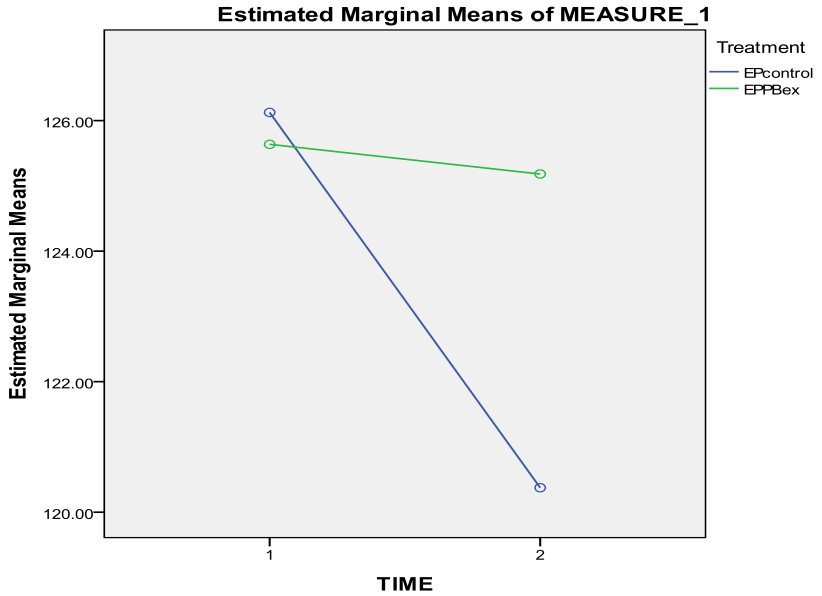
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	89.150	1	89.150	.892	.358	.050
	Greenhouse-Geisser	89.150	1.000	89.150	.892	.358	.050
	Huynh-Feldt	89.150	1.000	89.150	.892	.358	.050
	Lower-bound	89.150	1.000	89.150	.892	.358	.050
TIME * Treatment	Sphericity Assumed	64.939	1	64.939	.650	.431	.037
	Greenhouse-Geisser	64.939	1.000	64.939	.650	.431	.037
	Huynh-Feldt	64.939	1.000	64.939	.650	.431	.037
	Lower-bound	64.939	1.000	64.939	.650	.431	.037
Error(TIME)	Sphericity Assumed	1698.114	17	99.889			
	Greenhouse-Geisser	1698.114	17.000	99.889			
	Huynh-Feldt	1698.114	17.000	99.889			
	Lower-bound	1698.114	17.000	99.889			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Rating of Perceived Exertion at Stage 2 of Bruce Protocol

Estimates

Measure:MEASURE_1

TIME	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	11.568	.431	10.659	12.478
2	11.352	.564	10.162	12.542

Within-Subjects Factors

Measure:MEASURE_1

TIME	Dependent Variable
1	PreRPEat2
2	PostRPEat2

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreRPEat2	EPcontrol	11.5000	.92582	8
	EPPBex	11.6364	2.29228	11
	Total	11.5789	1.80480	19
PostRPEat2	EPcontrol	11.2500	2.37547	8
	EPPBex	11.4545	2.46429	11
	Total	11.3684	2.36198	19

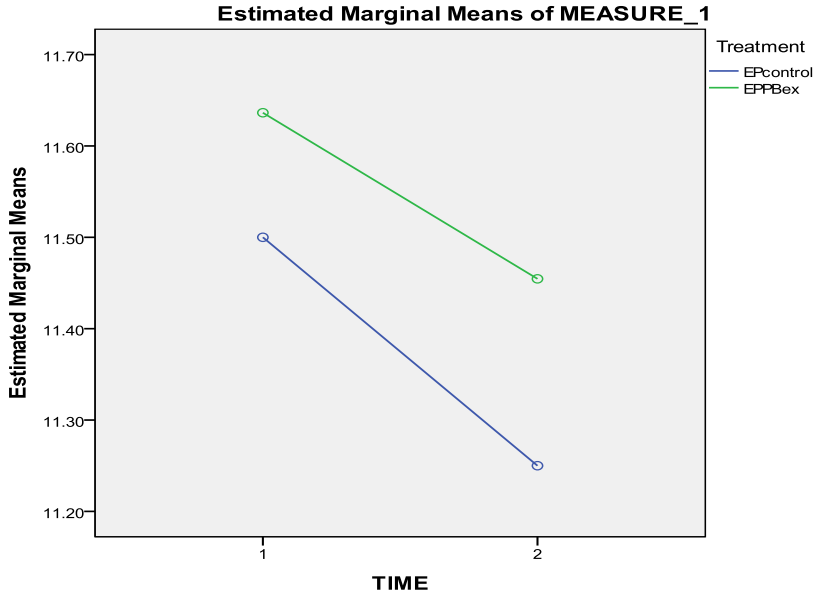
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcontrol	8
	2.00	EPPBex	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
TIME	Sphericity Assumed	.432	1	.432	.225	.641	.013
	Greenhouse-Geisser	.432	1.000	.432	.225	.641	.013
	Huynh-Feldt	.432	1.000	.432	.225	.641	.013
	Lower-bound	.432	1.000	.432	.225	.641	.013
TIME * Treatment	Sphericity Assumed	.011	1	.011	.006	.941	.000
	Greenhouse-Geisser	.011	1.000	.011	.006	.941	.000
	Huynh-Feldt	.011	1.000	.011	.006	.941	.000
	Lower-bound	.011	1.000	.011	.006	.941	.000
Error(TIME)	Sphericity Assumed	32.568	17	1.916			
	Greenhouse-Geisser	32.568	17.000	1.916			
	Huynh-Feldt	32.568	17.000	1.916			
	Lower-bound	32.568	17.000	1.916			



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Quality of Life

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Treatment	18	1.00	2.00	1.6111	.50163
Age	18	28.00	70.00	51.8889	11.65630
Gender	18	.00	1.00	.5556	.51131
PrePhysfunc	18	10.00	100.00	84.4444	26.94706
PostPhysfunc	18	15.00	100.00	90.5556	19.62058
PreRLphys	18	.00	100.00	83.3333	33.21056
PostRLphys	18	50.00	100.00	94.4444	16.16904
PreRLemo	18	.00	100.00	90.7444	25.05970
PostRLemo	18	66.70	100.00	96.3000	10.76858
PreEnergy	18	25.00	85.00	61.6667	17.90498
PostEnergy	18	25.00	80.00	64.1667	17.25671
PreEmowell	18	40.00	92.00	78.4444	14.52876
PostEmowell	18	40.00	92.00	81.7778	13.52799
PreSocial	18	37.50	100.00	90.2778	18.46875
PostSocial	18	62.50	100.00	93.0556	12.29406
PrePain	18	35.00	100.00	78.1944	18.18624
PostPain	18	35.00	100.00	82.0833	18.59495
PreGenhth	18	35.00	95.00	73.3333	18.94264
PostGenhth	18	35.00	95.00	74.1667	14.37420
PreOverall	18	289.50	762.00	640.4389	134.11660
PostOverall	18	461.70	757.00	676.5500	90.77094
Valid N (listwise)	18				

Basic Descriptives. N=18. mean±SD. EPcontrol = Individualized Exercise Prescription (Group 1)
EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Physical Functioning*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	85.065	6.678	70.907	99.223
2	91.623	4.739	81.576	101.670

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PrePhysfunc
2	PostPhysfunc

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PrePhysfunc	EPcon	87.8571	19.33415	7
	EPPBexp	82.2727	31.57243	11
	Total	84.4444	26.94706	18
PostPhysfunc	EPcon	96.4286	3.77964	7
	EPPBexp	86.8182	24.62445	11
	Total	90.5556	19.62058	18

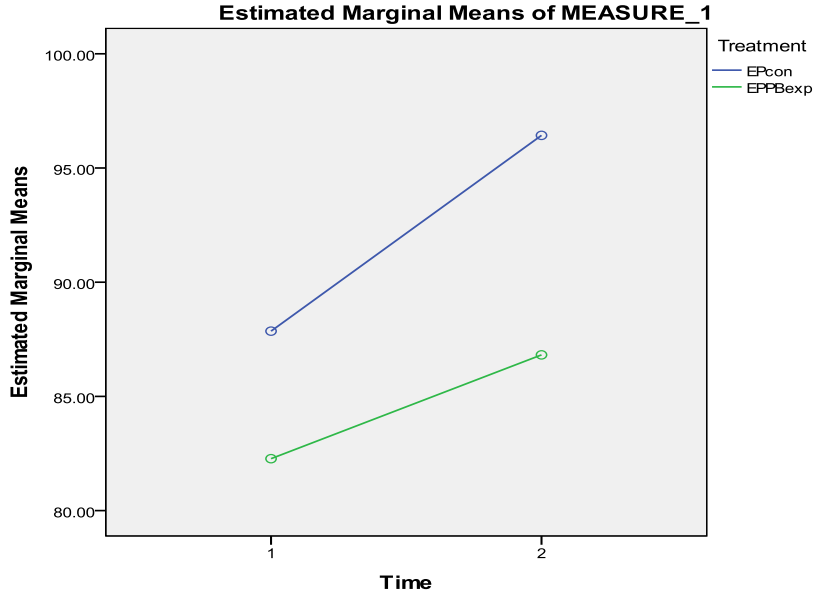
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	368.001	1	368.001	1.579	.227	.090
	Greenhouse-Geisser	368.001	1.000	368.001	1.579	.227	.090
	Huynh-Feldt	368.001	1.000	368.001	1.579	.227	.090
	Lower-bound	368.001	1.000	368.001	1.579	.227	.090
Time * Treatment	Sphericity Assumed	34.668	1	34.668	.149	.705	.009
	Greenhouse-Geisser	34.668	1.000	34.668	.149	.705	.009
	Huynh-Feldt	34.668	1.000	34.668	.149	.705	.009
	Lower-bound	34.668	1.000	34.668	.149	.705	.009
Error(Time)	Sphericity Assumed	3729.221	16	233.076			
	Greenhouse-Geisser	3729.221	16.000	233.076			
	Huynh-Feldt	3729.221	16.000	233.076			
	Lower-bound	3729.221	16.000	233.076			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Role Limitations due to Physical Health*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	80.519	7.646	64.310	96.729
2	92.857	3.612	85.201	100.514

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreRLphys
2	PostRLphys

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreRLphys	EPcon	67.8571	42.60841	7
	EPPBexp	93.1818	22.61335	11
	Total	83.3333	33.21056	18
PostRLphys	EPcon	85.7143	24.39750	7
	EPPBexp	100.0000	.00000	11
	Total	94.4444	16.16904	18

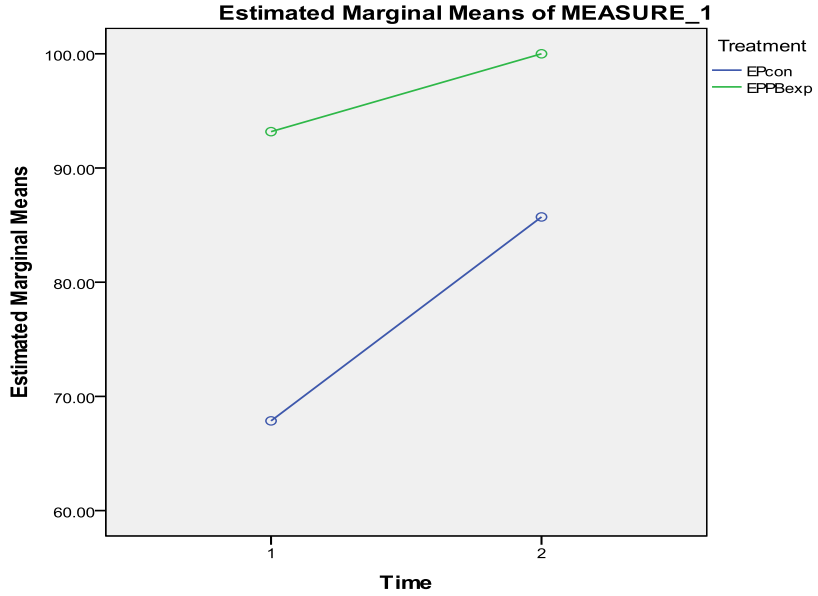
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	1302.309	1	1302.309	3.786	.069	.191
	Greenhouse-Geisser	1302.309	1.000	1302.309	3.786	.069	.191
	Huynh-Feldt	1302.309	1.000	1302.309	3.786	.069	.191
	Lower-bound	1302.309	1.000	1302.309	3.786	.069	.191
Time * Treatment	Sphericity Assumed	260.642	1	260.642	.758	.397	.045
	Greenhouse-Geisser	260.642	1.000	260.642	.758	.397	.045
	Huynh-Feldt	260.642	1.000	260.642	.758	.397	.045
	Lower-bound	260.642	1.000	260.642	.758	.397	.045
Error(Time)	Sphericity Assumed	5503.247	16	343.953			
	Greenhouse-Geisser	5503.247	16.000	343.953			
	Huynh-Feldt	5503.247	16.000	343.953			
	Lower-bound	5503.247	16.000	343.953			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Role Limitations due to Emotional Problems*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	90.697	6.244	77.460	103.935
2	95.243	2.405	90.144	100.342

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreRLemo
2	PostRLemo

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreRLemo	EPcon	90.4857	16.24874	7
	EPPBexp	90.9091	30.15113	11
	Total	90.7444	25.05970	18
PostRLemo	EPcon	90.4857	16.24874	7
	EPPBexp	100.0000	.00000	11
	Total	96.3000	10.76858	18

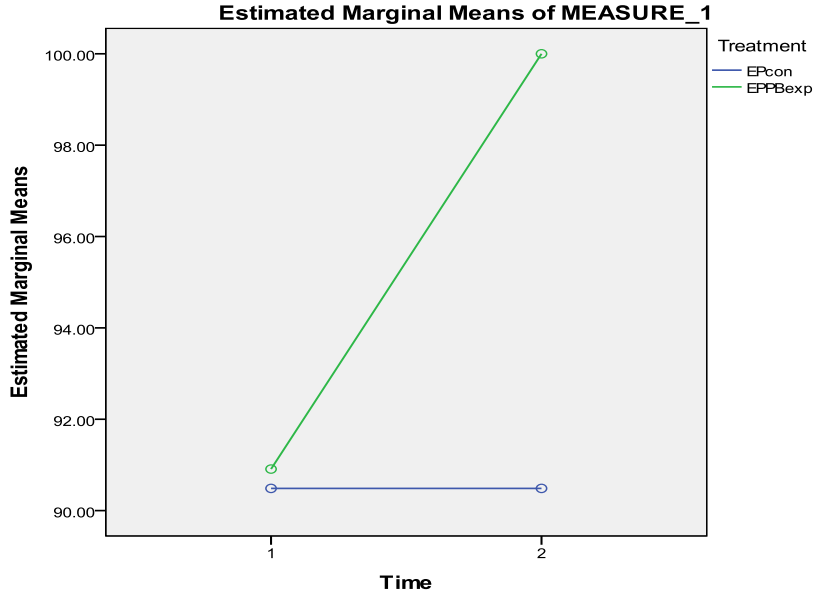
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	176.768	1	176.768	.622	.442	.037
	Greenhouse-Geisser	176.768	1.000	176.768	.622	.442	.037
	Huynh-Feldt	176.768	1.000	176.768	.622	.442	.037
	Lower-bound	176.768	1.000	176.768	.622	.442	.037
Time * Treatment	Sphericity Assumed	176.768	1	176.768	.622	.442	.037
	Greenhouse-Geisser	176.768	1.000	176.768	.622	.442	.037
	Huynh-Feldt	176.768	1.000	176.768	.622	.442	.037
	Lower-bound	176.768	1.000	176.768	.622	.442	.037
Error(Time)	Sphericity Assumed	4545.455	16	284.091			
	Greenhouse-Geisser	4545.455	16.000	284.091			
	Huynh-Feldt	4545.455	16.000	284.091			
	Lower-bound	4545.455	16.000	284.091			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Energy/Fatigue*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	60.065	4.082	51.412	68.718
2	63.539	4.242	54.547	72.531

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreEnergy
2	PostEnergy

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreEnergy	EPcon	52.8571	18.89822	7
	EPPBexp	67.2727	15.55050	11
	Total	61.6667	17.90498	18
PostEnergy	EPcon	60.7143	20.70197	7
	EPPBexp	66.3636	15.34453	11
	Total	64.1667	17.25671	18

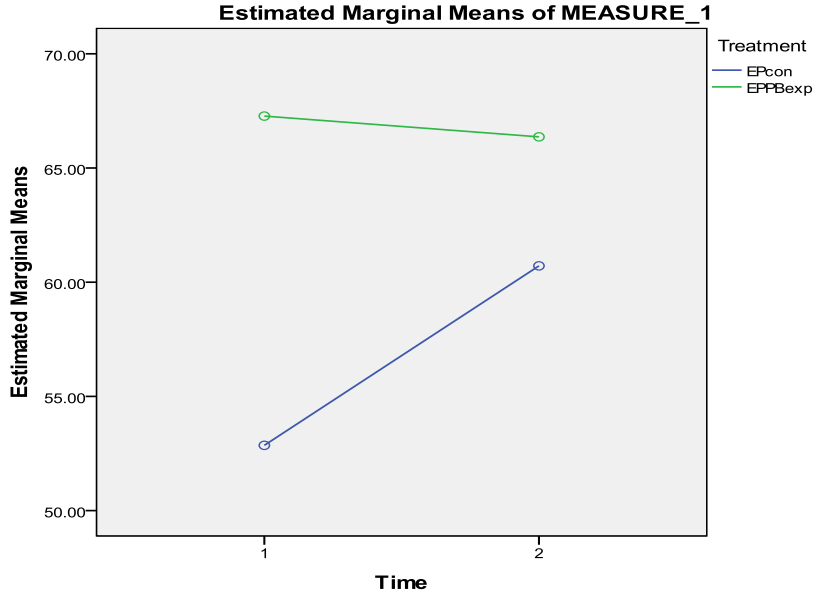
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	103.256	1	103.256	2.914	.107	.154
	Greenhouse-Geisser	103.256	1.000	103.256	2.914	.107	.154
	Huynh-Feldt	103.256	1.000	103.256	2.914	.107	.154
	Lower-bound	103.256	1.000	103.256	2.914	.107	.154
Time * Treatment	Sphericity Assumed	164.367	1	164.367	4.639	.047	.225
	Greenhouse-Geisser	164.367	1.000	164.367	4.639	.047	.225
	Huynh-Feldt	164.367	1.000	164.367	4.639	.047	.225
	Lower-bound	164.367	1.000	164.367	4.639	.047	.225
Error(Time)	Sphericity Assumed	566.883	16	35.430			
	Greenhouse-Geisser	566.883	16.000	35.430			
	Huynh-Feldt	566.883	16.000	35.430			
	Lower-bound	566.883	16.000	35.430			



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Quality of Life – *Emotional Well-Being*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	78.000	3.586	70.399	85.601
2	81.351	3.337	74.277	88.424

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreEmowell
2	PostEmowell

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreEmowell	EPcon	76.0000	17.12698	7
	EPPBexp	80.0000	13.26650	11
	Total	78.4444	14.52876	18
PostEmowell	EPcon	79.4286	18.10025	7
	EPPBexp	83.2727	10.40280	11
	Total	81.7778	13.52799	18

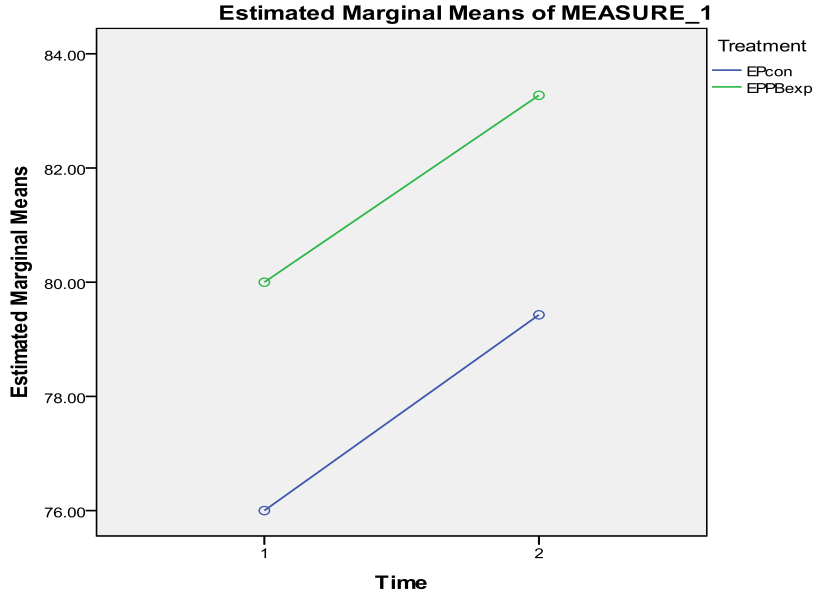
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	96.052	1	96.052	8.540	.010	.348
	Greenhouse-Geisser	96.052	1.000	96.052	8.540	.010	.348
	Huynh-Feldt	96.052	1.000	96.052	8.540	.010	.348
	Lower-bound	96.052	1.000	96.052	8.540	.010	.348
Time * Treatment	Sphericity Assumed	.052	1	.052	.005	.947	.000
	Greenhouse-Geisser	.052	1.000	.052	.005	.947	.000
	Huynh-Feldt	.052	1.000	.052	.005	.947	.000
	Lower-bound	.052	1.000	.052	.005	.947	.000
Error(Time)	Sphericity Assumed	179.948	16	11.247			
	Greenhouse-Geisser	179.948	16.000	11.247			
	Huynh-Feldt	179.948	16.000	11.247			
	Lower-bound	179.948	16.000	11.247			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Social Functioning*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	89.123	4.415	79.764	98.483
2	92.695	3.037	86.258	99.132

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreSocial
2	PostSocial

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreSocial	EPcon	83.9286	17.25164	7
	EPPBexp	94.3182	18.84446	11
	Total	90.2778	18.46875	18
PostSocial	EPcon	91.0714	15.66958	7
	EPPBexp	94.3182	10.25249	11
	Total	93.0556	12.29406	18

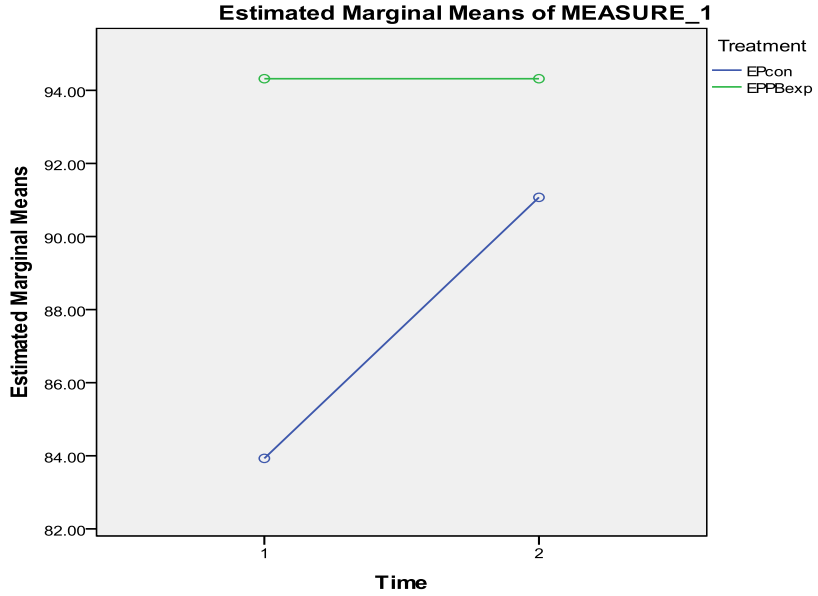
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	109.127	1	109.127	1.029	.325	.060
	Greenhouse-Geisser	109.127	1.000	109.127	1.029	.325	.060
	Huynh-Feldt	109.127	1.000	109.127	1.029	.325	.060
	Lower-bound	109.127	1.000	109.127	1.029	.325	.060
Time * Treatment	Sphericity Assumed	109.127	1	109.127	1.029	.325	.060
	Greenhouse-Geisser	109.127	1.000	109.127	1.029	.325	.060
	Huynh-Feldt	109.127	1.000	109.127	1.029	.325	.060
	Lower-bound	109.127	1.000	109.127	1.029	.325	.060
Error(Time)	Sphericity Assumed	1696.429	16	106.027			
	Greenhouse-Geisser	1696.429	16.000	106.027			
	Huynh-Feldt	1696.429	16.000	106.027			
	Lower-bound	1696.429	16.000	106.027			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Pain*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	76.834	4.266	67.792	85.877
2	81.769	4.620	71.975	91.564

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PrePain
2	PostPain

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PrePain	EPcon	70.7143	15.25576	7
	EPPBexp	82.9545	18.93470	11
	Total	78.1944	18.18624	18
PostPain	EPcon	80.3571	21.33212	7
	EPPBexp	83.1818	17.64550	11
	Total	82.0833	18.59495	18

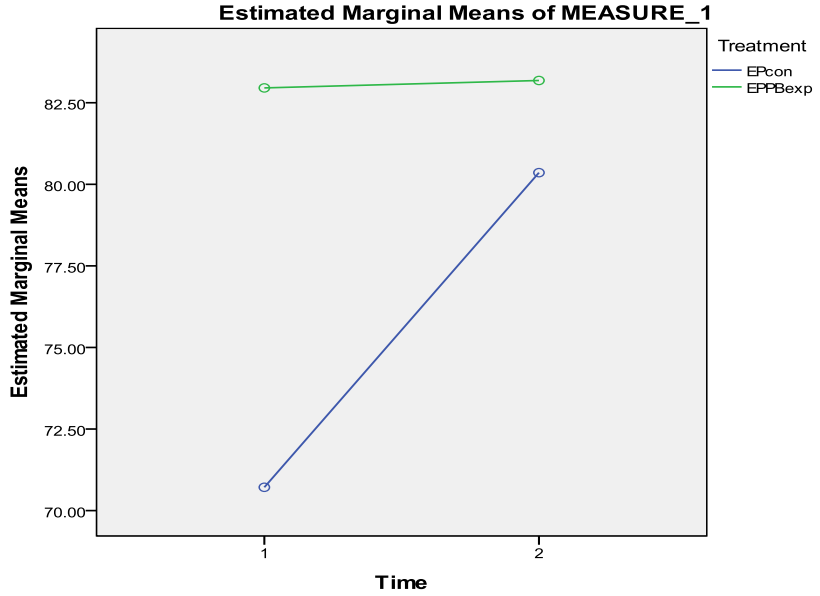
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	208.369	1	208.369	4.525	.049	.220
	Greenhouse-Geisser	208.369	1.000	208.369	4.525	.049	.220
	Huynh-Feldt	208.369	1.000	208.369	4.525	.049	.220
	Lower-bound	208.369	1.000	208.369	4.525	.049	.220
Time * Treatment	Sphericity Assumed	189.619	1	189.619	4.118	.059	.205
	Greenhouse-Geisser	189.619	1.000	189.619	4.118	.059	.205
	Huynh-Feldt	189.619	1.000	189.619	4.118	.059	.205
	Lower-bound	189.619	1.000	189.619	4.118	.059	.205
Error(Time)	Sphericity Assumed	736.769	16	46.048			
	Greenhouse-Geisser	736.769	16.000	46.048			
	Huynh-Feldt	736.769	16.000	46.048			
	Lower-bound	736.769	16.000	46.048			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *General Health*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	72.078	4.504	62.530	81.626
2	73.539	3.512	66.095	80.983

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreGenhth
2	PostGenhth

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreGenhth	EPcon	66.4286	22.67787	7
	EPPBexp	77.7273	15.71045	11
	Total	73.3333	18.94264	18
PostGenhth	EPcon	70.7143	17.66083	7
	EPPBexp	76.3636	12.26599	11
	Total	74.1667	14.37420	18

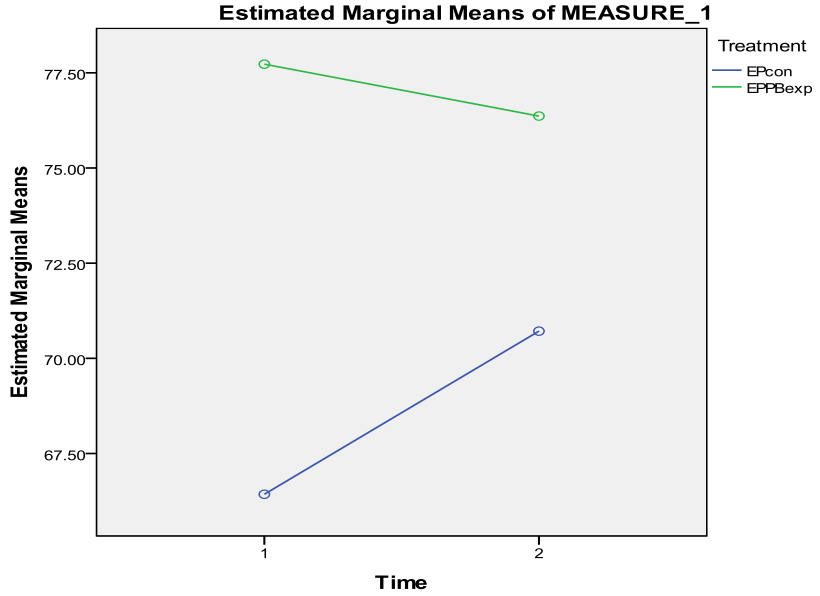
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	18.263	1	18.263	.184	.674	.011
	Greenhouse-Geisser	18.263	1.000	18.263	.184	.674	.011
	Huynh-Feldt	18.263	1.000	18.263	.184	.674	.011
	Lower-bound	18.263	1.000	18.263	.184	.674	.011
Time * Treatment	Sphericity Assumed	68.263	1	68.263	.688	.419	.041
	Greenhouse-Geisser	68.263	1.000	68.263	.688	.419	.041
	Huynh-Feldt	68.263	1.000	68.263	.688	.419	.041
	Lower-bound	68.263	1.000	68.263	.688	.419	.041
Error(Time)	Sphericity Assumed	1587.987	16	99.249			
	Greenhouse-Geisser	1587.987	16.000	99.249			
	Huynh-Feldt	1587.987	16.000	99.249			
	Lower-bound	1587.987	16.000	99.249			



*EPcontrol = Individualized Exercise Prescription (Group 1) & EPPBex = Individualized Exercise Prescription and Pedometer-Base Program (Group 2)

Quality of Life – *Overall*

Estimates

Measure:MEASURE_1

Time	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	649.481	31.834	581.995	716.967
2	679.131	22.432	631.577	726.684

Within-Subjects Factors

Measure:MEASURE_1

Time	Dependent Variable
1	PreOverall
2	PostOverall

Descriptive Statistics

	Treatment	Mean	Std. Deviation	N
PreOverall	EPcon	690.1714	102.46783	7
	EPPBexp	608.7909	146.44272	11
	Total	640.4389	134.11660	18
PostOverall	EPcon	690.7429	101.98634	7
	EPPBexp	667.5182	86.80699	11
	Total	676.5500	90.77094	18

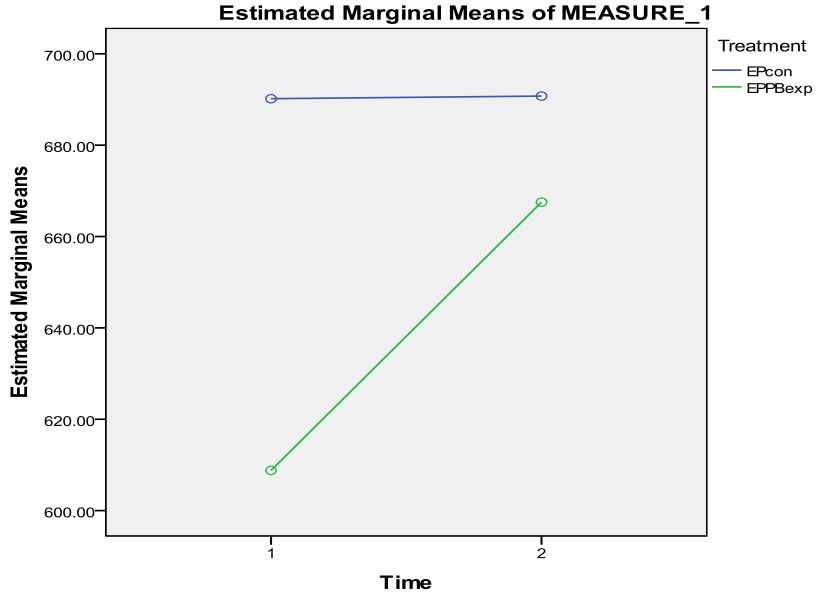
Between-Subjects Factors

		Value Label	N
Treatment	1.00	EPcon	7
	2.00	EPPBexp	11

Tests of Within-Subjects Effects

Measure:MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time	Sphericity Assumed	7521.052	1	7521.052	2.438	.138	.132
	Greenhouse-Geisser	7521.052	1.000	7521.052	2.438	.138	.132
	Huynh-Feldt	7521.052	1.000	7521.052	2.438	.138	.132
	Lower-bound	7521.052	1.000	7521.052	2.438	.138	.132
Time * Treatment	Sphericity Assumed	7233.941	1	7233.941	2.345	.145	.128
	Greenhouse-Geisser	7233.941	1.000	7233.941	2.345	.145	.128
	Huynh-Feldt	7233.941	1.000	7233.941	2.345	.145	.128
	Lower-bound	7233.941	1.000	7233.941	2.345	.145	.128
Error(Time)	Sphericity Assumed	49364.948	16	3085.309			
	Greenhouse-Geisser	49364.948	16.000	3085.309			
	Huynh-Feldt	49364.948	16.000	3085.309			
	Lower-bound	49364.948	16.000	3085.309			



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A-4: Recruitment Brochure.

Exercise Stress-Testing Program

We started this as a cooperative program between the Health and Human Performance (HHP) Dept. at the University of Montana and the American Heart Association – Missoula Go Red program – and over the past several years have expanded to include University on Montana Employees and retirees who are 50 years or older or who have multiple risk factors for CHD or metabolic syndrome (ie: high blood pressure, high cholesterol, overweight, physically inactive, high blood sugar, shortness of breath during light exercise, etc.).

The service includes health screening, a finger prick blood analysis of glucose and cholesterol, a treadmill stress test, basic strength and flexibility testing and body composition analysis. A results packet is put together by HHP students specific to your results. A team of students will meet with you to go over your results and help you develop a plan to reduce your risk factors for chronic diseases and to help you become more physically active.

This is a **free service** by HHP students and faculty for University faculty, staff and Missoula Community members. Males and females are invited to participate. You can participate even if you have known heart disease, diabetes, hypertension or other ailments! We adjust the intensity of the exercise test to your degree of risk and adhere to exercise testing and prescription guidelines of the American College of Sports Medicine and AMA.

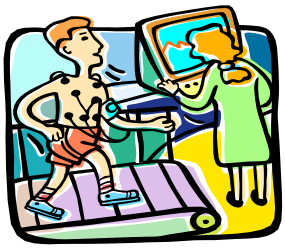
Purpose:

1) Provide on-going testing (stress, aerobic, strength, body composition and risk factor) and behavior change consultations for University faculty, staff and Missoula Community members.
2) Help University faculty, staff and Missoula Community members understand their risk factors for heart disease and other chronic diseases and how to change lifestyle behaviors to improve health.
3) Provide hands-on learning for senior students in the HHP department. These are great students and you provide a wonderful resource for them to learn how to work with clients. All student stress testing is supervised by Dr. Gaskill. The students are learning and we ask that you help them by giving positive feedback or suggestions to improve as necessary.

Program:

1) Testing is completed in April and May during the spring semester plus October and November during the fall semester.
2) You can chose which aspects of the program you would like to participate in, but we encourage all tests.
3) The stress testing intensity is limited by the numbers of risk factors that you have, or if you have known heart disease. Thus, the stress test may only be administered through moderate intensity, but if allowed, you may be pushed to a moderately hard intensity. Since we do not take most participants to maximal intensity, the stress test cannot rule out heart disease, but can give you feedback on the safety of exercise at moderate to moderately hard intensities.

FREE EXERCISE-STRESS TESTING



Getting started:

If you are interested, please email Steven Gaskill, Ph.D. at the University of Montana with your email address and phone number where we can contact you. You will be emailed a packet of information and can decide if you want to participate. We would love to have you.

Steven.gaskill@umontana.edu

Beginning:
October 2010

A-5: Bruce Ramp Protocol.

Stage	MPH	Grade	HR	RPE	Angina	BP	ECG Notes
Resting							
Standing							
Warm-up	2.0	0					
Bruce 1	1.8	10					
Bruce 2	2.5	12					
Bruce 3	3.4	14					
Bruce 4	4.2	16					
Recovery	2.0	0					
Seated							

A-6: ACSM Guidelines for Terminating a Stress-Test.

	Criteria for Stopping a GXT in Apparently Healthy Adults
1.	Onset of Angina or angina-like symptoms
2.	Ventricular tachycardia
3.	Significant decrease in SBP, 20 mmHg or more
4.	Failure of SBP and/or HR to rise with an increase in exercise load
5.	Light-headedness, confusion, ataxia, pallor, cyanosis, nausea, or signs of severe peripheral circulatory insufficiency.
6.	Early onset horizontal or down sloping S-T segment depression or elevation (>4mm)
7.	Increasing ventricular ectopy, multiform PVCs
8.	Excessive increase in blood pressure: systolic>260mmHg; diastolic>115mmHg
9.	Decrease in HR < 25 beats·min^{-1} of predicted normal value (in the absence of beta blockade medicine)
10.	Sustained supraventricular tachycardia
11.	Subject requests to stop test for whatever reason
12.	Equipment failure

From: *ACSM's Guidelines for Exercise Testing and Prescription.* 8th Ed. Baltimore: Lippincott, Williams & Wilkins, 2009.

A-7: Pedometer Log.

Weekly Recording Log

Client ID #:_____

Date	Step Goal	Actual Steps	General Comments What You Did For Physical Activity

INSTRUCTIONS

For each day:

- You can record the date under the "Date" box
- Record a personal step goal based on your plan or goals (The American College of Sports Medicine recommends 10,000 steps per day for health)
- Before bed, record the number of steps your pedometer reads for the day
- Under "General Comments" above, note the duration of your activity/exercise and a description of the type of activity/exercise

* Please remember, we hope that you can record your steps each day, but we do understand when some days are missed.

A-8: Weekly Call Log for Pedometer-Base Group.

12/10/2010	Client ID	No Contact	Contact	Left Message
	1			x
	3			x
	5		x	
	8			x
	9			x
	14			x
	15		x	
	17			x
	18		x	
	19			x
	20			x
	25			x
	26			x
	28			x
	32			x
	33		x	
	34			x
	35			x
	38			x
	39	x		
	40			x

12/17/2010	Client ID	No Contact	Contact	Left Message
	1			x
	3			x
	5		x	
	8		x	
	9			x
	14			x
	15			x
	17			x
	18		x	
	19			x
	20		x	
	25			x
	26		x	
	28		x	
	32			x
	33		x	
	34			x
	35			
	38		x	
	39		x	
	40		x	

1/14/2011	Client ID	No Contact	Contact	Left Message
	1			x
	3			x
	5		x	
	8			x
	9			x
	14			x
	15		x	
	17			x
	18		x	
	19			x
	20			x
	25			x
	26			x
	28			x
	32			x
	33		x	
	34			x
	35			x
	38			x
	39		x	
	40			x

1/21/2011	Client ID	No Contact	Contact	Left Message
	1			x
	3			x
	5			x
	8	x		
	9	x		
	14	x		
	15			x
	17			x
	18			x
	19			
	20		x	
	25			x
	26		x	
	28		x	
	32			x
	33		x	
	34			x
	35	x		
	38			x
	39			x
	40		x	

1/29/2011	Client ID	No Contact	Contact	Left Message
	1			x
	3			x
	5		x	
	8			x
	9			x
	14			x
	15		x	
	17			x
	18		x	
	19			x
	20			x
	25			x
	26			x
	28			x
	32			x
	33		x	
	34			x
	35			x
	38			x
	39	x		
	40			x

2/3/2011	Client ID	No Contact	Contact	Left Message
	1		x	
	3			x
	5		x	
	8		x	
	9			x
	14			x
	15			x
	17			x
	18		x	
	19			x
	20		x	
	25			x
	26		x	
	28		x	
	32			x
	33			
	34			x
	35		x	
	38		x	
	39		x	
	40		x	

2/10/2011	Client ID	No Contact	Contact	Left Message
	1			x
	3		x	
	5			x
	8		x	
	9			x
	14			x
	15			x
	17			x
	18		x	
	19			x
	20		x	
	25			x
	26			x
	28		x	
	32			x
	33		x	
	34			x
	35		x	
	38			x
	39		x	
	40		x	

2/18/2011	Client ID	No Contact	Contact	Left Message
	1			x
	3		x	
	5		x	
	8			x
	9			x
	14			x
	15		x	
	17			x
	18			x
	19			x
	20		x	
	25		x	
	26			x
	28		x	
	32			x
	33		x	
	34			x
	35			x
	38			x
	39		x	
	40			x

A-9: RAND SF-36 – Quality of Life Survey

RAND 36 ITEM HEALTH SURVEY 1.0

Client ID #: _____

1. In general, would you say your health is:
(Circle One Number)

Excellent 1
Very Good 2
Good 3
Fair 4
Poor 5

2. **Compared to one year ago**, how would you rate your: general health right **now** ?
(Circle One Number)

Much better than one year ago 1
Somewhat better than one year ago 2
About the same 3
Somewhat worse now than one year ago 4
Much worse now than one year ago 5

The following items are about activities you might do during a typical day: Does **your health now limit you** in these activities ? If so, how much ? **(Circle One Number on Each Line)**	**Yes, Limited A Lot**	**Yes, Limited A Little**	**No, Not Limited at All**
3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	1	2	3
4. **Moderate activities**, such as moving a table pushing a vacuum cleaner, bowling or playing golf	1	2	3
5. Lifting or carrying groceries	1	2	3
6. Climbing **several** fights of stairs	1	2	3
7. Climbing **one** flight of stairs	1	2	3
8. Bending, kneeling or stooping	1	2	3
9. Walking **more than a mile**	1	2	3
10. Walking **several blocks**	1	2	3
11. Walking **one block**	1	2	3
12. Bathing or dressing yourself	1	2	3

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health** ?: **(Circle One Number on Each Line)**	**Yes**	**No**
13. Cut down the amount of time you spend on work or other activities	1	2
14. Accomplish less than you would like	1	2
15. Were limited in the kind of work or other activities	1	2
16. Had difficulty performing the work or other activities (for example, took extra effort)	1	2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** ?: (depressed, anxious) **(Circle One Number on Each Line)**	**Yes**	**No**
17. Cut down the amount of time you spend on work or other activities	1	2
18. Accomplish less than you would like	1	2
19. Didn't do work or other activities as carefully as usual	1	2

20. During the **past 4 weeks**, to what extent has your physical health or emotional: problems interfered with your normal social activities with family, friends, neighbors or groups?
(Circle One Number)

Not at all 1
Slightly 2
Moderate 3
Quite a bit 4
Good 5

21. How much **bodily** pain have you had during the **past 4 weeks**:
(Circle One Number)

None 1
Very Mild 2
Mild 3
Moderate 4
Severe 5
Very Severe 6

22. During the **past 4 weeks**, how much did pain interfere with your normal work (including both work outside the home and housework ?
(Circle One Number)

Not at all 1
Slightly 2
Moderately 3
Quite a bit 4
Extremely 5

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the past 4 weeks . . . **(Circle One Number on Each Line)**	**All of the Time**	**Most of the Time**	**A Good Bit of the Time**	**Some of the Time**	**A Little of the Time**	**None of the Time**
23. Did you feel full of pep ?	1	2	3	4	5	6
24. Have you been a very nervous person ?	1	2	3	4	5	6
25. Have you felt so down in the dumps that nothing could cheer you up ?	1	2	3	4	5	6
26. Have you felt calm and peaceful ?	1	2	3	4	5	6
27. Do you have a lot of energy ?	1	2	3	4	5	6
28. Have you felt downhearted and blue ?	1	2	3	4	5	6
29. Did you feel worn out ?	1	2	3	4	5	6
30. Have you been a happy person ?	1	2	3	4	5	6
31. Did you feel tired ?	1	2	3	4	5	6

32. During the **past 4 weeks**, to what extent has your **physical health or emotional problems** interfered with your normal social activities like visiting with family, friends, relatives, etc.?
(Circle One Number)

All of the time 1
Most of the time 2
Some of the time 3
A little of the time 4
None of the time 5

How TRUE or FALSE is each of the following statements for you ?

(Circle One Number on Each Line)	**Definitely True**	**Mostly True**	**Don't Know**	**Mostly False**	**Definitely False**
33. I seem to get sick a little easier than other people	1	2	3	4	5
34. I am as healthy as anybody I know	1	2	3	4	5
35. I expect my health to get worse	1	2	3	4	5
36. My health is excellent	1	2	3	4	5

Comments: _____

_____