EFFECTS OF SEVERE AND PERSISTENT MENTAL ILLNESS ON MAXIMAL AEROBIC CAPACITY

A Thesis by

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The following faculty members have examined the final copy of this thesis for form and content, and recommend that it be accepted in partial fulfillment of the requirement for the degree of Master of Education with a major in Exercise Science.

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DEDICATION

This is dedicated to my sister Sarah who helped me through this long process.

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ABSTRACT

Maximal aerobic capacity (VO_{2max}) is a good indicator of overall health and is commonly measured in the general population, but often goes overlooked in individuals with SMI. Previous studies involving exercise and SMI focus mainly on self-perception and mood. Only one study has measured the VO_{2max} in this select population while promoting exercise and dietary changes. Purpose**:** To assess the maximum aerobic capacity, weight, and body fat percentage (BF%) in individuals with SMI. Methods**:** Weight, BF%, and VO_{2max} were measured prior to wellness intervention (pre) and following wellness intervention (post). Forty-nine individuals (27=male, 22=female) with a mean age of 43±13.20 years of age and a diagnosis meeting the criteria for severe and persistent mental illness (SMI) were assessed. SMI classification among the subjects as follows: schizophrenia (n=11), bipolar disorder (n=17), schizoaffective disorder (n=14), major depressive disorder (n=7). Results**:** No significant difference was observed between baseline and endpoint measurements of BF% in all diagnoses except MDD. Males with MDD benefited from a wellness intervention with a significantly lower BF% ($p(.036);p<0.05$). A wellness intervention did not increase in the VO_{2max} in individuals with SMI ($p(.0358);p<0.05$). Individuals with SMI continually rated in the very poor to poor section for VO_{2max}. Conclusion: Individuals with SMI tend to have low aerobic capacity and high body fat percentage. Individuals in the current study did not benefit from a wellness intervention in terms of BF% and VO_{2max} except males with MDD. Males with MDD significantly lowered their BF% following a wellness intervention.

TABLE OF CONTENTS

CHAPTER PAGE

TABLE OF CONTENTS CONT.

CHAPTER PAGE

LIST OF TABLES

TABLE PAGE

CHAPTER ONE

INTRODUCTION

Maximal aerobic capacity measures cardiorespiratory fitness, an important indicator of overall health and longevity. Exercise is a major component in improving maximal aerobic capacity, lowering the risk of morbities (Dalleck & Dalleck, 2008). Lifestyle factors such as obesity, smoking, and sedentary behavior impact your cardiorespatory fitness over time and place your body at higher risk for morbidites (Liu & Spaulding, 2010). Sedentary behavior has been stated as the biggest health concern this century for all populations (Blair, 2009). Two-thirds of the general population is currently overweight or obese due to poor dietary choices and lack of exercise (CDC, 2011). In addition to the general population, health interventions are now prominent in specialized populations due to the increase of modifiable risk factors found.

Severe and persistent mental illness (SMI) is associated with higher levels of modifiable risk factors and mortality rates than in the general population. Modifiable risk factors, such as smoking, obesity, sedentary behavior, and substance abuse lead to significant morbidities such as hyperglycemia, hypertension, cardiovascular disease, liver disease, and respiratory disease. These comorbid illnesses are as high as 60 percent among people with SMI (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005). Due to concerning levels of mortality, morbidity, and years of potential life lost in the SMI population, research and change in treatment has progressively grown since 2000.

Statement of Problem

Thirty percent of Americans are diagnosed with a mental illness; often they are diagnosed with multiple disorders (Kessler, Chiu, Demler, & Walters, 2005). Individuals with SMI face a high mortality rate of 2.5 times the general population and a life-expectancy shortened by 20-25 years (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005)(Viron & Stern, 2010). Schizophrenia and bipolar disorder are two of the most common diseases faced in the SMI population. Schizophrenia and bipolar disorder affect 2.4 million and 5.7 million Americans annually, respectively (NAMI, 2010).

All too commonly, these individuals slip through the cracks and do not receive adequate healthcare and health education. A major push to integrate health education into medical practice for people with SMI is being promoted due to the high mortality rate. Emerging literature is centered on an exercise education component for preventing weight gain among individuals with SMI (Richardson, Avripas and Neal)(Skrinar, Huxley and Hutchinson)(Pelletier, Nguyen and Bradley)(McDevitt, Wilbur and Kogan).

A recent publication focused on 966 people with SMI who participated in an exercise activity evaluation. Thirty-seven percent of individuals with SMI did not engage in exercise at all and 31% engaged in at least 90 minutes of exercise per week (Smith, et al., 2007) compared to 35 percent of the American population not participating in any form of exercise (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005). A major challenge in the SMI population is instituting exercise into everyday routine. The exercise drop-out rate in these patients is approximately 90% after 6 months, compared to 50% in the general population after 6 months (Smith, et al., 2007) (Warren, Ball, Feldman, Liu,

McMahon, & Kelly, 2010). Due to the high rates of obesity, a national consensus panel has recommended exercise and nutritional counseling for all overweight and obese patients taking antipsychotic medications (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005).

1.1 Purpose

The purpose of this study is to assess maximal aerobic capacity prior and following a wellness intervention in community-based individuals with severe and persistent mental illness.

1.2 Significance of Study

Maximal aerobic capacity (Vo_{2max}) rarely is assessed in the SMI population with weight acting as the common indicator of health. This is the first study in the SMI population to assess VO_{2max} using a cycle ergometer.

1.3 Variables

1.3.1 Independent Variable

The independent variables in this study were the type of severe mental illness, lifestyle, and environment.

1.3.2 Dependent Variable

The dependent variable in this study was maximal aerobic capacity.

1.4 Hypothesis

It is hypothesized that maximal aerobic capacity will increase significantly following a wellness intervention.

1.5 Definitions

1. Severe and Persistent Mental Illness (SMI): a diagnosable mental, behavioral, or emotional disorder that meets criteria in the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) resulting in functional impairment that interferes with major life activities (Colton & Manderscheid, 2006).
2. Maximal Aerobic Capacity (VO_{2max}): the maximum rate of oxygen that can be used for production of ATP during exercise (ACSM, 2010).
3. Body Mass Index (BMI): body weight (in kg) divided by height^2 (in meters) is an expression used to evaluate weight in the context of the distribution of mass over an individual's height (ACSM, 2010).
4. Exercise: physical activity that is planned, structured, and repetitive causing a physiological stress on the body that will result in an adaptation (Caspersen, Powell, & Christenson, 1985).
5. Physical Activity: any bodily movement produced by skeletal muscles, that result in energy expenditure (Caspersen, Powell, & Christenson, 1985).
6. Cardiorespiratory Fitness: the ability to engage in physical activities that rely on oxygen consumption as the primary source of energy; best indicated by the body's ability to transport and utilize oxygen (ie: VO_{2max}) (ACSM, 2010).
7. Hyperglycemia: high levels of glucose in the blood.
8. Diagnostic and Statistical Manual of Mental Disorders (DSM) IV: a classification of all mental disorders for both children and adults published

by the American Psychiatric Association. The latest issue was published in 1995 (fourth edition).

9. Sedentary Lifestyle: characterized as not participating in any physical activity.
10. Schizophrenia: profound disruption in cognition and emotion, affecting the most fundamental human attributes: language, thought, perception, affect, and sense of self (American Psychiatric Association, 2000).
11. Bipolar I Disorder: characterized as one or more manic episodes or mixed episodes, also a major depressive episode usually occurs (American Psychiatric Association, 2000).
12. Bipolar II Disorder: disorder does not include a manic episode but one or more hypomanic episodes and one or more major depressive episodes (American Psychiatric Association, 2000).

1.6 Assumptions

In order for the experimental design to be valid the author has accepted the following assumptions.

1. It is assumed that the individuals involved in this study were truthful regarding their health and any concerns before participating in the sub-maximal aerobic test.
2. It is assumed that the MONARK cycle ergometer and MONARK analysis software was correctly and accurately in working order, per the manufacturer.

3. It is assumed that each individual participated in the sub-maximal aerobic test to the best of his or her ability giving an accurate reading of maximal aerobic capacity.

1.7 Limitations

The author recognizes the limitations to this experimental design and will briefly discuss them in this section.

1. The major limitation in this study was the inability to consistently have individuals come and be tested after allotted durations.
2. Although this study tests a larger sample size than previous studies, it is still small and a larger sample size would allow for more of the diagnoses tested and may provide more accurate results.
3. The sample size had a vast age range, 18-62 years of age. Looking at a specific age group for the entire duration of the study would allow for the decrease in maximal aerobic capacity with age.
4. Exercise (physical activity) increases maximal aerobic capacity, this study did not track the amount of exercise completed by each individual outside of a local health club.

1.8 Delimitations

The individuals involved in this study have SMI and have had no changes in medications three weeks prior to the wellness intervention. Maximal aerobic capacity results are calculated through the MONARK cycle ergometer and software; therefore results from similar studies conducted may not yield similar findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview of Severe and Persistent Mental Illness

Although defined in numerous ways, severe mental illness (SMI) has been defined as a diagnosable mental, behavioral, or emotional disorder that meets criteria in the Diagnostic and Statistical Manual of Mental Disorders fourth edition (DSM-IV) resulting in functional impairment that interferes with major life activities (Colton & Manderscheid, 2006). SMI is common in the general population, with 30 percent of the United States adult population meeting criteria for a 12-month DSM-IV mental disorder, and often having more than one disorder (Kessler, Chiu, Demler, & Walters, 2005). Approximately 1 in 17 of these individuals suffer from SMI, with schizophrenia and bipolar disorder being two of the most common illnesses. (Kessler, Chiu, Demler, & Walters, 2005).

The SMI population comprises 4.5% of the Wichita population and despite the prevalence of SMI, it goes largely untreated in the public, with less than half of the population receiving any type of treatment. One possible barrier to treatment is the stigma associated with the illness. This stigma can discourage seeking treatment and cause isolation, which makes it difficult to fully treat the disease and symptoms. Providing adequate healthcare and the ability to connect and understand individuals with SMI has become a focus of the health care community. In a recent survey by the National Alliance on Mental Illness (NAMI), 49 percent of individuals with SMI felt that doctors took their medical problems less seriously after discovering a psychiatric diagnosis (National Alliance on Mental Illness (NAMI), 2008). Mental health care workers are advocates to challenge any prejudice involved in the treatment of individuals with SMI (Wildgust & Beary, 2010).

2.1.1 Morbidity in SMI

Data from The World Health Organization shows hypertension, hyperglycemia, sedentary lifestyle, over-weight and obesity, and hyperlipidemia as the top six global risk factors for premature mortality in the SMI population. Nearly 85% of people living with SMI have co-morbid associated risk factors (Liu & Spaulding, 2010). As a result, mentally ill individuals are more likely to develop medical illnesses, develop them at a younger age, and die sooner, compared with those in the general population. Recent publications have shown that 50%-90% of individuals with SMI have at least one chronic medical illness (Viron & Stern, 2010)(Colton & Manderscheid, 2006), with diabetes, lung disease, and/or liver disease ranking as the most common diseases. Twenty-five million Americans are now facing the impact of diabetes (CDC, 2011). Diabetes is exceedingly prevalent throughout the SMI population as a result of poor diet, low rates of exercise, and obesity (Farnam, Zipple, Tyrell, & Chittinanda, 1999). Individuals with SMI are eight times more likely to be obese than the general population (Farnam, Zipple, Tyrell, & Chittinanda, 1999). Additionally, medications used to treat SMI put patients at an increased risk for diabetes. All these factors contribute toward impaired glucose tolerance and insulin resistance (Liu & Spaulding, 2010).

2.1.2 Mortality in SMI

It is widely accepted by the medical community that individuals with SMI in the United States are at a greater risk of death, with mortality 20-25 years earlier than the general population. This mortality gap is 10-15 years wider than in the early 1990s (Viron & Stern, 2010). In 2008, the average life expectancy in the U.S. was 78 years, which was an

increase of 5 years from the 1990's. Average life expectancy for someone with SMI in 2008 was 53 years, and in the 1990's it was 63 years. This premature death rate, considering all types of disease, is estimated at 2.4 times above the general population (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005) (Berren, Hill, Merikle, Gonzalez, & Santiago, 1994).

Out of all the diseases, cardiovascular disease is responsible for the majority of the mortality with SMI, accounting for some 50%-60% of the deaths due to medical illness (Viron & Stern, 2010). Individuals with SMI may be less likely to be monitored for and appropriately treated for cardiovascular risk factors (Weiner, Warren, & Fiedorowicz, 2011). Osborn et al. (2007), found an abundance of deaths from cardiovascular causes at all ages in individuals with SMI. Lower socioeconomic status and fewer natural supports, which in turn result in increased vulnerability and risk for morbidity, may partially explain the high mortality rate (Berren, Hill, Merikle, Gonzalez, & Santiago, 1994).

Not only is the mortality rate extremely high for individuals with SMI, the years of potential life lost is an impending factor. Years of potential life lost (YPLL) are the amount of years an individual would have lived if he or she had not prematurely died. Patients with SMI lose over 25 years of potential life compared to the general population, with approximately 87% of the years of potential life lost due to death from medical illnesses (Viron & Stern, 2010)(Parks, Radke, Mazade, & Mauer, 2008). The majority of leading illnesses are primarily linked to cardiovascular disease (Leas & McCabe, 2007) (Newcomer, 2006).

2.1.3 Lifestyle Factors in SMI

Unhealthy lifestyle is assumed to be the primary modifiable risk factor contributing to an increased mortality difference between the SMI population and the general population (Liu & Spaulding, 2010). Lifestyle factors such as smoking, alcohol, substance abuse, poor diet, and lack of exercise are behaviors associated with mental illness (Brown, Birtwistle, & Thompson, 1999). Individuals with SMI are six times more likely to abuse drugs than the general population, causing a higher incidence of death from liver and cardiac problems (Expert Consensus Meeting, 2005) (Berren, Hill, Merikle, Gonzalez, & Santiago, 1994).

Additionally, the SMI population has elevated rates of HIV compared to the general population due to their high-risk behavior. Rosenberg, et al., found that patients with SMI to have a HIV infection rate of 3.1 percent; eight times the estimated U.S. adult population rate. Previous studies have placed the infection rate among the SMI population as high as 22.9 percent. Also the SMI population has high rates of Hepatitis B and Hepatitis C at 23.4 and 19.6 percent respectively. These increased rates for Hepatitis B and Hepatitis C are 5 and 11 times over the estimated general population rates for infection of Hepatitis (Rosenberg, et al., 2001).

Tobacco use is also a prevalent unhealthy lifestyle factor in this population. Approximately 90% of the mentally ill excessively smoke, inhaling more deeply than individuals without SMI (Liu & Spaulding, 2010). Discontinuation of tobacco use may drastically reduce comorbid physical health problems, particularly cardiovascular and pulmonary disease (Viron & Stern, 2010).

Lastly, obesity is rampant in the SMI population due to poor dietary choices, antipsychotic medications, and sedentary behavior. Weight gain in psychiatric patients has been associated with decreased general quality of life; even modest weight reduction can have significant health benefits (Kolotkin, et al., 2008) (Viron & Stern, 2010). Few studies have been published establishing an intervention regarding lifestyle changes to provide a higher and healthier quality of life. Liu & Spaulding concluded that interventions targeting health-related behaviors (e.g., dietary planning, eating habits, exercise and smoking) could reduce medical co-morbidity, related mortality, and improve quality of life. It is difficult to institute this type of intervention due to accessibility. Strained financial resources and social circumstances often limit access to low-calorie foods and preclude membership in health clubs, access to exercise equipment, and dietary counseling or education (Kolotkin, et al., 2008). Obesity related morbidity accounts for 6.8% of U.S. healthcare costs due to the effects of SMI (Fagiolini, et al., 2002). Individuals with SMI also fear the perception of the general population to mental illness, which this inhibits access of community resources to construct a healthier lifestyle.

2.1.4 Exercise in SMI

Exercise is a crucial component to improve and maintain overall health. Sedentary behavior is more prevalent in the SMI population than the general population, leading to poor cardiorespiratory fitness (Wildgust & Beary, 2010) (Brown, Birtwistle, & Thompson, 1999). Exercise is physical activity that is planned, structured, and repetitive (Caspersen, Powell, & Christenson, 1985) causing a physiological stress on the body that will result in an adaptation.

Physical inactivity has become one of the largest public health concerns for the 21st century (Blair, 2009). Physical activity, a component of exercise, is defined as any bodily movement produced by skeletal muscles resulting in energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical activity has been shown to reduce symptoms, improve physical functioning, promote psychological wellbeing, and increase quality of life for persons with established chronic diseases or conditions (Lindamer, et al., 2008) (Richardson, Avripas, Neal, & Marcus, 2005). Exercise may also help in reducing social isolation for people with SMI, viewed by the SMI population as a useful element in their mental rehabilitation (Tetlie, Heimsnes, & Almvik, 2009) (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005).

Sedentary behavior is a substantial cause of obesity. Due to the increased rate of obesity in the SMI population, formal exercise programs are promoted for the structured environment. Formal exercise training programs can reduce body weight and fat mass in overweight and obese clients (McInnis, 2000).

In a recent publication by Van Citters et. al (2010), a lifestyle intervention sustaining the length of nine months was instituted in 76 community-based individuals with SMI. Exercise was promoted through a local YMCA and dietary changes were made through a trusted mentor. Over the span of nine months, individuals were associated with increased exercise, vigorous activity, and leisurely walking. This study established promoting exercise in the SMI community was effective and should be administered throughout mental health facilities.

2.1.5 Aerobic Exercise Testing in SMI

Aerobic capacity is a high indicator of overall health. Due to the morbidities associated with SMI, maximal oxygen uptake may be considerably lower than the general population. Maximal oxygen uptake (VO_{2max}) is the highest rate at which oxygen can be taken up and consumed by the body during intense exercise and can be used for production of ATP during exercise (Dalleck & Dalleck, 2008) (ACSM, 2010). It is the product of the maximal cardiac output ($L \cdot blood \cdot min^{-1}$) and arterial-venous oxygen difference ($mL \cdot O_2 \cdot L \cdot blood$) (ACSM, 2010). Cardiorespiratory fitness, usually measured by VO_{2max}, is a key marker for risk stratification and health outcomes (Dalleck & Dalleck, 2008). The measure of VO_{2max} has been invaluable in quantifying endurance fitness and the status of the cardio-respiratory and muscular systems for all individuals, including the sedentary and diseased (Akalan, Robergs, & Kravitz, 2008).

Pelletier et. al, (2005) conducted a similar, and previously never attempted, study to test the physical fitness of individuals with SMI from an ICCD certified clubhouse. Seventeen population-based individuals, over the age of 18, meeting the criteria for SMI based on DSM-IV completed 16 weeks of aerobic exercise. The subjects participated in 90-minute sessions three times a week. Aerobic capacity was established prior and post to the wellness intervention by a sub-maximal stress test. The researchers found an initial VO_{2max} of 28.03 ± 6.80 and a post of 36.40 ± 7.60, showing a significant improvement in aerobic capacity. Pelletier et. al, (2005) concluded that an exercise program can be successful among individuals with SMI. However these results are not typical among other studies. Richardson et. al, (2005) recruited thirty-nine individuals with SMI in an 18 week exercise program consisting of nine 1-hour group sessions. Measurements of weight, physical

activity, and blood pressure were taken initially, 6-weeks into the program, and after the final 18 weeks. The researchers experienced a high drop out rate and no significant results, but still stress the mental benefits made by this research.

Aerobic capacity declines with age and requires adequate aerobic exercise to maintain. Aerobic capacity can be measured through maximal or sub-maximal testing (ACSM, 2010). Tables 2.1.6 and 2.1.7 demonstrate the desired aerobic capacity for gender and age.

Table 2.1.6 ACSM's Percentile Values for Maximal Aerobic Power (Males)

	Males						
	Ages 20-29	Ages 30-39	Ages 40-49	Ages 50-59	Ages 60-69	Ages 70-79	
			Max VO2				
%			(ml/kg/min)				Rating
99	61.2	58.3	57	54.3	51.1	49.7	
95	56.2	54.3	52.9	49.7	46.1	42.4	Superior
90	54	52.5	51.1	46.8	43.2	39.5	
85	52.5	50.7	48.5	44.6	41	38.1	
80	51.1	47.5	46.8	43.3	39.5	36	Excellent
75	49.2	47.5	45.4	41.8	38.1	34.4	
70	48.2	46.8	44.2	41	36.7	33	
65	46.8	45.3	43.9	39.5	35.9	32.3	
60	45.7	44.4	42.4	38.3	35	30.9	Good
55	45.3	43.9	41	38.1	33.9	30.2	
50	43.9	42.4	40.4	36.7	33.1	29.4	
45	43.1	41.4	39.5	36.6	32.3	28.5	
40	42.2	41	38.4	35.2	31.4	28	Fair
35	41	39.5	37.6	33.9	30.6	27.1	
30	40.3	38.5	36.7	33.2	29.4	26	
25	39.5	37.6	35.7	32.3	28.7	25.1	
20	38.1	36.7	34.6	31.1	27.4	23.7	Poor
15	36.7	35.2	33.4	29.8	25.9	22.2	
10	35.2	33.8	31.8	28.4	24.1	20.8	
5	32.3	31.1	29.4	25.8	22.1	19.3	
1	26.6	26.6	25.1	21.3	18.6	17.9	Very Poor

Table 2.1.7 ACSM's Percentile Values for Maximal Aerobic Power (Females)

	Females						
	Ages 20-29	Ages 30-39	Ages 40-49	Ages 50-59	Ages 60-69	Ages 70-79	
			Max VO2				
%			(ml/kg/min)				Rating
99	55	52.5	51.1	45.3	42.4	42.4	
95	50.2	46.9	45.2	39.9	36.9	36.7	Superior
90	47.5	44.7	42.4	38.1	34.6	33.5	
85	45.3	42.5	40	36.7	33	32	
80	44	41	38.9	35.2	32.3	30.2	Excellent
75	43.4	40.3	38.1	34.1	31	29.4	
70	41.1	38.8	36.7	32.9	30.2	28.4	
65	40.6	38.1	35.6	32.3	29.4	27.6	
60	39.5	36.7	35.1	31.4	29.1	26.6	Good
55	38.1	36.7	33.8	30.9	28.3	26	
50	37.4	35.2	33.3	30.2	27.5	25.1	
45	36.7	34.5	32.3	29.4	26.9	24.6	
40	35.5	33.8	31.6	28.7	26.6	23.8	Fair
35	34.6	32.4	30.9	28	25.4	22.9	
30	33.8	32.3	29.7	27.3	24.9	22.2	
25	32.4	30.9	29.4	26.6	24.2	21.9	
20	31.6	29.9	28	25.5	23.7	21.2	Poor
15	30.5	28.9	26.7	24.6	22.8	20.8	
10	29.4	27.4	25.6	23.7	21.7	19.3	
5	26.4	25.5	24.1	21.9	20.1	17.9	
1	22.6	22.7	20.8	19.3	18.1	16.4	Very Poor

2.1.7 Exercise testing

Submaximal testing assumes the principle that a linear relationship between heart rate and workload exists. Submaximal testing can be carried out through a variety of modes, including cycle, treadmill, or field tests. Cycle ergometer testing is beneficial because it is low cost, safe, controlled, quick, and easy to maintain. Submaximal testing can be carried out with a mass population and does not require a physician present if the individual has been cleared for exercise. It is also ideal for the SMI population because it is non-weight bearing and will not place pressure on any ailing joints.

2.1.8 Recommendations for Exercise

Many studies have been published supporting the positive effects of exercise on mental well-being. These studies demonstrate that improved disease-prevention efforts can take the form of increasing rates of exercise (Viron & Stern, 2010). The most recent recommendations from The American College of Sports Medicine (ACSM) are 20-60 minutes of aerobic exercise 3-5 days/week at an intensity of 64/70-94% of heart rate maximum, and 40/50-85% of heart rate reserve (HRR) or oxygen uptake reserve (VO_2R) for healthy adults (Dalleck & Dalleck, 2008). At least 60% of the global population fails to achieve the minimum recommendation for health-related physical fitness (Vancampfort, et al., 2010). The benefits with exercise are both physical and psychosocial in all populations. An active lifestyle that includes one 20-minute walk per day can result in a 35% to 55% reduction of coronary heart disease (Newcomer, 2006).

Overweight and obese patients taking antipsychotic medications are now recommended to maintain an exercise regimen suggested by the ACSM (Tetlie, Heimsnes, &

Almvik, 2009). Overweight and obese SMI populations should exercise at a frequency of 5 days per week with a low to moderate intensity, 40%-60% VO_2R for 30 to 60 minutes a day with a focus on mainly aerobic exercise (ACSM, 2010).

Recommendations leading to incorporation of exercise are becoming more frequent in the management of SMI. This recommendation stems from the preventable diseases present and saturated throughout this population. Medication, dietary adjustments, and exercise prescriptions are being instituted throughout the medical community as the standard of care for the SMI.

2.1.9 Limitations on Exercise in SMI

Obesity inhibits many people in the SMI population from properly exercising. The high rate of obesity accompanies high rates of comorbities making the SMI population unable to safely exercise on their own. Individuals with SMI consistently fear injury and falling, causing a barrier to exercise (Hamera, Goetz, Brown, & Van Sciver, 2010). Hamera et al. (2010) suggest that recommendations for exercise need to be modified to promote adherence and prevent injury for those individuals with SMI. Along with the ailments associated with SMI, motivation to be active may be a low priority in this population. The low level of priority on health creates difficulties in motivating these individuals with SMI into necessary lifestyle changes.

2.2 Schizophrenia

Schizophrenia is characterized by profound disruption in cognition and emotion, affecting the most fundamental human attributes: language, thought, perception, affect, and sense of self (American Psychiatric Association, 2000). Schizophrenia affects

approximately 2.4 million American adults annually and 51 million people worldwide at any given time, with an equal frequency in both genders (National Institute of Mental Health, 2011). There is no cure for schizophrenia, although the National Alliance for Mental Illness (NAMI) predicts a cure as early as 2013 (National Alliance for the Mentally Ill, 2003).

Along with a high mortality rate, individuals with schizophrenia have higher rates of modifiable cardiovascular risk factors than the general population (Viron & Stern, 2010).

2.2.1 Morbidity in Schizophrenia

At least 50% of individuals with schizophrenia have a comorbid physical condition (Expert Consensus Meeting, 2005). Researchers from Australia found that physical comorbities in people with schizophrenia account for 60% of deaths not related to suicide in this population (Colton & Manderscheid, 2006). These modifiable risk factors include diabetes, hypertension, obesity, smoking, and lack of exercise. A healthy lifestyle could drastically decrease these modifiable risk factors.

Obesity, smoking, diabetes, hypertension, and dyslipidemia occur at rates 1.5 to 5 times greater than the general population (Correll, 2007). Between 40-60% of individuals with schizophrenia are overweight or obese, specifically due to a combination of illness-related factors and use of antipsychotic drugs (Kolotkin, et al., 2008)(Fountoulakis, et al., 2010). Of note, the incidence of diabetes is two to four times higher in the schizophrenia population (Expert Consensus Meeting, 2005) than the general population. Clinicians treating individuals with schizophrenia or bipolar disorder need to be aware of the effects obesity has on quality of life. Weight gain from antipsychotic medication use might reduce

adherence to an already shaky or uncommitted exercise regiment. Therefore clinicians need to be mindful of the weight gain before prescribing medications with individuals who do not exercise or engage in any form of physical activity (Expert Consensus Meeting, 2005).

2.2.2 Mortality in Schizophrenia

Individuals with schizophrenia experience a mortality rate more than twice the general population and have a 20-25 year reduced life expectancy (Viron & Stern, 2010)(Berren, Hill, Merikle, Gonzalez, & Santiago, 1994) (Vancampfort, et al., 2010). Sedentary behavior plays an intricate role in mortality, 16% in men, and 17% in women (Blair, 2009). A Finnish Register study of 66,881 patients with schizophrenia revealed a mortality gap of 25 years in 1996 and a decrease of 22.5 years in 2006, showing improvement in mortality (Viron & Stern, 2010). Although the mortality rate is high, little has been done to find a solution to this problem, with minimal research done on this important matter (Wildgust & Beary, 2010).

Schizophrenia is also associated with an increased risk of cardiac death, independent of clinical and behavioral risk factors (Wildgust & Beary, 2010). Premature cardiovascular disease causes an extensive reduction in life expectancy, causing nearly twice the normal risk of dying from cardiovascular disease (Vancampfort, et al., 2010). Specifically coronary heart disease and stroke in persons younger than 75 years of age with SMI causes excess deaths (Osborn, Levy, Nazareth, Petersen, Islam, & King, 2007).

2.2.3 Lifestyle and Environmental Factors in Schizophrenia

Lifestyle and environmental factors are another major influence on the high mortality rates and modifiable risk factors. Lack of exercise, poor dietary habits, smoking, caffeine consumption, and housing are all connected to these factors.

Smoking is all too common in the SMI population, specifically individuals with schizophrenia, contributing to the reduced life expectancy. (Bobes, Arango, Garcia-Garcia, & Rejas, 2010). Community-dwelling patients with schizophrenia smoke at much higher rates and consume more caffeine, nearly 400 mg per day, than comparable individuals in the US population (Strassmig, Brar, & Ganguli, 2006). Some studies have reported a 90% prevalence rate of smoking in the schizophrenia population (Vancampfort, et al., 2010). Although there has been a steady decline in the general population in the smoking rates, there has not been a similar rate in the schizophrenic population, who inhale an average 20 cigarettes per day (Strassmig, Brar, & Ganguli, 2006).

Seeking adequate hygiene, housing, and healthcare are low priorities among individuals with schizophrenia. Up to one-fifth of those with schizophrenia are, at some point, homeless (Viron & Stern, 2010).

2.2.4 Physical Activity (Exercise) in Schizophrenia

Modern guidelines emphasize the importance of physical activity, exercise, and fitness on the schizophrenic population (Wildgust & Beary, 2010). Only 25.7% of the schizophrenic population meets the 150 min a week of moderate-intensity physical activity public recommendation, with greater than 40% reporting no moderate physical activity at all (Faulkner, Cohn, & Remington, 2006) compared to the general population at 25 percent

(Dubbert, 2002). In a recent published study by Lindamer et al (2008), patients with schizophrenia spent less than half the time in participating in physical activity and expended less than half of the kilocalories per week compared to a non-psychiatric comparison group. Individuals with schizophrenia are more limited in their ability to be physically active and show lower levels of physical fitness than the general population (Vancampfort, et al., 2010). Exercise could help alleviate secondary symptoms of schizophrenia, such as depression, low self-esteem, and social withdrawal (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005). People with schizophrenia indicate gaining weight as the most negative effect of their medication protocol and therefore plays a major role in their compliance (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005). Motivation plays an intricate role in exercise for individuals with schizophrenia. Research has suggested that people with schizophrenia have levels of knowledge and attitude about exercise that are similar to those of the general population, but their perception of their abilities to exercise is lower and the exercise barriers limiting exercise behaviors are enhanced (Leas & McCabe, 2007). Results from a pilot study by Scheewe et al. (2008) showed that people with schizophrenia have a low maximum oxygen uptake when compared to a healthy adult population. There was a strong negative correlation between the maximum oxygen uptake and the duration of inactivity (Vancampfort, et al., 2010). The metabolic variables associated with the low maximum oxygen uptake were not examined.

2.3 Bipolar Disorder

Bipolar disorder is classified as a spectrum of disorders. It is a complex disorder to treat, due to the different episodes needing different treatment. The DSM-IV recognizes four types of bipolar disorder, Bipolar I Disorder, Bipolar II Disorder, Bipolar Disorder not otherwise specified, and cyclothymic disorder. Two of the most common and recognized are Bipolar I Disorder and Bipolar II Disorder. Bipolar I Disorder is characterized as one or more manic episodes or mixed episodes; a major depressive episode usually occurs with bipolar disorder (American Psychiatric Association, 2000). Bipolar II disorder does not include a manic episode but one or more hypomanic episodes and one or more major depressive episode (American Psychiatric Association, 2000). Many different forms of bipolar exist and not all have been recognized.

Bipolar disorder affects 2.6 percent or 5.7 million American adults age 18 and older in a given year. Bipolar I disorder exceeds more than 1% and bipolar II disorder approaching 5% in the international general population (Baldessarini, 2002)(National Institute of Mental Health, 2011).

Although the cause of bipolar disorder is still unknown, scientists believe genetics and brain structure and function play a significant role in the formation of the disorder (National Institute of Mental Health, 2010).

Half the cases of bipolar disorder are diagnosed before the age of 25 (National Institute of Mental Health). Symptoms for bipolar disorder can be developed either in childhood or later in adulthood. The depression phase places the largest burden on patients needing specific treatment. Patients with bipolar disorder spent three times more days in a depressive state than patients with other mood disorders, and this state becomes

more severe if left untreated (Nivoli, et al., 2011). Treatment for bipolar disorder specifically focuses on medications and psychotherapy but other treatments include electroconvulsive therapy.

2.3.1 Morbidity in Bipolar Disorder

Similar to what was discussed above in relation to schizophrenia, patients with bipolar disorder also have an increased prevalence of modifiable risk factors including obesity, smoking, thyroid disease, heart disease, hyperglycemia, hypertension, and dyslipidemia (Newcomer, 2006) (National Institute of Mental Health). Having more than one of these risk factors increase the probability of developing heart disease (Newcomer, 2006).

Obesity is estimated to claim 280,000 American lives annually due to a number of diseases including coronary disease, hypertension, dyslipidemia, diabetes mellitus, gallbladder disease, osteoarthritis and some cancers (Fagiolini, et al., 2002). Obesity plays a major role in both clinical and population based bipolar disorder, accounting for 55-68% of the bipolar disorder population (Kolotkin, et al., 2008) (Jacka, et al., 2011) (Weiner, Warren, & Fiedorowicz, 2011) Due to the high rate of obesity in this population, individuals with bipolar disorder are three times more likely to have diabetes than the general population (Weiner, Warren, & Fiedorowicz, 2011).

Health recommendations have been set for the initial onset of bipolar disorder. These include monitoring weight, cholesterol, blood glucose, and blood pressure from baseline and throughout the disorder (Fagiolini & Chengappa, 2007).

2.3.2 Antipsychotic Medications in Bipolar Disorder

Along with lifestyle factors, psychotropic drugs prescribed to patients causes an increase in morbidity. Although there is not one set guideline for treating bipolar disorder, most guidelines suggest the use of antidepressant agents only in combination with an antimanic agent, in order to avoid manic switches (Nivoli, et al., 2011). Treatment is based off of clinical judgment. Patients with bipolar disorder can induce or exacerbate some of the modifiable risk factors associated with cardiovascular disease and diabetes (Newcomer, 2006). Weight gain, hypertension, hyperglycemia, and diabetes are all potential adverse effects associated with antipsychotic treatment (Newcomer, 2006). Significant weight gain is a major side effect associated with medications, specifically lithium, prescribed to patients with bipolar disorder (Weiner, Warren, & Fiedorowicz, 2011).

Due to the length of the depressive episode stalling longer, more aggressive medication is used for a longer period of time, causing increased weight gain and adverse side effects. Fagiolini et al, (2002) found a distinct correlation between increased body mass index (BMI) and length of depressive episode. Between 55-68% of individuals with bipolar disorder are over-weight or obese due to a combination of illness-related factors and use of antipsychotic medications compared to the general population at an estimated 68 percent (Kolotkin, et al., 2008)(Garko, 2011).

2.3.3 Mortality in Bipolar Disorder

Bipolar disorder is the leading cause of premature mortality due to suicide and associated medical conditions, and individuals with bipolar disorder and a medical

condition were found to have higher standardized mortality ratios for natural causes of death then the general population that had a medical condition (Newcomer, 2006) (Merikangas, Akiskal, Angst, Greenberg, Hirschfeld, & Kessler, 2007). In the 1940s and early 1950s, and continuing into the 21st century, individuals with bipolar disorder were reported to have a mortality rate twice that of the schizophrenic population (Weiner, Warren, & Fiedorowicz, 2011).

Along with other SMI, individuals with bipolar disorder have a high risk for cardiovascular mortality compared to the general population. The increased risk for mortality is not only affected by the morbities associated with the disorder but also with the seriousness of the depression. Due to the seriousness and extent of the depressive episode, individuals with any form of bipolar disorder are at the most risk of suicide compared to other individuals with SMI.

2.3.4 Lifestyle in Bipolar Disorder

Individuals with bipolar disorder face many of the same lifestyle challenges as others with SMI such as smoking, poor diet, and substance abuse. Years of studies have shown that the prevalence of smoking remains unchanged among the bipolar disorder population (Bobes, Arango, Garcia-Garcia, & Rejas, 2010).

Although it is known that individuals with SMI have higher rates of substance abuse, individuals with bipolar disorder, specifically, contain the highest rates for substance abuse. McElroy et al, found high rates of lifetime and current substance use, anxiety, and eating disorders in patients with bipolar disorders.

CHAPTER THREE

METHODS

3.1 Participants

Participants for this study were eligible if they have been diagnosed with severe and persistent mental illness. Subjects ranged from 18 to 62 years of age. Recruitment occurred at health and education classes at Breakthrough Club of Sedgwick County. The sub-maximal bike test was encouraged but entirely optional to the participant. Other than a healthier life, no other incentive was given to encourage participation. Informed consent was obtained prior to participation and study design. The Institutional Review Board of Wichita State University reviewed and approved the protocol.

3.2 Apparatus

The apparatus used for the YMCA bike test was a MONARK Ergomedic 828 E bike. The YMCA bike test has been stated as an effective way in predicting aerobic capacity (VO_{2max}) (Beekley et. al, 2004). This is based off of four assumptions. The first is a linear relationship between VO_2 and heart rate. The second assumption is that similar individuals with the same age and fitness levels have similar heart rates (Beekley et. al, 2004). Third, is heart rate does not vary daily. Finally, every subject has the same mechanical efficiency (Beekley et. al, 2004).

The MONARK bike contains an electronic meter that shows pedal-turns per minute (RPM), heart rate in beats per minute (HR), cycling-time in minutes and seconds (TIME), intended cycling speed in km/miles per hour (SPEED) plus distance covered in km/miles (DISTANCE). A POLAR heart rate monitor was used for a more precise heart rate. A

Matrix-500 metronome was used for keeping a 50-rpm cadence. A rating of perceived exertion (RPE) scale was used in administering this test to gauge the subject's view of the intensity of the exercise**.**

3.3 Procedures

Participants were involved in a three-month wellness intervention. Exercise promotion, dietary education, and group activities were conducted as part of this intervention. Subjects were taught the benefits of a healthy diet, including meal planning, shopping on a budget, and caloric intake. Exercise was promoted through daily walks, exercise videos, group exercises classes, and one-on-one training with a personal trainer. Anthropometric measurements and a sub-maximal aerobic cycle test were conducted prior and post to the intervention.

Prior to participating in the YMCA bike test, participants completed a fitness stratification form describing their health. Based on this stratification (APENDIX A) the researcher determined whether the subject could safely participate in the test. The YMCA bike test is used for estimating maximum oxygen uptake in ml/kg/min. This is a sub-maximal test generating results through a computer program based on heart rate after each stage. Subjects were initially instructed to place a heart rate monitor in the region of their xiphoid process. Based upon the heart rate displayed by the receiver, the subject either rested to lower their heart rate closer to a resting heart rate or the subjects began the test. Subjects were fitted to comfortably sit on the bike while maintaining a slight bend in their knee during a complete cycle. This test included three stages. The initial stage starts with a small amount of resistance used to warm-up the participant. The second stage

either increases or decreases the amount of resistance based upon the subject's heart rate from the first stage. An increase in resistance was applied over stages. The final stage was the most strenuous, and with the highest resistance, to obtain a reading of the related heart rate at the peak workload. The goal of the test for the subject is to maintain a cadence of 50 repetitions per minute. This number can be found on the MONARK bike. A metronome was set at 50 rpm for the subject to maintain a comfortable cadence. This is a 9-minute bike test that measures VO_{2max} based on heart rate after each of the 3-minute stages. After each stage a heart rate and RPE are collected. Based on the heart rate collected from the previous stage, the resistance is increased, maintained, or decreased. The test progressively becomes more strenuous after each stage to push the participant's oxygen intake to its full potential. To receive a read-out from this test the subject must complete at least two stages. It is ideal for subjects to complete all three stages, but the software used for this test will calculate a VO_{2max} after two stages using the following equation:

$$VO_{2max} = SM_2 + [b \times (HR_{max} - HR_2)$$

(VO_{2max}= $mL/kg^{-1}/min^{-1}$ SM_2= VO_2 at last workload, b= slope, HR_{max}= 220-age, HR_2= heart rate at final workload (bpm)

Following the test, a cool-down is set in place to safely lower the subject's heart rate. At the conclusion of the test the participant was asked what major factor was the most difficult for them towards the end of the test. Based on the answer guidance was given to either focus more on resistance training or cardiovascular exercise to improve VO_{2max}. If any chest pain or discomfort was conveyed to the researcher, the test was discontinued immediately.

3.4 Data Analysis:

The computer software used to analyze the data from the YMCA bike test was the MONARK 818 E Analysis software. Maximal oxygen intake is computed based upon predicted maximum heart rate.

Statistical Package for the Social Sciences (SPSS), eighth edition, was used in running the statistical data. A paired samples t-test was used to compute the changes between baseline and endpoint measurements.

CHAPTER FOUR

RESULTS

4.1 Overview

Throughout the study, fifty-two individuals (n=52) with SMI agreed to participate in the submaximal aerobic cycle ergometer test. Forty-nine individuals with SMI (n=49) completed baseline measures, and then were enrolled into a three-month wellness education program focusing on exercise and nutrition. Following the intervention period, endpoint data was collected. Forty-nine of the fifty-two participants (n=49) completed the fitness test after the three-month wellness education program. Data from the three individuals that were unable to complete the baseline fitness test were omitted from the analysis of aerobic capacity pre and post intervention, but were included the body fat percentage analysis. The testing group had a mean of 43.02 ± 13.20 years of age. Thirty-six individuals had moderate- risk stratification, fourteen individuals had a high-risk stratification, and two had a low-risk stratification. Individuals with a high-risk stratification were encouraged to receive a doctor's release prior to exercise. Decision to test a subject was left to the researcher's discretion on the subject's ability. All participants had been diagnosed with a type of severe mental illness prior to their enrollment; Table 4.1 lists the type of disorder and the number of participants with that diagnosis. Baseline measures compared to endpoint (post 3 month intervention) were analyzed with all participants, separated by gender, and separated by disorder. A significant difference in VO2max was observed between genders at baseline, but no group shown significant change in aerobic capacity following a three-month wellness intervention except males with bipolar disorder. Males with bipolar disorder had a significant decrease in aerobic capacity

(p(.031);p<0.05) following a three-month wellness intervention. No significant change in body fat percentage following a three-month wellness intervention except in males with major depressive disorder (MDD). Males with MDD were shown to have a significant decrease in body fat percentage (p(.036);p<0.05) following a three-month wellness intervention.

Table 4.1 Breakdown of Diagnosis

Disorder	**Number of Individuals**
Schizoaffective Disorder	14
Bipolar Disorder	17
Schizophrenia Disorder	11
Major Depressive Disorder	7

Table 4.1.1 Mean Measurements at Baseline and Endpoint

	Baseline	Endpoint
Height (inches)	67.5 ± 4.29	67.5 ± 4.29
Age (years)	42.16 ± 14.76	42.16 ± 14.76
Weight (lbs)	205.47 ± 41.94	204.45 ± 41.21
BMI (m^2/kg^2)	31.73 ± 6.18	31.65 ± 6.18
BF (%)	31.85 ± 9.70	32.14 ± 9.65
VO2max ($ml^{-1}/kg^{-1}/min^{-1}$)	31.80 ± 9.63	30.79 ± 9.35

Table 4.1.2 Mean Measurements Between Disorders

Disorder	Baseline VO_{2max}	Endpoint VO_{2max}	Baseline BF%	Endpoint BF%
Schizoaffective	32.71 ± 6.55	29.88 ± 8.17	32.81 ± 8.30	33.21 ± 8.88
Schizophrenia	29.56 ± 11.26	30.57 ± 11.77	33.41 ± 11.77	32.74 ± 10.05
Bipolar Disorder	33.23 ± 12.56	31.46 ± 10.63	29.01 ± 10.53	29.81 ± 10.98
MDD	28.96 ± 6.88	30.12 ± 7.36	34.86 ± 5.86	35.29 ± 6.89

4.2 Difference in VO_{2max} from Pre-Post in SMI

Hypothesis I: There will be a statistically significant increase in VO_{2max} following a wellness intervention in individuals with SMI.

Technique: Paired samples t-test

Analysis: Table 4.2.1, Table 4.2.2, Table 4.2.3

Interpretation: There was no statistically significant difference in VO_{2max} following a wellness intervention in individuals with severe and persistent mental illness ($p(.0358); p<0.05$).

Table 4.2.1-4.2.3 Difference in VO_{2max} from Pre-Post in SMI

Table 4.2.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Vo2 pre	31.778	48	10.0527	1.4510
	Vo2 post	30.797	48	9.6224	1.3889

Table 4.2.2

		N	Correlation	Sig.
Pair 1	Vo2 pre & Vo2 post	48	.725	.000

Table 4.2.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Vo2pre – Vo2 post	.9804	7.3125	1.0555	-1.1429	3.1037	.929	47	.358

4.5 Difference in VO_{2max} from Pre-Post in Males with SMI

Hypothesis II: There will be a statistically significant increase in VO_{2max} following a wellness intervention in males with schizoaffective disorder, schizophrenia disorder, bipolar disorder, and major depressive disorder.

Technique: Paired samples t-test

Analysis: Table 4.5.1, Table 4.5.2, Table 4.5.3, Table 4.5.3, Table 4.5.4, Table 4.5.5, Table 4.5.6, Table 4.5.7, Table 4.5.8, Table 4.5.9, Table 4.5.10, Table 4.5.11, Table 4.5.12

Interpretation: There was no statistically significant difference in VO_{2max} following a wellness intervention in males with schizoaffective disorder ($p(.513);p<0.05$), schizophrenia disorder ($p(.442);p<0.05$), and major depressive disorder ($p(.100);p<0.05$). There was a statistically significant decrease in VO_{2max} following a wellness intervention in males with bipolar disorder ($p(.031);p<0.05$).

4.6 Difference in VO_{2max} from Pre-Post in Females with SMI

Hypothesis III: There will be a statistically significant increase in VO_{2max} following a wellness intervention in females with schizoaffective disorder, schizophrenia disorder, bipolar disorder, and major depressive disorder.

Technique: Paired samples t-test

Analysis: Table 4.6.1, Table 4.6.2, Table 4.6.3, Table 4.6.4, Table 4.6.5, Table 4.6.6, Table 4.6.7, Table 4.6.8, Table 4.6.9, Table 4.6.10, Table 4.6.11, Table 4.6.12

Interpretation: There was no statistically significant difference in VO_{2max} following a wellness intervention in females with schizoaffective disorder ($p(.289);p<0.05$), schizophrenia disorder ($p(.602);p<0.05$), bipolar disorder ($p(.213);p<0.05$), and major depressive disorder ($p(.416);p<0.05$).

Tables 4.5.1-4.5.3 Differences in VO_{2max} from Pre-Post (Males with Schizoaffective Disorder)

Table 4.5.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	33.2044	9	6.41859	2.13953
	Post VO2	30.9711	9	10.16746	3.38915

Table 4.5.2

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	9	.374	.322

Table 4.5.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	2.23333	9.78772	3.26257	-5.29017	9.75684	.685	8	.513

Table 4.6.1-4.6.3 Difference in VO_{2max} from Pre-Post (Females with Schizoaffective Disorder)

Table 4.6.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	31.8160	5	7.45753	3.33511
	Post VO2	27.9140	5	1.56232	.69869

Table 4.6.2

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	5	.306	.616

Table 4.6.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	3.90200	7.13551	3.19110	-4.95790	12.76190	1.223	4	.289

Table 4.5.4-4.5.6 Difference in VO_{2max} from Pre-Post (Males with Schizophrenia Disorder)

Table 4.5.4

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	30.8600	7	11.30633	4.27339
	Post VO2	33.0014	7	11.88055	4.49043

Table 4.5.5

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	7	.825	.022

Table 4.5.6

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	-2.14143	6.88763	2.60328	-8.51142	4.22856	-.823	6	.442

Table 4.6.4-4.6.6 Difference in VO_{2max} from Pre-Post (Females with Schizophrenia Disorder)

Table 4.6.4

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	27.2800	4	12.48491	6.24246
	Post VO2	26.3075	4	11.88554	5.94277

Table 4.6.5

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	4	.963	.037

Table 4.6.6

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	.97250	3.34546	1.67273	-4.35087	6.29587	.581	3	.602

Table 4.5.7-4.5.9 Difference in VO_{2max} from Pre-Post (Males with Bipolar Disorder)

Table 4.5.7

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	41.1300	9	11.07175	3.69058
	Post VO2	35.3544	9	10.13516	3.37839

Table 4.5.8

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	9	.809	.008

Table 4.5.9

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	5.77556	6.62091	2.20697	.68628	10.86483	2.617	8	.031

Table 4.6.7-4.6.9 Difference in VO_{2max} from Pre-Post (Females with Bipolar Disorder)

Table 4.6.7

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	24.3500	8	7.06634	2.49833
	Post VO2	27.0838	8	9.97827	3.52785

Table 4.6.8

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	8	.835	.010

Table 4.6.9

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	2.73375	5.63926	1.99378	-7.44829	1.98079	-1.371	7	.213

Table 4.5.10-4.5.12 Difference in VO_{2max} from Pre-Post (Males with MDD)

Table 4.5.10

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	35.2450	2	3.95273	2.79500
	Post VO2	33.7950	2	4.27800	3.02500

Table 4.5.11

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	2	1.000	.000

Table 4.5.12

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	1.45000	.32527	.23000	-1.47243	4.37243	6.304	1	.100

Table 4.6.10-4.6.12 Difference in VO_{2max} from Pre-Post (Females with MDD)

Table 4.6.10

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre VO2	26.4420	5	6.27805	2.80763
	Post VO2	28.9240	5	8.26651	3.69690

Table 4.6.11

		N	Correlation	Sig.
Pair 1	Pre VO2 & Post VO2	5	.677	.209

Table 4.6.12

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre VO2 - Post VO2	-2.48200	6.12266	2.73814	-10.08429	5.12029	-.906	4	.416

5.1 Difference in BF% from Pre-Post in SMI

Hypothesis IV: There will be a statistically significant difference in body fat percentage following a wellness intervention in individuals with SMI.

Technique: Paired samples t-test

Analysis: Table 5.1.1, Table 5.1.2, Table 5.1.3

Interpretation: There was no statistically significant difference in body fat percentage following a wellness intervention in individuals with severe and persistent mental illness ($p(.797); p<0.05$).

Table 5.1.1-5.1.3 Difference in BF% from Pre-Post in SMI

Table 5.1.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	30.736	28	11.0332	2.0851
	Post BF	30.961	28	10.5356	1.9910

Table 5.1.2

		N	Correlation	Sig.
Pair 1	Pre BF- Post BF	28	.911	.000

Table 5.1.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF- Post BF	-.2250	4.5861	.8667	-2.0033	1.5533	-.260	27	.797

5.2 Difference in BF% from Pre-Post in Males with SMI

Hypothesis V: There will be a statistically significant difference in body fat percentage following a wellness intervention in males with schizoaffective disorder, schizophrenia disorder, bipolar disorder, and major depressive disorder.

Technique: Paired samples t-test

Analysis: Table 5.2.1, Table 5.2.2, Table 5.2.3, 5.2.4, Table 5.2.5, Table 5.2.6, Table 5.2.7, Table 5.2.8, Table 5.2.9, Table 5.2.10, Table 5.2.11, Table 5.2.12

Interpretation: There was no statistically significant difference in body fat percentage following a wellness intervention in males with schizophrenia disorder ($p(.864);p<0.05$), schizoaffective disorder($p(.771);p<0.05$), and bipolar disorder ($p(.653);p<0.05$). There was a statistically significant decrease in body fat percentage following a wellness intervention in males with major depressive disorder ($p(.036);p<0.05$).

5.3 Difference in BF% from Pre-Post in Females with SMI

Hypothesis VI: There will be a statistically significant difference following a wellness intervention in decreased body fat percentage among females with schizoaffective disorder, schizophrenia disorder, bipolar disorder, and major depressive disorder.

Technique: Paired samples t-test

Analysis: Table 5.3.1, Table 5.3.2, Table 5.3.3, Table 5.3.4, Table 5.3.5, Table 5.3.6, Table 5.3.7, Table 5.3.8, Table 5.3.9, Table 5.3.10, Table 5.3.11, Table 5.3.12

Interpretation: There was no statistically significant difference in BIA following wellness intervention in females with schizoaffective disorder ($p(.089);p<0.05$), schizophrenia disorder ($p(.347);p<0.05$), bipolar disorder ($p(.251);p<0.05$), and major depressive disorder ($p(.262);p<0.05$).

Tables 5.2.1-5.2.3 Difference in BF% from Pre-Post (Males with Schizoaffective Disorder)

Table 5.2.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	27.344	9	4.1953	1.3984
	Post BF	27.478	9	4.8885	1.6295

Table 5.2.2

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	9	.887	.001

Table 5.2.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	-.1333	2.2572	.7524	-1.8684	1.6017	-.177	8	.864

Tables 5.3.1-5.3.3 Difference in BF% from Pre-Post (Females with Schizoaffective Disorder)

Table 5.3.1

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	42.640	5	.8503	.3803
	Post BF	43.520	5	1.2153	.5435

Table 5.3.2

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	5	.691	.196

Table 5.3.3

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF -Post BF	-.8800	.8786	.3929	-1.9710	.2110	-2.240	4	.089

Tables 5.2.4-5.2.6 Difference in BF% from Pre-Post (Males with Schizophrenia Disorder)

Table 5.2.4

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	27.657	7	10.7236	4.0532
	Post BF	28.300	7	9.9753	3.7703

Table 5.2.5

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	7	.857	.014

Table 5.2.6

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	-.6429	5.5764	2.1077	-5.8002	4.5144	-.305	6	.771

Tables 5.3.4-5.3.6 Difference in BF% from Pre-Post (Females with Schizophrenia Disorder)

Table 5.3.4

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	43.475	4	4.3745	2.1872
	Post BF	40.500	4	3.4010	1.7005

Table 5.3.5

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	4	.070	.930

Table 5.3.6

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	2.9750	5.3494	2.6747	-5.5371	11.4871	1.112	3	.347

Table 5.2.7-5.2.9 Difference in BF% from Pre-Post (Males with Bipolar Disorder)

Table 5.2.7

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	22.489	9	6.9212	2.3071
	Post BF	22.089	9	6.2148	2.0716

Table 5.2.8

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	9	.929	.000

Table 5.2.9

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	.4000	2.5661	.8554	-1.5725	2.3725	.468	8	.653

Tables 5.3.7-5.3.9 Difference in BF% from Pre-Post (Females with Bipolar Disorder)

Table 5.3.7

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	36.338	8	9.0831	3.2114
	Post BF	38.500	8	8.2772	2.9264

Table 5.3.8

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	8	.846	.008

Table 5.3.9

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	-2.1625	4.8849	1.7271	-6.2464	1.9214	-1.252	7	.251

Tables 5.2.10-5.2.11 Difference in BF% from Pre-Post (Males with MDD)

Table 5.2.10

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	29.950	2	.3536	.2500
	Post BF	27.300	2	.5657	.4000

Table 5.2.11

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	2	1.000	.000

Table 5.2.12

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	2.6500	.2121	.1500	.7441	4.5559	17.667	1	.036

Tables 5.3.10-5.3.12 Difference in BF% from Pre-Post (Females with MDD)

Table 5.3.10

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre BF	36.820	5	5.8870	2.6328
	Post BF	38.480	5	5.3143	2.3766

Table 5.3.11

		N	Correlation	Sig.
Pair 1	Pre BF & Post BF	5	.876	.051

Table 5.3.12

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre BF - Post BF	-1.6600	2.8431	1.2715	-5.1901	1.8701	-1.306	4	.262

CHAPTER FIVE

DISCUSSION

6.1 Overview

This study has focused on the effects of a wellness intervention on maximum aerobic capacity and body fat percentage. We have found that co-morbidities, such as obesity and gender, impact maximal aerobic capacity. Supporting published research has found an increase in maximum aerobic capacity after undergoing a structured exercise program and a decrease in weight (McDevitt, Wilbur, Kogan, & Briller, 2005) (Pelletier, Nguyen, Bradley, Johnsen, & McKay, 2005).

Due to environmental factors, genetic factors, and medications individuals with SMI face higher levels of co-morbidities than the general population. These factors cause a decrease in maximum aerobic capacity. These factors also inhibit the majority of the SMI population from living long and healthy lives, dying 20-25 years earlier than the general population (Viron & Stern, 2010). Previous published studies have been done implementing a wellness intervention in this population. Most previous published studies focused on dietary change with a minor emphasis on exercise. Five published studies, since 2005, have implemented an exercise program, or emphasized exercise. Only one of these studies has assessed the aerobic capacity of individuals with SMI, excluding major depressive disorder (Pelletier, Nguyen, Bradley, Johnsen, & McKay, 2005). The current study included a dietary and exercise component. Although exercise cannot be a mandatory component, different activities including exercise videos, group exercise classes, and personal training were made available to participants daily. A dietary intervention occurred for one hour per week for twelve weeks. The current study allowed access to

community resources such as fitness facilities, and national walks. This is the first study to measure aerobic capacity prior and following a dietary and exercise intervention. The following topics will be in this discussion: discuss SMI and exercise focusing on aerobic capacity, discuss weight, BIA, gender, and SMI, and discuss limitations on exercise with SMI population.

6.1.1 Established Reliability of Study

Over one hundred published studies have been done focusing on the benefits of exercise on mental illness. Most of these previous published studies focus on exercise and depression and the relationship it has on self-perception. Fifty-three studies have been published examining SMI and health interventions and 24 studies conducted and published in the United States. Only five published studies have focused on exercise and SMI (Pelletier, Nguyen, Bradley, Johnsen, & McKay, 2005) (Hutchinson, Skrinar, & Cross, 1999) (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005) (McDevitt, Wilbur, Kogan, & Briller, 2005) (Van Citters et. al, 2010). However, the main purpose for two of the previous studies was strictly on the effects exercise has on self-perception and mood, with health benefits secondary. Since 2005, three previous studies published have been done with a focus on overall health when correlating exercise and SMI (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005) (Pelletier, Nguyen, Bradley, Johnsen, & McKay, 2005)(Van Citters et. al, 2010). Only one published study has looked at aerobic capacity and SMI (Pelletier, Nguyen, Bradley, Johnsen, & McKay, 2005). However, the present study is the only known study to use a cycle ergometer in testing maximal aerobic capacity. Previously published studies tested aerobic capacity by using tests such as the six-minute walk test, but focused

on distance walked instead of calculating aerobic capacity. A limitation of previous studies is the small sample size, short duration, and low adherence rates. This study contains the small outpatient study population, evaluating a community-based population of 49 individuals with SMI over a 12-week period. Study endpoints included assessment of aerobic capacity and body fat percentage. The study population is larger than most previous studies and meets previous research recommendations by extending the duration of the intervention (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005) (Skrinar, Huxley, Hutchinson, Menninger, & Glew, 2005) (Kemp, Bates, & Mohan, 2009).

Table 6.1.2 Summary of Studies

Study	# of Participants	Outpatient/Inpatient	Duration	Diagnosis	Results
Drake et. al, (2011)	*49*	*Outpatient*	*12 weeks*	*SMI*	*Sig. decrease in BF% in males with MDD; No sig. increase in VO_{2max} in all groups; No sig. increase or decrease in weight, BF%, and BMI in all SMI groups*
Pelletier et. al, (2005)	17	Outpatient	16 weeks	Mood & Anxiety Disorders; Schizophrenia	Improvement in aerobic capacity, social skills, general health
Van Citters et. al, (2010)	76	Outpatient	9 months	SMI	Sig.improvement in waist circumference & physical exercise. Sig. improvement in mood & self satisfaction.
Skrinar et. al, (2005)	20	Outpatient	12 weeks	Mood & Anxiety Disorders; Schizophrenia	Improved general health & empowerment
Hutchinson et. al, (1999)	37	Outpatient	20 weeks	Mood & Anxiety Disorders; Schizophrenia	Increase in self-esteem, self confidence, & anti-depressant effect
McDevitt et. al, (2005)	15	Outpatient	12 weeks	Schizoaffective & Schizophrenia Disorder; BP; MDD;	May improve mood and psycho functioning in adults
Lindenmayer et. al, (2009)	275	Inpatient	36 weeks	SMI	Increase in knowledge of healthy lifestyles: Sig. reduction in weight & BMI
Warren et. al, (2010)	17	Outpatient & Inpatient	10 weeks	Schizophrenia & Schizoaffective Disorder	High adherence rate; No Sig. weight loss
Smith et. al, (2007)	966	Outpatient	24 months	SMI	Low adherence rates, High BMI, Weight, & Risk Factors
Menza et. al, (2004)	31	Outpatient	52 weeks	Schizophrenia & Schizoaffective Disorder	Sig. decrease in weight & BMI
Richardson et. al,(2005)	39	Outpatient	18 weeks	SMI	Sig. decrease in weight

6.1.3 SMI and Exercise

As found by the majority of previous published research, most individuals with SMI do not take part in any form of exercise. The vast amount of information available dealing with exercise and mental well-being is focused on the benefits of exercise on depression. A narrower amount of research is available with the SMI population. As with the general population, exercise has significant benefits to overall health, but the SMI population rarely takes part in this prescription. As suggested by (Perham & Accordino, 2007), exercise may bridge the gap between antipsychotic medications and positive effects of lifestyle with individuals in the SMI population. Many wellness intervention studies focused primarily on the effects of exercise on self-perception and mood.

One of the objectives of this study was to examine if a wellness intervention had an impact on an individual's maximum aerobic capacity in the SMI population. A previous study conducted by Pelletier et al (2005), experienced an improvement in VO_{2max} over a period of time but experienced high drop out rates throughout the study. This study showed that given the commitment, individuals with SMI could improve their VO_{2max} over time, and potentially improving their quality of life. The study gave promise to future research. However, this study found no significant increase in aerobic capacity in individuals with SMI following a wellness intervention. The individuals involved in this study had a rating between fair and poor for maximal aerobic capacity in both genders up to the 60-69 age group. Table 5.3.1 rates the maximal aerobic capacity for the different age groups tested.

Table 6.1.4 Rating of Maximal Aerobic Capacity by Age Group

Age Group	Mean VO2max	Std. Dev.	Rating
20-29	30.98	9.05	Very Poor
30-39	30.94	9.87	Very Poor-Poor
40-49	28.8	8.86	Very Poor-Poor
50-59	30.84	10.66	Very Poor-Fair
60-69	35.71	8.72	Good-Excellent

Low intensity exercise has been described as the best type of exercise for the SMI population. Due to all the comorbities associated with SMI, safety while exercising is an important aspect. Caregivers need to be aggressively monitoring this population while conducting anything other than low intensity exercise. As stated by previous research, many challenges were faced throughout this study. It was difficult to convince members to participate in any type of exercise other than walking. Due to the resistance to participate in any form of exercise, an increase in maximum aerobic capacity did not occur.

As found by (Daumit, et al., 2005), walking was the most participated and accepted exercise not only in the general population but also the SMI population. Walking is an appropriate exercise prescription for the SMI population because it is low-cost, safe, and can be supervised. Exercise videos are also appropriate and were successfully utilized in the current study. Long adherence rates are met when programs continually promoted exercise whether during leisure time or at home (Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005). Most individuals at Breakthrough Club had a negative

perception of exercise and would adamantly deny any involvement. Dietary changes were more welcomed than exercise in the current study.

6.1.5 Weight, Body Fat Percentage, and Aerobic Capacity

Two-thirds of the general population is overweight or obese (CDC, 2011), commonly defined as a BF% of >25 or >30 respectively. Although previous published research has stated an obesity rate eight times the general population, the percentage of Americans in the general population that are obese is currently equal to the percentage of Americans in the SMI population that are obese. Body fat percentage, affected by weight, is a common indicator of health. Risk factors are commonly obtained as BF% increases. Most research concludes that health drastically improves as weight and BF% decreases. Weight increase is a major side effect of antipsychotic medications, making it difficult for individuals to lower their BMI and increase their maximal aerobic capacity.

Prevention is crucial for the comorbities described in chapter one. The American College of Sports Medicine prescribes a healthy balance of exercise and caloric intake to maintain a healthy BF% and weight. Eight-three percent of the individuals tested for this study faced the challenge of being overweight or obese. Sixty-two percent of the individuals tested were at moderate risk for disease development and ten percent at high risk for disease development. Out of 18 studies reviewed by the New York State Psychiatric Institute, ten published studies found statistically significant reduction in weight loss, proving a lifestyle intervention can be effective (NYS Center of Excellence for Cultural Competence, 2010).

6.1.6 Limitations on SMI population

Many studies emphasized the high dropout rate while conducting a study with the SMI population. The same challenge was faced in this study. Multiple individuals performed only one aerobic capacity test and would not return for later testing. A number of factors were associated with this high dropout rate, including motivation, lack of priority, and illness. During the course of this study, five of the enrolled members passed away, and many others became increasingly ill. Only five out of the fifty-two tested individuals participated in one-on-one training with a personal trainer. After completing one of the submaximal aerobic bike test, multiple members decided it was too difficult and declined repeating the test. Previous studies done were conducted in an inpatient facility causing a more structured environment to conduct research. Dealing with this community-based population was difficult to coordinate and motivate people to be tested.

To keep with current practices, research before 1998 was disregarded due to changes in antipsychotic medications. Additionally, the majority published before 2000 focused on the benefits of exercise on depression, and disregarded SMI.

6.2 Conclusion

The following summarizes the main conclusions found in this research.

1. A wellness intervention did not increase maximum aerobic capacity in males or females with SMI.
2. A wellness intervention did not decrease body fat percentage in males with schizoaffective disorder, schizophrenia disorder, and bipolar disorder.

3. A wellness intervention decreased the body fat percentage in males with major depressive disorder.
4. A wellness intervention did not decrease body fat percentage in females with schizophrenia disorder, schizoaffective disorder, bipolar disorder, and major depressive disorder.

6.3 Recommendations for Future Research

This study identified three considerations for future research. First, a wellness intervention not specifically focusing on exercise does not increase maximum aerobic capacity. Second, the participants continually rated in the "very poor-poor" category for maximal aerobic capacity. Finally, a wellness intervention in a community-based SMI population does not decrease body fat percentages expect in males with major depressive disorder. Based on these three points, future research would need to implement additional changes to ensure optimal outcomes. First, a larger sample size is needed to ensure adequate representation of all SMI diagnoses. Second, participants need to consistently participate in testing to ensure appropriate categorization of maximal aerobic capacity. Finally, investigators need to consider independent risk factors, such as antipsychotic drug use, when implementing a lifestyle intervention.

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APPENDICES

Appendix A

Summary of Anthropometric Data

Gender	Height	Age	Pre-Weight	Post Weight	Pre BMI	Post BMI
M	76	41	204.5	201.5	24.9	24.5
F	66	29	239	247.8	38.6	40
M	70	40	203.8	194	29.1	27.8
M	67.25	62	203.5	205	31.6	31.9
F	63	23	139.5	154	24.7	27.3
M	69.5	24	152	151.5	22.4	22.1
F	64.25	22	168	189.25	28.6	32.2
F	63.75	58	201	200.6	34.8	34.7
M	72.5	35	209	212.1	27.9	28.4
F	66	49	197.8	203	31.9	32.8
M	72.5	22	242	240	32.4	32.2
M	73	54	277	270.3	36.5	35.6
F	66	51	291	280	46.96	45.2
M	69.5	34	269.3	276	36.5	40.2
F	63.5	61	201	196	35.1	34.2
M	68	29	228	212	34.7	32.3
M	73	56	244.5	239.5	32.3	31.6
F	66.5	32	127	137	20.2	21.8
M	68	58	195.5	202	29.7	30.7
F	60.5	51	202	207	38.8	39.7
M	66.25	28	210	192.8	33.7	30.8
M	75	30	196.75	175	24.59	21.7
M	74	40	160.2	161	21.2	21.2
M	66	60	177	172.5	28.6	27.8
M	70	23	218.5	221.5	31.3	31.8
M	72.5	56	192	178	25.7	23.8
M	68.25	37	213.5	219.9	32.22	33.2
F	64.25	59	192	191.5	32.7	32.6

Appendix B

Summary of Anthropometric Data Cont.

ID #	Gender	Height	Age	Pre-Weight	Post Weight	Pre BMI	Post BMI
P1101971	M	71.25	41	223.25	220.4	30.9	30.5
P1101942	F	60.5	60	171.25	175.9	32.89	33.78
1102286	M	69	25	170.6	174.3	24.4	25
110216	F	64.5	54	208	206	35.1	34.8
1102621	M	70.25	61	218.3	224.6	31.3	32
1104371	M	70.5	52	156	156.5	22.1	22.1
1104053	M	72	35	306	315	41.5	42.7
1103309	F	62	28	156.6	167	28.6	30.6
11048	M	72.25	58	265	250	35.7	33.7
1105588	F	67	60	216.3	222.5	33.9	34.8
1106408	F	68	22	286	278	43.5	42.3
1107409	F	69	38	187	176	27.6	26
1107625	F	64	29	263.75	258.3	45.2	44.3
2103337	F	61	56	212.2	195.9	39.71	37.5
2105403	F	59	41	173.7	173.5	35.1	35
2104383	M	71.5	35	233.8	246	32.2	33.8
2102357	F	64.5	51	207.8	205.3	34.8	34.4
2104387	F	57	55	142	132.9	30.7	28.8
2106434	F	63.25	44	230	228	40.1	40
1111276	M	71.5	33	258	258	35.5	35.5
1112459	F	64.5	56	164	158	27.7	26.7
1112893	F	66	42	155.5	155.5	25.1	25.1
1211682	M	67.25	44	137.5	130.5	21.4	20.3
2105405	M	69.25	53	186.5	192.4	27.3	28.2

Appendix C

Summary of Disorder and Maximal Aerobic Capacity & BF%

ID #		Diagnosis	Risk	Pre VO2	Post VO2	Pre BF%	Post BF%
P1101971	M	schizoaffective disorder	2	40.1	32.3	24.8	26.2
P1101942	F	schizoaffective disorder	2	32.38	25.97	42.1	43.6
1102286	M	Bipolar Disorder	2	40.1	42.58	17.7	17.6
110216	F	schizoaffective disorder	2	21.16	27.28	42.6	42.3
1102621	M	schizophrenia	2	26.04	42	29.3	29.9
1104371	M	Bipolar Disorder	2	48.3	41.69	16.4	18.2
1104053	M	schizophrenia	2	22.7	22.61	37.6	37.6
1103309	F	Bipolar Disorder	2	27.7	37.87	34.2	34.9
11048	M	schizophrenia	2	22.87	17.19	36.7	36.3
1105588	F	Generalized Anxiety Disorder	2	32.96	29.8	42.6	43.7
1106408	F	MDD	2	18.9	17.92	39.1	43.6
1107409	M	schizoaffective disorder	2	35.63	45.82	23.5	20.5
1107625	F	schizophrenia	2	32.5	27.86	45.7	45.1
2103337	F	schizophrenia)	2	42.36	42.5	48.1	37.2
2105403	F	schizoaffective disorder	3	33	27.35	42	43.7
2104383	M	schizoaffective disorder	2	26.42	26.42	26.2	28.8
2102357	F	MDD	2	23.49	36.64	44	44.5
2104387	F	schizophrenia	2	15.27	18.37	42	40.8
2106434	F	Bipolar Disorder	2	18.18	19.42	44.7	43.6
1111276	M	schizoaffective disorder	2	28.83	38.51	31	31.8
1112459	F	MDD	3	28.7	29.99	38.7	36.1

Appendix D

Summary of Disorder and Maximal Aerobic Capacity & BF% Cont.

ID #		Diagnosis	Risk	Pre VO2	Post VO2	Pre BF%	Post BF%
1112893	F	Bipolar Disorder	2	29.11	29.71	35.5	33.5
1211682	M	schizophrenia	1	42.62	41.13	13.4	8.1
2105405	M	Bipolar Disorder	2	46.15	37.18	24.5	25.6
1114512	M	schizoaffective disorder	2	31.64	28.64	21.1	20
1114942	F	Bipolar Disorder	2	24.58	33.93	44.8	45.3
1114944	M	Bipolar Disorder	3	36.75	21.3	29.1	24.6
P1101227	M	MDD	3	38.04	36.82	30.2	27.7
1115270	F	MDD	2	35.71	36.71	28.5	32.3
1115886	M	Bipolar Disorder	2	57.65	43.84	9.4	12.1
1115947	F	Bipolar Disorder	2	21.45	16.52	33.8	35.9
1103331	F	MDD	3	25.41	23.36	33.8	35.9
1106901	M	schizoaffective disorder	2	30.12	29.46	24.8	26.9
1116995	F	schizophrenia	2	18.99	16.5	38.1	38.9
1116253	M	Bipolar Disorder	3	31.14	30	28.1	28.2
2107902	M	dysthymic disorder	2	37.7	37.7	31	31
218905	F	Bipolar Disorder	3	14.44	11.74	36.2	48.8
2110926	M	schizoaffective disorder	2	24.32	16.69	32.3	35
1105885	F	Bipolar Disorder	3	22.11	29.71	44.2	42.9
1117284	M	schizophrenia	3	31.04	34.83	30	29
1113877	M	schizoaffective disorder	3	39.9	17.9	32.8	30.2
1118521	F	Bipolar Disorder	2	37.23	37.77	17.3	23.1
1117148	M	schizophrenia	3	50.11	49.12	34.7	32.8
1115946	F	schizoaffective disorder	2	42.08	29.08	44.1	45.4
1118350	M	MDD	2	32.45	30.77	29.7	26.9
P1101243	M	Bipolar I Disorder	2	26.67	19.72	20.5	15.8
1217267	M	Personality Disorder	1	32.15	31.95	18.5	18.3
111941	M	Bipolar I Disorder	3	53.98	48.72	28.4	28.3
1109455	M	schizophrenia	3	20.64	24.13	11.9	24.4
1113935	M	schizoaffective disorder	2	41.88	43	29.6	27.9
P1101268	M	Bipolar Disorder	2	29.43	33.16	28.3	28.4
1118312	F	schizoaffective disorder	3	30.46	29.89	42.4	41.9

Low Risk=1 Medium Risk=2 High Risk=3

Appendix E

Breakthrough Fitness Screening Questionnaire

Date: _____

Name: _____ Phone: _____

Address: _____

Sex: Male Female Height: _____ Weight : _____ Date of Birth:_____

BMI: _____ Blood pressure:_____ Resting Heart Rate: _____

Risk Stratification Level: Low Medium High

Fitness Test Results: _____

Yes/No

Y / N 1. Have you experienced pain, pressure or a squeezing sensation in your chest during of after exercise, physical or sexual activity, or exposure to cold air.

Y / N 2. Do you have a history of, or have been told you have a history of heart disease such as heart attack, coronary thrombosis, coronary insufficiency, angina, a rapid or irregular heart beat?

Y / N 3. Have you ever had an abnormal EKG?

Y / N 4. Do you have high blood pressure (hypertension)? Are you on medications to control it?

Y / N 5. Do you have diabetes? Do you know your blood glucose levels?

Y / N 6. Have you smoked within the last 6 months?

Y / N 7. In the last 6 months have you been told by a health professional that you need to lose weight?

Y / N 8. Do you have leg pain after walking several blocks that improves after you rest?

Y / N 9. Have you experienced rapid weight loss or weight gain in the last six months?

Y / N 10. Are you pregnant or have you given birth within the past six weeks?

Y / N 11. Have you had any surgery within the last six weeks?

Y / N 12. Do you have any joint disease, arthritis, or prior lower extremity injury or chronic recurrent back pain?
Y / N 13. Do you have a family history of heart disease or sudden death before 55 years of age in a male first degree relative or 65 years of age in a female first degree relative?
Y / N 14. Do you know your total cholesterol? If yes: _____

Do you have any other health issues or concerns that may affect your ability to exercise?
_____
_____
_____

Are you presently involved in an exercise program? _____
If NO: Please list the last time you participated in physical activity on a regular basis:
_____

I understand the HEAL Project assessment is designed to increase the heart rate for beneficial physical training. I certify the answers to the above questions are true and correct to the best of my knowledge. I assume the risk of any injury or even death, which I might suffer due to increased heart rate activity. I do hereby, for myself, my heir, administrators and assigns, release the BTC Wellness Center, its staffs, from all claims and causes of action of any sort, present, future, known, for injury to my person during my participation in such activities.

I HAVE READ AND UNDERSTAND THE RELEASE:
In witness whereof, I voluntarily executed this release at Breakthrough Club Wellness Center in Wichita, Kansas on the ____ day of the ____month, during the year_____.

Signature_____

Emergency Contact Person: _____ Phone: _____

Measurements:

Waist:

Abdomen:

Hips:

BIA: