A Dissertation

Entitled

Evaluating the Effectiveness of Brief Motivational Interviewing
As an Adjunct to Health Home Services

by

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Research indicates that individuals with severe and persistent mental illness (SPMI) experience higher rates of medical comorbidity and mortality than the general population (Colton & Manderscheid, 2006; Miller, Paschall, & Svendsen, 2006; Scott & Happell, 2011). These physical health disparities have not yet been addressed adequately by the healthcare system (Felker, Yazel, & Short, 1996). In the current study, a brief Motivational Interviewing (MI) intervention was evaluated as an adjunct to the Health Home model of integrated health care at a large community mental health center providing services to adults with severe and persistent mental illness in an urban area. MI is a therapeutic intervention with efficacy in promoting improved well-being and health-related behavior change, including behaviors contributing to poor health and increased morbidity for adults living with SPMI. Some preliminary evidence suggests MI can even be effective in brief, one session forms. A longitudinal (pre-post) design was utilized to assess the impact of Health Home and brief MI interventions on objective physical health outcomes (i.e., blood pressure, heart rate, weight, and BMI), as well as self-reported
health-related behaviors (i.e., nutrition, physical activity, and smoking behaviors as measured by the Health-Related Behavior Questionnaire).

Results indicated that participants were experiencing high rates of medical comorbidity (e.g., hypertension, obesity, and diabetes) and engaging in unhealthy lifestyle behaviors consistent with prior literature assessing adults living with SPMI in community settings and providing rationale for interventions aimed at improving wellness. Engagement in Health Home services (regardless of participation in MI) was associated with some positive outcomes (e.g., an increase in the average number of days per week that participants engaged in physical activity; moderate, significant reductions in both systolic and diastolic blood pressure) over a 3-month period.

One brief MI session appeared to succeed in its intended purpose (i.e., assisting people in moving from a lower stage of change to a higher stage of change). Specifically, the majority of people who received brief MI experienced a slight increase in their desire to change (on a scale of 0-10) and almost half of the participants experienced an increase in their confidence that they could successfully change a health-related behavior (i.e., nutrition, physical activity, or smoking). Additionally, with regard to smoking, participants who received brief MI were more likely to report they had thought about quitting smoking than those receiving Health Home services only. Unfortunately, increased motivation for behavior change was not associated with an increase in attempts to change after one brief MI session. In general, it appears a longer course of MI intervention is needed to result in a clinically meaningful change in physical health and health-related behaviors above and beyond that of participants’ typical Health Home
services. Future studies should examine ‘larger doses’ of MI as a way of better addressing the severity and complexity of this population’s needs.
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Chapter One

Introduction

A large body of evidence has demonstrated that individuals with severe and persistent mental illness (SPMI) experience higher rates of comorbid physical health conditions than persons in the general population (Colton & Manderscheid, 2006; DeHert et al., 2011; Fleischhacker et al., 2008; Miller et al., 2006; Scott & Happell, 2011). This body of research also indicates that individuals with SPMI are at risk for higher mortality rates associated with their poorer physical health (DeHert et al., 2011; Laursen, Munk-Olsen, & Vestergaard, 2012; Miller et al., 2006). In response to these high rates of medical comorbidity and mortality, many health care providers have begun transitioning toward integrated healthcare for this population. Preliminary evidence for integrated health care services (e.g., the Health Home model of care) has demonstrated positive outcomes, such as improved health status and quality of care in this population (Bartels, 2004; Chowdhury, Kulcsar, Gilchrist, & Hawkins, 2012; World Health Organization, 2008); however, proper management of most chronic conditions common to these individuals will require them to make significant health behavioral changes as well (Kolbasovsky, 2008).

One clinical intervention style that has demonstrated efficacy in helping individuals to work toward necessary behavioral changes and improved mental and physical well-being is Motivational Interviewing (MI; Rollnick & Miller, 1995). A growing body of research suggests that MI can be useful in promoting the types of health behavior changes needed to prevent and treat common medical comorbidities (Hettema, Steele, & Miller, 2005; Lundahl et al., 2013; Martins & McNeil, 2009). Furthermore, it
appears that MI interventions can promote increased motivation toward behavior change in brief forms, as short as a single session (Bird-Gulliver, Kamholz, Helstrom, Morissette, & Kahler, 2008; McCambridge & Strang, 2004). Despite preliminary research, little is known about the efficacy of MI, particularly brief MI adaptations, as an adjunct to integrated health care services for individuals with SPMI.

The primary goal of the current study was to evaluate the effects of integrated healthcare services and brief MI intervention targeting health behaviors among adults living with SPMI. A longitudinal (pre-post) design was used to assess changes in objective health outcomes and self-reported health behaviors over time. In addition, this study examined the impact of a single MI session on the importance and confidence in making a health-related behavior change. Participants in the present study participated in one of two treatment conditions: Health Home services only or Health Home services with an adjunct of brief MI targeting a health behavior selected by the participant. First, a review of the literature is conducted, including the high prevalence of comorbid physical health conditions among individuals with SPMI, factors contributing to poor health, health care disparities, recent integrated health care initiatives, the use of MI for health promotion, the use of MI for SPMI populations, and brief adaptations of MI. Second, an overview of the study’s methodology is conducted. Thirdly, analyses and results are discussed. Finally, a discussion of the results and limitations of the study are provided.
Chapter Two

Literature Review

Health Status of Individuals with Severe and Persistent Mental Illness

Historically, individuals living with SPMI were thought to have a permanent condition. For the purpose of research (the present study included), SPMI diagnoses most commonly include schizophrenia, bipolar disorder, and recurrent major depressive disorder. These conditions were considered to require lifelong behavioral health services through community mental health centers and/or psychiatric hospitals. Individuals living with SPMI, their families, and providers have traditionally had limited expectations for improvement in symptoms, behavior change, and the achievement of an independent, meaningful life (Ellis & King, 2003; Frese & Davis, 1997). After psychiatric deinstitutionalization, the concept of recovery began being conceptualized in a new way. The consumer-survivor movement shifted both providers and consumers toward a focus on the process of recovery (e.g., developing a meaningful life regardless of current symptomatology) instead of the more traditional focus on symptom remission (Anthony, 1993; Corrigan & Phelan, 2004). This provided hope for many and shifted perceptions and beliefs about potential for behavior change. With the efforts of individuals with SPMI and complex changes in systems of care, it is now more common for individuals with SPMI to be insured, living meaningful lives despite symptoms, and receiving healthcare services in a range of public and private settings.

Despite the changes that have occurred in the healthcare system, the high rate of comorbid physical health concerns experienced and their associated clinical implications for this population have not yet been adequately addressed. A large body of evidence
indicates that individuals with SPMI experience poorer physical health and a much shorter life expectancy when compared to the general population (Colton & Manderscheid, 2006; Lawrence, Hancock, & Kisely, 2013; Miller et al., 2006; Scott & Happell, 2011). This significant burden of morbidity and early mortality also results in consumption of substantial health resources (Hendrie et al., 2013; Hugh et al., 2014; Satcher, 2000).

Colton and Manderscheid (2006) estimated that the life expectancy for those with SPMI is at least 30% shorter than that of the general population in the United States. Additionally, a study of Ohio Department of Mental Health mortality and morbidity data from 1998 to 2003 indicated that the mean age of death for those with SPMI was 47.7 (±15.3) years, corresponding to an average 32.0 (±12.6) years of potential life lost per individual when compared to the general population (Miller et al., 2006). The excess morbidity and mortality reported among the SPMI population has been a consistent finding across heterogeneous studies (DeHert et al., 2011; Saha, Chant, & McGrath, 2007; Scott & Happell, 2011).

A large portion of these deaths are associated with preventable medical conditions (Cook, 2011; Laursen, Munk-Olsen, & Vestergaard, 2012). Although research indicates that the prevalence of obesity within the general population in the U. S. is high, ranking as the second leading cause of preventable disease and having an estimated prevalence of 33.9%, obesity is even more common within the population of persons with SPMI (Brunero & Lamont, 2010; Flegal, Carroll, & Ogden, 2010). A study by Brunero and Lamont (2010) estimated that 54% of individuals with SPMI evaluated currently met the
standard threshold for obesity, placing them at high risk for a number of chronic medical conditions.

**Estimated Rates of Medical Comorbidities**

Heart disease, hypertension, diabetes, chronic respiratory disorders, arthritis, cerebrovascular disorders, dental disease, and liver disease are among the other conditions found more frequently in those with SPMI than in the general population (Best Practices in Schizophrenia Treatment Center, 2011; De Hert et al., 2011; De Leon, Susce, Diaz, Rendon, & Velsquez, 2005; Kennedy, Salsberry, Nickel, Hunt, & Chipps, 2005; Van Hasselt et al., 2013). Consistent with the general population, the leading cause of death is heart disease (Miller et al., 2006), and this population is more likely than the general public to report having at least three health conditions that increase their likelihood of heart disease (e.g., obesity, diabetes mellitus, and current tobacco smoking) during a visit with their physician (Daumit, Pratt, Crum, Powe, & Ford, 2002).

These health disparities are also likely to be even greater for racially and ethnically diverse populations in the United States (U.S. Department of Health and Human Services, 2001). Racial and ethnic minorities experience higher rates of morbidity and mortality than non-minority groups with few exceptions. For example, African American and Hispanic American populations experience the higher rates of obesity and diabetes than non-minority populations (Carliner, Collins, Cabassa, McNallen, Joestl, & Lewis-Fernandez, 2014; Smedley, Stith, & Nelson, 2003). Additionally, persons who are African American experience the highest rates of mortality from heart disease, cancer, HIV/AIDS, and cerebrovascular disease (Smedley, Stith, & Nelson, 2003). These
disparities are likely related in part to differences in access to healthcare, socioeconomic status, health-related risk factors, and discrimination (Smedley, Stith, & Nelson, 2003).

Within the growing body of literature on the prevalence of physical health conditions in persons with SPMI, the prevalence rates vary largely due to the method of measurement (e.g., self-report, medical records, insurance billing records, and standardized objective measurements) and the specific criteria used for each condition. Kennedy et al. (2005) investigated the prevalence of obesity and hypertension in a sample of individuals with SPMI receiving services from a community mental health center by measuring the height, weight, and blood pressure of all study participants. BMI measurements indicated that 54% of these consumers had a BMI which met criteria for obesity and an additional 19% had a BMI indicating that they were overweight (Kennedy et al., 2005). Kennedy et al., (2005) also found that 37% of their participants had blood pressure levels indicating hypertension (i.e., systolic blood pressure of 140 mm Hg or greater or a diastolic blood pressure of 90 mm Hg or greater).

Many other studies rely on participant self-report, medical chart documentation, or DSM Axis III diagnoses to determine the physical health of persons with SPMI. Using this type of information in a study of persons with SPMI in a combination of inpatient and outpatient settings, De Leon et al. (2005) found that approximately 27% of participants with SPMI also had a diagnosis of hypertension, 18% had a diagnosis of diabetes mellitus, and 13% were found to have a form of hyperlipidemia (i.e., an elevated concentration of any or all of the lipids in plasma most commonly discussed in regard to cholesterol and triglyceride levels in the blood). Daumit et al. (2002) conducted a study of the medical records of persons with SPMI and found lower rates of hypertension than
De Leon et al. (2005) with 14.4% of the sample used having documentation of this condition. Additionally, 13.4% of the sample was documented as meeting criteria for obesity. Kennedy et al. (2005) obtained similar prevalence rates of diabetes when investigating self-report and psychiatric records of an outpatient sample of persons with SPMI, suggesting that approximately 14% of the SPMI population have this disorder. Kennedy et al. (2005) also indicated that approximately 22% were diagnosed with chronic respiratory disorders.

In a recent study investigating physical health conditions in persons with SPMI using Ohio Medicaid claims, this population was found to have higher prevalence rates of all measured co-occurring physical health conditions including hypertension (36%), chronic respiratory disorders (28%), diabetes (18%), arthritis (38%), heart disease (21%), cerebrovascular disorders (7%), obesity (10%), dental disease (8%), and liver disease (3%) when compared to the general population (Best Practices in Schizophrenia Treatment Center, 2011). The prevalence rates for the following co-occurring conditions were also found to be even higher in individuals diagnosed with schizophrenia when compared to a population with a combination of SPMI diagnoses: hypertension, chronic respiratory disorders, diabetes, heart disease, cerebrovascular disease, obesity, and liver disease. Furthermore, preventable physical health conditions were found to result in more frequent hospitalizations and emergency room visits in persons with SPMI than was found in the general population (Best Practices in Schizophrenia Treatment Center, 2011).
Factors Contributing to Poor Physical Health

Maintaining physical wellness can be particularly difficult for those living with SPMI. Studies suggest that a number of factors, including the side effects of antipsychotic medications (e.g., metabolic disturbances and food intake despite satiety), symptoms of mental illness (e.g., negative affective states, social isolation, and suspiciousness), and socioeconomic and lifestyle factors (e.g., unemployment; lack of exercise; smoking tobacco; and eating a diet high in saturated fat and refined sugar and low in fiber, fruits, and vegetables) contribute to this population’s risk of developing medical conditions (Beebe, 2008; Compton, Daumit, & Druss, 2006; Dipasquale, Pariante, Dazzan, Aguglia, McGuire, Mondelli, 2013; Henderson et al., 2006; Jerome, Young, Dalcin, Charleston, Anthony, Hayes, & Daumit, 2009; Melamed et al., 2008; Rege, 2007; Scott & Happell, 2011).

Although non-modifiable risk factors (e.g., age and heredity) play a role in physical health, a number of behaviorally modifiable risk factors strongly contribute to new instances of heart disease, chronic respiratory diseases, stroke, and other medical conditions (Kolbasovsky, 2008). In fact, a study by McGinnis and Foege (1996) suggested that almost half of all deaths in the United States are attributable to modifiable lifestyle behaviors (e.g., poor nutrition, tobacco and drug use, and sedentary lifestyle). World Health Organization data suggests that the three risk factors most commonly underlying the chronic medical conditions experienced by individuals living with mental illness include unhealthy nutrition, tobacco use, and physical inactivity (Kolbasovsky, 2008). Furthermore, these health risk behaviors are negatively associated with severity of symptoms of SPMI (Cerimele & Katon, 2013). Within the behavioral health arena,
greater emphasis has begun being placed on addressing lifestyle behaviors in order to improve health outcomes; however, this movement has been slow. Slow progress in this area appears related to perceived lack of time to discuss these health behaviors in context of brief medical visits, a lack of training in promoting health behavior change, and the slow pace inherent in large systemic changes (Kolbasovsky, 2008).

Health Care Disparities

Despite the link between living with SPMI and higher prevalence of preventable health conditions, there is growing evidence that disparities in healthcare provision for this population contribute to their poor physical health outcomes (Lawrence & Kisely, 2010). In spite of knowledge about their higher risk for preventable health conditions, Roberts, Roalfe, Wilson, and Lester (2006) found that the individuals with SPMI are no more likely than the general population to receive physical health checks that may identify the early-onset of physical health issues. As a result, comorbid medical conditions are largely undiagnosed and can go untreated. Felker et al. (1996) found that approximately 35% of individuals receiving behavioral health services were harboring undiagnosed medical disorders. Studies investigating health care disparities within the SPMI population suggest this suboptimal medical care can be attributed to a host of both patient-related and provider-related issues (De Hert et al., 2011).

Common patient-related issues include difficulty communicating health care needs, inefficient utilization of health care services available, difficulty following complex medical recommendations, and reduced likelihood to engage in help-seeking behaviors (Felker et al., 1996; Goldman, 1999; Kaufman, McDonell, Cristofalo, & Ries, 2012; Lawrence & Kisely, 2010). In a study of healthcare utilization, Dickerson,
McNary, Brown, Kreyenbuhl, Goldberg, and Dixon (2003) reported that 59% of persons with psychiatric illness report at least one barrier to accessing medical care, compared to 19% of the individuals without a psychiatric illness involved in the study. In qualitative studies, those with psychiatric illness most commonly reported barriers that include difficulty scheduling themselves for an appointment, difficulty paying for prescriptions, lifestyle instability, lack of transportation, homelessness, and poor timeliness of appointments that are scheduled (Dixon, 2003; Kaufman, McDonell, Cristofalo, & Ries, 2012). Low socioeconomic status and inadequate insurance coverage are also associated with a lack of affiliation with a primary care physician (Grumbach, Kean, & Bindman, 1993; Millar, 2008).

Provider-related issues commonly include stigma toward individuals with SPMI, a lack of integration between behavioral health and primary care services, long wait periods between available appointments, long wait times after checking in for an appointment, and other time and resource constraints (Felker et al., 1996; Goldman, 1999; Kaufman, McDonell, Cristofalo, & Ries, 2012; Lawrence & Kisely, 2010; Schulze, 2007). Kaufman, McDonell, Cristofalo, and Ries (2012) note provider biases in which patients with SPMI are viewed as undesirable to treat due to inadequate insurance coverage and likelihood of need for additional resources (e.g., longer visits; involvement of case management at appointments). Research has demonstrated that professionals, even those who have chosen to work with this population, continue to demonstrate stigma towards individuals living with psychiatric illness (Schulze, 2007; Thornicroft, Rose, & Kassam, 2007). In addition, most agencies continue to operate in a confusing, fragmented system of care that is difficult to navigate. More can be done to enhance the health of
individuals with SPMI but questions remain regarding reimbursement, efficacy of new services implemented, adequate workforce training, and community outreach to improve interest in these services (Cook, 2011).

**Integrated Health Care**

Integrating behavioral health and primary care services can reduce the fragmentation of health care delivery and improve the quality of preventative and treatment services (Chowdhury et al., 2012). Several studies evaluating integrated healthcare have demonstrated positive outcomes, such as improved health status and quality of care, as evidenced by improved health status one year later; higher percentages of individuals having a designated primary care physician; higher percentages of individuals receiving primary care visits, physical exams, and eye and dental exams; reductions in the use of emergency departments of medical care; and improvement of health self-management skills (Bartels, 2004; Chowdhury et al., 2012; World Health Organization, 2008).

Integrated Health Care (IHC) is a way of organizing a health system to address biopsychosocial needs through a range of behavioral health and primary care services (Forum on Integration, 2010). Many different models of IHC exist along a continuum from collaboration and communication between providers working for separate agencies to a fully integrated system of care using interdisciplinary team approaches and shared electronic medical records within a single location (Scharf, Eberhart, Schmidt, Vaughan, Dutta, Pincus, & Burnam, 2013). IHC entities typically provide both preventive and treatment services and target a specific population and that population’s needs. IHC can engender continuity of care by providing opportunity for consistent and effective
treatment relationships to be established (World Health Organization, 2008). IHC also aims to utilize resources more efficiently and lower overall health care expenditures.

The optimal model of interdisciplinary services used is typically related to the severity of the target population’s medical and psychiatric illnesses. IHC can also occur in a variety of settings (e.g., primary care, community mental health centers, long-term care, academic health centers, and psychiatric hospitals). Each community must develop its unique arrangement depending on factors such as consumer preferences (e.g., where people might be most willing to accept care), the training of the workforce (e.g., whether primary care and behavioral health staff are skilled to deliver the services planned), organizational support (e.g., impact on documentation of services and availability of multidisciplinary health record system), and reimbursement (e.g., whether payers will support billing for collaborative care) (National Council for Community Behavioral Healthcare, 2009).

From a consumer perspective, IHC appears to be person-oriented, more seamless, and easier to navigate due to improved awareness of the whole person, improved communication between providers, and the potential for minimizing trips to the agency for multiple health care visits (World Health Organization, 2008). IHC is more sensitive to meeting the needs of a traditionally marginalized population and can empower individuals to participate in their health decision-making and insist on more optimal health care (Forum on Integration, 2010). Evaluations of a range of IHC service providers indicate that IHC typically increases access to care, increases satisfaction among patients and providers, decreases costs of service delivery, improves adherence to treatment
recommendations and medications, improves clinical outcomes and maintenance of those improvements (Blout, 2003; Katon, 1995; Simon & VonKorff, 1997).

**Health Home Model of Care.** According to the Substance Abuse and Mental Health Services Administration (SAMHSA) and the Health Resources Services Administration (HRSA), Health Homes are a specific type of IHC agency which provides the following services through agency staff or coordination with other agencies: a comprehensive care plan, prevention and health promotion services, primary care, behavioral health and substance abuse treatment, continuing care strategies (e.g., care management, care coordination, and transitional care from the hospital to the community), and linkages to community supports and resources (SAMHSA-HRSA Center for Integrated Health Solutions, 2012). The target population of a Health Home typically includes people living with two or more chronic health conditions, one chronic condition and at risk for another, or a SPMI diagnosis.

In order to become a Health Home, an agency’s service delivery system is redesigned to include multidisciplinary teams with providers who have clear roles, use a single care plan, communicate more effectively, and utilize mechanisms between them to coordinate care within a team of providers (SAMHSA-HRSA Center for Integrated Health Solutions, 2012). The structure of Health Homes can take multiple permutations. Three predominant structures include the in-house model (i.e., the behavioral health agency provides and owns the complete array of primary care and specialty behavioral health services), co-located partnership model (i.e., the behavioral health agency arranges for the provision of primary care services onsite and routine communication/coordination between behavioral care providers and primary care partners), and the facilitated referral
model (i.e., the majority of primary care services are not provided onsite but the agency ensures coordination of care provided offsite) (SAMHSA-HRSA Center for Integrated Health Solutions, 2012). Regardless of the IHC model used, continued progress toward integration and coordination of services is needed in order to achieve more complete well-being for individuals living with psychiatric illness (Horvitz-Lennon, Kilbourne, & Pincus, 2006).

**Using Motivational Interviewing in Health Promotion**

Proper management of most chronic health conditions common to individuals living with psychiatric illnesses requires significant behavior change (Kolbasovsky, 2008; Richardson, Faulkner, McDevitt, Skrinar, Hutchinson, & Piette, 2005). One intervention style that has demonstrated efficacy in helping individuals work toward necessary behavior change and improved mental and physical well-being is Motivational Interviewing (MI). Rollnick and Miller (1995) define MI as “a directive, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence” (p. 326). MI is a method of communication, rather than a set of manualized techniques, that aims to elicit an individual’s intrinsic motivation for change. MI is based on the assumption that motivation for change is malleable and ambivalence toward behavior change can be resolved (Rollnick & Miller, 1995). Behavioral health providers most commonly use as a portion of a standard intake or assessment to increase motivation and engagement in treatment, MI as a pre-treatment to other therapy modalities, or as an approach integrated throughout treatment as part of a multi-component treatment package (Westra, Aviram & Doell, 2011). The flexibility of the MI approach allows providers to
integrate it in multiple ways and at various points during the treatment process (Westra et al., 2011).

**Components and Principles of Motivational Interviewing.** The “spirit,” or mindset, with which clinicians approach individuals about behavior change in MI is described as collaborative, evocative, and respectful of the individual’s autonomy. A collaborative relationship is engendered in MI by positioning clinicians and those receiving services as partners rather than an expert clinician advising a passive individual. Clinicians aim to activate, or evoke, an individual’s own motivation and resources for change rather than focusing on skill building or psychoeducation. Clinicians achieve a respectful stance toward the individual’s autonomy by accepting and acknowledging their right to make their own choices and changes, avoiding any resemblance to coercion (Rollnick et al., 2008).

MI also has four guiding principles. The first principle is to resist the desire, as a clinician, to make arguments for change, prevent harm, or heal the individual, as this “righting reflex” can often have a paradoxical effect (e.g., the consumer resisting this persuasion) when he/she is feeling ambivalent making a change. The second principle is to explore the individual’s own concerns, motivations for behavior change, and values, as these reasons for change are the ones most likely to promote change. Third, MI requires the clinician to listen with empathy. The fourth principle states that clinicians should empower the individual by helping them explore how they can be active in making a difference in their health (Rollnick et al., 2008).

**Motivational Interviewing for Health Behaviors.** The transtheoretical model (TTM) suggests that intentional human behavior change involves a process of
progressing through five specific stages of change. These stages of change include precontemplation (i.e., not considering a change), contemplation (i.e., serious consideration of a change), preparation (i.e., commitment to a change and engaging in planning related to this change), action (i.e., making the change), and maintenance (i.e., sustaining long-term change). Aspects of these stages of change within the transtheoretical model (TTM) played a role in the development of interventions, such as MI and brief interventions that utilize a motivational approach (Miller & Rollnick, 2012). Generally speaking, motivation is needed for individuals to devote effort toward making and maintaining change, and MI can be used to assist people in moving from a lower stage of change to a higher stage of change. MI is most often thought of as an intervention that is useful when an individual is in an earlier stage of change.

MI was initially developed as an intervention to help people with problem drinking by working through their ambivalence about changing. After several years of successful intervention in substance abuse, clinicians began adapting MI to intervene with other health behaviors. A growing body of literature has now demonstrated that MI can be effective in fostering change across a wide range of health-related behaviors (Hettema et al., 2005; Lundahl, Moleni, Burke, Butters, Tollefson, … Rollnick, 2013; Martins & McNeil, 2009; Rubak, Sandbaek, Lauritzen, & Christensen, 2005; Rollnick et al., 2008). Consequently, one way of helping individuals gain control over lifestyle-related health problems and decrease disease burden is to use MI.

Not surprisingly, many people feel ambivalent about the types of lifestyle changes needed to manage health problems (e.g., COPD and obesity), because the problem behaviors are often pleasurable (e.g., tobacco use and poor nutrition) and individuals
doubt their ability to make these changes (Rollnick, Heather, & Bell, 1992). Furthermore, many individuals are faced with the need to change multiple health-related behaviors. As a result, assisting individuals in identifying a single health-related behavior that is most important to them can be a useful strategy (Thompson, Chair, Astin, Davidson, & Ski, 2011).

**Outcomes of Motivational Interviewing for Health Behaviors.** Clinical trials have demonstrated that MI can successfully promote lifestyle changes, such as increased physical activity, improved eating habits, and smoking cessation to managing chronic health conditions (Hettema et al., 2005; Lundahl et al., 2013; Martins & McNeil, 2009; Rubak, Sandbaek, Lauritzen, & Christensen, 2005; Rollnick et al., 2008). Furthermore, studies have demonstrated that MI can facilitate positive behavior changes in less time than other comparable methods and the positive effects appear to remain over time (Dunn, Deroo, & Rivara, 2001; Lundahl, et al., 2010). Overall, the use of MI in promoting and maintaining health behavior change has been strongly supported and is typically more effective than medical advice-giving (Martins & McNeil, 2009).

Burke, Arkowitz, & Menchola (2003) conducted a meta-analysis reviewing 30 controlled clinical trials of MI adaptations used for health promotion and treatment of health-risk behaviors (i.e., tobacco smoking, drug addiction, alcohol abuse, nutrition and exercise, treatment adherence, and HIV risk behaviors). The results of this meta-analysis indicated that use of MI to promote health-related behavior change was as effective as other treatments and more effective than no-treatment or placebo controls in promoting improvement in the areas of nutrition and exercise, heavy drinking, and drug use. Burke et al. (2003) noted that findings were less supportive for the use of MI in promoting
smoking cessation and reducing HIV-risk behaviors. Similarly, Hettema et al. (2005) conducted a meta-analysis evaluating research findings for the use of MI in promoting change in nutrition and exercise, smoking, disordered eating, water safety, intimate relationships, gambling, treatment adherence, drug and alcohol abuse, and HIV/AIDS risk behaviors. The use of MI interventions in improving these health behaviors demonstrated effect sizes ranging from medium to large effects (i.e., Hedge’s $g$ of .30 to .77), with larger effects tending to emerge when interventions were not guided by a manual.

Rubak et al. (2005) conducted a meta-analysis evaluating 72 studies which utilized MI in promoting change in nutrition, exercise, diabetes management, and substance use behaviors. Rubak et al. (2005) indicated that a significant effect of MI was found in 74% of the 72 studies reviewed regardless of the problem behavior or length of the intervention. When evaluating only those studies with an MI intervention lasting 60 minutes or more, a significant effect was found in 81% of the studies. Similarly, Lundahl, Kunz, Brownwell, Tollefson, & Burke (2010) conducted a meta-analysis comparing MI to a number of other interventions. Within the 119 studies they selected for inclusion, 25% of the studies demonstrated neutral or negative effect sizes, 50% demonstrated a small but meaningful effect, and 25% demonstrated a medium or large effect (Lundahl et al., 2010). They concluded that “MI does exert small though significant positive effects across a wide range of problem domains, although it is more potent in some situations compared to others, and does not work in all cases” (Lundahl, et al., 2010, p. 151). These effects also appear to be maintained over time, with no significant decline in gains at a 3 month, one year, or two year follow-up.
MI interventions and readiness to change behavior has been most frequently examined in individuals with substance abuse problems. Relatively fewer studies have examined these concepts within the population with SPMI diagnoses; however, preliminary studies suggest that motivational enhancement can be useful and applicable in this population.

**Motivational Interviewing for SPMI Populations.** Literature addressing the impact of MI as an adjunct to routine care for improving health-related behaviors in individuals with SPMI is limited; however, studies have evaluated use of MI and routine care to reduce substance use in this population. DiClemente, Nidecker, & Bellack (2008) note that it individuals living with severe mental illness and substance use disorders access and use a process of intentional behavior change; however, how this process appears to be qualitatively different than the process used by individuals without these conditions. The intervention adaptations needed to encourage behavior change in individuals with SPMI are not well understood (DiClemente, Nidecker, & Bellack, 2008).

Bellack & DiClemente (1999) assert that this population’s behavior change process may be less intentional, more motivated by external forces, and more chaotic. Research also suggests that the more severe the mental illness, the higher the likelihood of impaired thought processes, self-evaluation, decision-making, and insight (Substance Abuse and Mental Health Services Administration, 1995). These impairments can impact individuals’ help-seeking behavior, adherence to treatment, and engagement in the process of intentional behavior change. That being said, providers working with this population may underestimate their capacity to engage in a process of change and forego interventions like MI. There is great need to better understand this population’s
motivation for change in order to address the multitude of behavioral health and primary care concerns present and the most appropriate level of care (DiClemente, Nidecker, & Bellack, 2008).

Drake, O’Neal, & Wallach (2008) conducted a systematic review of studies evaluating psychosocial interventions for individuals with SPMI and substance use disorders. Their review indicates that evidence for MI is somewhat weak and inconsistent for this population; however, a study by Barrowclough et al. (2001) demonstrates some efficacy for this population. Barrowclough et al. (2001) integrated routine care with a combination of MI, cognitive behavioral therapy (CBT), and family/caregiver interventions targeting reduction of substance use in this population. Routine care typically included psychiatric management by a clinical team, case management, and access to day treatment and drop-in clinics. Barrowclough et al. (2001) noted that this adjunctive treatment which included MI was associated with significant improvement in general functioning (i.e., using the Global Assessment of Functioning Scale), reduction in positive symptoms of SPMI, fewer periods of symptom exacerbation, and increased abstinence from drugs and alcohol. Research also suggests that use of MI during intake for individuals SPMI and substance abuse problems improves appointment attendance (Daley, Salloum, Zuckoff, Kirisce, & Thase, 1998; Steinberg, Ziedonis, Krejei, & Brandon, 2004; Swanson, Pantalon, & Cohen, 1999).

Baker et al. (2006) evaluated the impact of 8 sessions of MI and CBT with nicotine replacement therapy as an adjunct to routine care on the smoking behavior of individuals with a psychotic disorder. This research suggested that there were no statistically significant differences in completely abstaining from tobacco for those an
adjunct of MI, CBT, and nicotine therapy when compared to those receiving routine care; however, the results suggested that those who received the MI, CBT, and nicotine therapy treatment were more likely to report a reduction in their tobacco use at 3 months (Baker et al., 2006).

Zhang, Harmon, Werkner, & McCormick (2004) assessed individuals with co-occurring SPMI and alcohol dependence for motivation to change alcohol use at baseline and 9 month follow up. They determined that participants who were highly ambivalent at baseline were less aware of alcohol-related problems and reported consuming significantly more alcohol when re-assessed at the 9 month follow up. Zhang et al. (2004) suggest that awareness of substance-use problems appeared essential to behavior change for this population.

**Brief Adaptations of Motivational Interviewing**

Rollnick et al. (1992) developed a brief form of motivational interviewing for use in medical settings. Many individuals entering a medical setting are not in a state of readiness to make significant changes to their unhealthy behavior patterns. Although the type of brief, straightforward advice-giving and attempts at persuasion that often occur in a medical setting have been demonstrated to work in some instances, this type of advice can elicit resistance and defensiveness when individuals are not ready to change (Rollnick et al., 1992). Providing action steps or specific advice to an individual at a time when they feel highly ambivalent can be premature and have limited value. It appears that brief MI adaptations could be well-suited for use in conjunction with traditional primary care as a way of working with ambivalence about lifestyle changes necessary for improved health or medical conditions.
**Components of Brief Motivational Interviewing Interventions.** In order to develop briefer adaptations of MI to include in treatment, it is important to consider which MI ingredients are most critical (Emmons & Rollnick, 2001). Rollnick and Miller (1995) argue that the “spirit” of MI, most noticeable in the quality of the interpersonal style between therapist and consumer, is the key to promoting behavior change. In addition to adhering to this interpersonal style, researchers have suggested the use of non-directive “microskills” (e.g., using open-ended questions, reflective listening, asking permission, rolling with resistance, summarizing, and making affirmations) throughout the brief MI intervention (Resnicow, Diloroio, Soet, Borrelli, Hecht, and Ernst, 2002; Rollnick et al., 1992).

Rollnick et al. (1992) also described a continuum of broader MI strategies, which last approximately 5 to 15 minutes each that can be used during brief MI interventions. These broader strategies can include:

1) Agenda setting (e.g., can include user-friendly aids, such as a menu of choices in the form of drawings or words inside oval shapes, used to help the person decide which health behavior will be discussed in the session);

2) An opening strategy (e.g., asking generally about a person’s health or current lifestyle and stresses and where this particular behavior fits in or affects their health);

3) Inquiry about a typical day of the behavior (e.g., helping the person talk about their current behavior in detail within a non-pathological framework assists the clinician in understanding the context of the behavior and how the behavior related to the way the person feels);
4) Assessing desire and efficacy for change (e.g., asking a person “on a scale of 0 to 10 with 10 being the highest, how motivated/interested are you in making this behavior change?” and “on a scale of 0 to 10, how confident are you that you can make the change assuming that you want to do so?” can assess desire and efficacy for change, while follow-up questions, such as “why did you not choose a lower number, like 1 or 2?” and “what would it take to get you to a higher number?” can also elicit change talk and discrepancies between current behavior and personal values or goals);

5) “The good things and the less good things” (e.g., clinician builds rapport and assesses readiness to change through an exploration of the person’s concerns);

6) Providing information (e.g., for persons that are concerned to some degree with the behavior, emphasis is placed on the readiness of the person to receive information, providing information in a neutral and non-personal way, and following provision of this information by eliciting the person’s reaction with a question like “what do you make of this?”);

7) Discussing the future and the present (e.g., asking “how would you like things to be different in the future?” to clarify future aspirations and the present by asking “what’s stopping you from doing these things you would like to do?”);

8) Exploring concerns (e.g., eliciting from the person a number of concerns about the behavior by following their mention of a concern with “what else, what other concerns, do you have?” and summarizing to highlight the benefits and concerns related to the behavior, eliciting what concerns they have about no longer engaging in this current behavior);
9) Helping with decision-making (e.g., for persons who indicate some desire to make a decision to change, asking a neutrally-worded question like “where does this leave you now?” followed by a conversation in which the clinician allows the person to move back and forth between contemplating change and staying the same, offering support and information without undermining the person’s autonomy or falling into the expert clinician mode) (Resnicow et al., 2002, p. 445).

Rollnick et al. (1992) suggest using this model of microskills along with broader MI strategies results in a brief, person-centered intervention in which clinicians are able to match their strategy selections to the person’s readiness to change. Researchers have also suggested that brief MI might be further strengthened by the provision of adjunctive materials (e.g., printed materials, telephone counseling, and supportive videotapes or mailings) that provide additional support and build on the relationship initiated during the session (Emmons & Rollnick, 2001).

**Length of Brief Motivational Interviewing Interventions.** The brevity of MI interventions has varied considerably across settings, depending primarily on the time constraints present in one’s pre-established work flow. Applications have varied from a one-time consultation lasting as short as five minutes to more extended interventions including multiple hour-long sessions (Emmons & Rollnick, 2001). Some of briefest MI interventions models for addictive behaviors range from 5 to 30 minutes (Rollnick, Butler, Stott, 1997; Rollnick et al., 1992; Senft, Polem Freeborn, & Hollis, 1995). Resnicow et al. (2002) suggested that the nature of ambivalence may differ between addictive (e.g., alcohol dependence) and non-addictive behaviors (e.g., physical
inactivity), implying that the potential difference in the nature of ambivalence between these types of behaviors may provide additional support for the use of brief MI to resolve ambivalence in the case of a non-addictive, health-related lifestyle behaviors.

Lundahl et al. (2013) conducted a meta-analysis of forty-eight studies comparing use of MI interventions to comparison conditions within medical settings. Their meta-analysis suggested even brief MI interventions appear effective and demonstrated a statistically significant modest advantage over comparison conditions (i.e., waitlist no-treatment groups, information-only groups, and treatment-as-usual groups) in this setting. The impact of MI interventions was found to be robust. The only moderators accounting for differing effect sizes appeared to be the medical outcome targeted, type of measurement (e.g., biophysical indicators and self-report), fidelity, and dosage of MI in some cases (Lundahl et al, 2013). Areas in which MI interventions were found to be successful in promoting change were body weight, alcohol and tobacco use, sedentary behavior, cholesterol level, blood pressure, physical strength, amount of alcohol consumed, smoking abstinence, marijuana use, self-monitoring, HIV viral load, dental outcomes, death rate, confidence in making a change, intention to change, and treatment engagement. MI interventions appeared to be less promising when targeting eating disorders, healthy eating, medication adherence, self-care behaviors, and some medical conditions (e.g., heart rate and blood glucose). Lundahl et al. (2013) found that effect sizes were lowest when comparing biophysical indicators, followed by records, and largest when looking at self-report indicators of change.

Dunn et al. (2001) conducted a systematic review of 29 studies involving brief, face-to-face MI interventions in the areas of smoking, nutrition, exercise, smoking, and
HIV risk behaviors. The brevity of the MI interventions reviewed ranged from 5 to 360 minutes across the 29 studies. Within the reviewed studies which utilized MI as an enhancement to usual treatment, the average duration of the MI intervention was 70 minutes (Dunn et al., 2001). All studies selected for inclusion in the meta-analysis claimed to monitor the use of MI principles and techniques, randomization of subjects into an experimental and a control or comparison group, and measurement of behavioral and/or health outcomes. Dunn et al. (2001) found studies supporting the use of brief MI interventions in all reviewed areas (i.e., smoking, nutrition, exercise, smoking, and HIV risk behaviors). The largest effect sizes were reported by studies using brief MI as an intervention for poor nutrition (i.e., Hedge’s $g$ ranged from 0.36 to 2.17) and for both nutrition and exercise (i.e., Hedge’s $g$ ranged from 0.36 to 2.17). The most modest effects were found in studies using brief MI as an intervention for tobacco smoking (i.e., Hedge’s $g = 0.23$). Dunn et al. (2001) contained some limitations in their systematic analysis related to not knowing the skill level of the clinicians providing brief MI interventions in many cases. They also noted that many studies included in the review used researchers as interventionists rather than clinicians actually working in the agencies in which they were conducted.

McCambridge and Strang (2004) conducted a study using a one-time, one-hour long session of MI versus education-as-usual on the topics of alcohol, tobacco, and illicit drug use (N= 200). The brief MI session used by McCambridge and Strang (2004) typically including agenda-setting using a menu of topic options; rapport building; discussion of risk, problems, or concerns related to their drug use; eliciting of positive and negatives about each drug used; exploring the relationship between drug use and
non-drug values and goals; and a decisional balance exercise. They also utilized MI microskills, such as reflective listening, affirmation, open questions, and summaries throughout the session. Results suggested that the use of a one-time MI session was beneficial to young adults who were currently using alcohol, tobacco, cannabis, and other illegal drugs. In comparison to the education-as-usual group, individuals receiving brief MI experienced a greater reduction of ongoing substance use, primarily in the form of greater moderation of use rather than cessation of use. The greatest effect sizes were also found among participants using alcohol and cannabis more heavily before the intervention (McCambridge & Strang, 2004). While McCambridge and Strang (2004) suggests positive outcomes for the use of a single-session of MI, their findings are limited by the fact that they are based on self-reported changes only.

Similarly, Diskin and Hodgins (2009) conducted a randomized control trial evaluating the use of a one-time MI intervention aimed at reducing gambling behavior. A comparison control group of individuals who received an interview about gambling behavior was used. All participants had expressed concern about the severity of their gambling behavior prior to their involvement in the study. The MI intervention included “microskills” (e.g., reflective listening, summarizing, and support of autonomy and self-efficacy) and broader MI strategies (e.g., discussion of the good and not so good things about gambling, use of a readiness ruler to assess motivation to change, and a decisional balance exercise). Although both the control interview and brief MI intervention groups displayed a reduction in gambling problem severity, individuals who received the brief MI intervention reported greater decreases in gambling behaviors (i.e., spending significantly less money on gambling per month and gambling fewer days per month)
and distress over time than those who received a control interview only (Diskin & Hodgins, 2009).

A study by Butler, Rollnick, Cohen, Bachmann, Russell, and Stott (1999) compared the use of brief MI techniques versus brief advice provided by a medical professional to help individuals quit smoking. Participants were individuals receiving medical services from the general practice medical providers who agreed to participate in the study. The brief MI intervention in the present study lasted an average of 10 minutes and brief advice interventions lasted an average of two minutes. At a 6-month follow-up, significantly more people in the group who received a brief MI intervention reported making an attempt to quit smoking lasting at least a week, being in a more ready stage of change, and not smoking in the past 24 hours when compared to individuals receiving brief advice (Butler et al., 1999). Butler et al. (1999) also found that those participants classified as least ready to quit smoking (i.e., pre-contemplators) benefited most from receiving brief MI. Limitations of Butler et al. (1999) included the limited training in the provision of MI interventions for medical providers and the inclusion of 24 different MI providers in the course of the study.

Bird-Gulliver, Kamholz, Helstrom, Morissette, and Kahler (2008) compared the efficacy of three different brief motivational interviewing conditions (i.e., one session motivational interviewing only, one session of motivational interviewing plus breathing instruction, or one session for motivational interviewing plus use of a tool for feedback about the individual’s lung function) in yielding changes in smoking behavior. Bird-Gulliver et al. (2008) recruited 201 psychiatrically complex veterans to participate in the in a single session of MI lasted 40 to 50 minutes and was informed by the Project
MATCH motivational enhancement manual. More specifically, sessions typically included obtaining a smoking history, eliciting the participants’ perceptions and concerns about smoking, eliciting self-motivating statements, personalized feedback, discussion of benefits and concerns, and development of a change plan and referrals when appropriate. Bird-Gulliver et al. (2008) found that smoking behavior decreased over time in all one-session conditions. There were no significant differences in cigarette usage or tobacco dependence between the treatment conditions. Limitations in this study include their recruitment method (i.e., recruiting volunteers via flyers), attrition (i.e., obtaining complete follow-up data on only 39.9% of participants), using a predominantly male sample (97%), and lack of a non-MI comparison condition.

**Brief Measures of Change in Motivation.** Motivation for change is multidimensional. Miller and Johnson (2008) found that six dimensions of motivation for change occur in natural conversation (e.g., desire to change, ability to change, need to change, and commitment to change). Within these dimensions of motivation to change, research suggests that three factors emerged: importance of change, perceived ability to change, and commitment to changing (Miller & Johnson, 2008). The literature assessing the validity of these subareas in predicting behavior change suggests that, while “readiness to change” is predictive of behavior change attempts (Hesse, 2006), “readiness to change” is not necessarily predictive of behavior change maintenance (Williams, Horton, Samet, & Saitz, 2007). Rather, measures of self-efficacy, such as “confidence in changing” best predicted behavior change maintenance (Stretcher, McEvoy-DeVellis, Becker, & Rosenstock, 1986; Williams et al., 2007).
There is a lack of research related to measuring change in motivation among individuals with SPMI and low-literacy populations. DiClemente, Nidecker, and Bellack (2008) noted concern regarding whether individuals with SPMI demonstrate poorer ability to self-report intentions to change a behavior due to problems with abstract thinking and self-awareness. Although research is limited in this area, DiClemente et al. (2008) suggest that, among the tools available to assess motivation for change, this population may be most accurate in their self-report when responding to shorter, less complex measures of motivation (e.g., “On a scale of 1 to 10, how confident are you in your ability to quit smoking?”).

In summary, preliminary research demonstrates some efficacy in using brief MI interventions to promote change in adults’ health-risk behaviors. MI techniques also appear to be more beneficial than straightforward advice-giving and can be adapted to fast-pace primary care settings. Given its potential to promote enhanced motivation and greater readiness to change, brief MI may be particularly helpful for adults living with medical conditions requiring lifestyle changes. More research is needed to identify whether brief MI interventions are useful for populations receiving services for comorbid SPMI and physical health conditions in public health settings. More specifically, it would be beneficial to understand whether brief MI is useful as an early adjunct to other Health Home services as a way of addressing motivation.

The Present Study

The purpose of the present study was to examine the effects of a brief MI intervention as an adjunct to involvement in Health Home services with adults living with comorbid psychiatric and medical conditions. More specifically, this study explored the
impact of one brief MI session, targeting either nutrition, exercise, or smoking behavior, on the physical health and health-related behaviors of individuals engaged in Health Home services. The study included two treatment groups: treatment as usual (TAU), in which participants received Health Home services only, and treatment as usual with one brief MI session (TAU + MI). This design allowed for evaluation of the brief MI intervention over and above Health Home participation. A longitudinal (pre-post) approach was used to assess health outcomes and health behaviors over time. The effects of the brief MI intervention on participants’ desire and efficacy for change were also examined.

**Hypotheses**

To evaluate the outcomes of the study, the following hypotheses were tested:

**Hypothesis 1.** Participants in the TAU + MI intervention group would show significant improvements in their self-ratings of the importance of changing the health behavior from the beginning of the MI session to the end of the session, supporting the fidelity of the MI intervention in promoting increased motivation to change.

**Hypothesis 2.** Participants in the TAU + MI intervention group would show significant improvements in their self-ratings of their confidence in changing the health behavior from the beginning of the MI session to the end of the session, supporting the fidelity of the MI intervention in promoting increased motivation to change.

**Hypothesis 3.** A significant main effect for time would be found, such that the overall sample (both TAU and TAU + MI) would experience significant improvements in objective physical health measures and self-reported health behaviors from the study start date (i.e., date baseline measures were administered) to a 3-month follow-up
appointment, as evidenced by objective physical health measures (e.g., blood pressure, heart rate, and body mass index) and items on the Health-Related Behaviors Questionnaire (e.g., smoking, eating habits, and exercise).

Hypothesis 4. A significant interaction effect would be found, such that participants in the TAU + MI group would demonstrate significantly better objective physical health outcomes and health behaviors at the 3-month follow-up compared to the Health Home TAU condition.
Chapter Three

Methods

Motivational Interviewing Training

To obtain training in MI, the researcher, faculty advisor, and two research assistants attended a MI immersion training series provided by the University of Toledo (UT) Medicaid Technical Assistance and Policy Program (MEDTAPP) Health Care Access (HCA) Initiative. This training series included two 8-hour workshop trainings and eight 1-hour group supervision sessions in Toledo, Ohio conducted by a clinical psychologist who is a member of MINT (MI Network of Trainers). In accordance with MINT recommendations, this immersion training series included training on the principles of MI, hands-on skill-building activities, and ongoing support from the trainer for learning transfer. All clinicians providing MI in the present study (i.e., two PhD candidates in Clinical Psychology and one postdoctoral fellow with a PhD in Clinical Psychology) recorded samples of example practitioner-patient encounters and submitted them for assessment by the MI trainer. A validated, standardized MI assessment tool was used to provide feedback and coaching to each clinician. During this training series, the researcher, faculty advisor, and research assistants learned skills in encouraging individuals to set and achieve goals for health maintenance and illness management, address issues of tobacco use and problematic drug use, and promote patient engagement in their health care.
Setting

The research study was conducted at the Zepf Center, a large community mental health center in an urban area of Toledo, Ohio. The Zepf Center partners with Neighborhood Health Association (NHA), a Federally Qualified Health Center (FQHC), to provide co-located primary and behavioral health care for people with serious mental illness. The Zepf Center serves approximately 3,700 adults with serious mental illness. According to their 2012 SAMHSA “360 Project” grant proposal, the Zepf Center reported that a large portion of the population they serve falls below the poverty level (87%) and receives Medicaid (64%) or reported no insurance benefits (26%). Approximately 25% of this population had Medicare benefits, some of whom receive Medicaid benefits as well. When compared to the general population within the City of Toledo, adults with SMI at the Zepf Center represent a higher concentration of individuals falling between the ages of 40 and 59, identifying as Black, and falling below the poverty level (i.e., the average income of individuals receiving services at the Zepf Center is less than one-third of the average per-capita income for residents of Toledo).

Over the past two years, Zepf has worked with NHA to provide co-located Health Home services. The Zepf Center was also awarded funding from SAMHSA for the “360 Project” in September 2012 which allowed the Zepf Center to increase the number of adults with SPMI and chronic health conditions who establish a Health Home and receive co-located care with the Zepf Center and its partner agencies. Although the present study was conducted at the Zepf Center who provided Health Home services, it is notable and important to recognize that this agency was new to providing this type of integrated care service. Many individuals previously providing behavioral health services in an
exclusively behavioral health agency were beginning to work with primary care providers, some of whom did not previously work in integrated care. As a result, this Health Home was a work in progress, not an ideal clinical model, at the time this study was conducted. This type of continued change and work toward a desired clinical model often takes years. Research conducted in such setting remains valuable, as it can assess the feasibility of programs in spite of real world changes.

**Recruitment**

Referrals to the Zepf Center’s Health Home services occur in two ways: Individuals newly enrolled in services at the Zepf Center are screened during the intake process at the agency to determine whether they are already linked to a primary care provider. If they do not have a usual source of medical care, they are offered access to the Zepf Center’s Health Home services. Zepf Center staff also conducts outreach to individuals already engaged in behavioral services at the agency based on the individuals’ co-occurring medical problems and lack of a usual source of medical services. In the present study, attempts were made to recruit study participants from the pool of individuals newly admitted to these Health Home services; however, patient feedback demonstrated that this was a difficult time to engage patients in additional services, such as MI, due to the number of new patient appointments already scheduled. As a result, participants were recruited for this study after they had been engaged in Health Home participation for several months. This recruitment strategy emulates a more common recruitment strategy used at the Zepf Center when developing new treatment programming.
Given the recruitment strategy necessary, random sampling of potential MI participants within the Zepf Health Home population was precluded. Although random sampling was not used to assign participants to the MI treatment group, analyses suggest participants in the TAU and TAU + MI groups were not significantly different in their demographic background (i.e., gender, ethnicity, age, marital status, employment status), baseline physical health measures (i.e., blood pressure, pulse, height, weight, BMI), the majority of DSM-IV-TR diagnoses (i.e., Mood Disorders, Schizophrenia and other Psychotic Disorders Substance-Related Disorders, Anxiety Disorders, and Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence), nor the majority of diagnosed physical health conditions (i.e., hypertension, respiratory disorder, obesity, heart disease, arthritis, diabetes, lipid disorder, infectious diseases, seizure disorders, and cerebrovascular disorders). The TAU and TAU + MI groups differed only in the presence of personality disorders, $\chi^2 (1) = 4.08, p = 0.04$, such that those participants in the TAU group had a higher percentage of documented personality disorders (22.0%) compared to the participants in the TAU+MI group (7.0%). There was also a significant difference between the two group in the proportion of documented gastrointestinal disorders, $\chi^2 (1) = 6.80, p = .01$, such that those in the TAU group had a higher percentage of gastrointestinal disorders (38.0%) than those in the TAU+MI group (14.0%).

**Participants**

Participants included 93 adults ranging in age from 21 to 68 years of age, with the average being 45 years old (SD = 11.12). Data were collected from both male and female participants; 52.7% (n = 49) of the sample were female and 47.3% (n = 44) of the sample were male. The majority of the sample identified as African American (57%), while
40.9% identified as European American, 1.1% as Asian, and 1.1% did not identify their ethnicity. The majority of participants identified as single (62.4%), whereas 6.5% reported they were married, 25.8% divorced, 2.2% separated, and 3.2% widowed. For the vast majority of participants, employment status was unavailable (86.0%); however, a portion of participants noted part-time (9.7%) or full-time (4.3%) employment. Refer to Table 1 for a summary of this demographic information.

Table 1

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<th>Demographic</th>
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<td><strong>Gender</strong></td>
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<td>47.3% male</td>
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<td><strong>Ethnicity</strong></td>
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<td>Range = 21-68 years old</td>
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<td>M = 45 (SD = 11.12)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>62.4% single</td>
</tr>
<tr>
<td></td>
<td>6.5% married</td>
</tr>
<tr>
<td></td>
<td>25.8% divorced</td>
</tr>
<tr>
<td></td>
<td>2.2% separated</td>
</tr>
<tr>
<td></td>
<td>3.2% widowed</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.7% part-time</td>
</tr>
<tr>
<td></td>
<td>4.3% full-time</td>
</tr>
<tr>
<td></td>
<td>86.0% no known employment</td>
</tr>
</tbody>
</table>

The majority of participants in the present study were identified through medical chart review as having DSM-IV-TR diagnoses classified as mood disorders (79.6.0%). Study participants were also diagnosed with substance-related disorders (40.9%).
schizophrenia and other psychotic-spectrum disorders (28.0%), anxiety disorders (23.7%), personality disorders (15.1%), and childhood disorders (2.2%). Refer to Table 2 for a summary of participants DSM-IV-TR diagnoses at baseline.

Table 2

<table>
<thead>
<tr>
<th>DSM-IV-TR Diagnostic Category</th>
<th>Prevalence (N=93)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood Disorders</td>
<td>79.6%</td>
</tr>
<tr>
<td>Personality Disorders</td>
<td>15.1%</td>
</tr>
<tr>
<td>Schizophrenia and other Psychotic Disorders</td>
<td>28.0%</td>
</tr>
<tr>
<td>Substance-Related Disorders</td>
<td>40.9%</td>
</tr>
<tr>
<td>Anxiety Disorders</td>
<td>23.7%</td>
</tr>
<tr>
<td>Disorders Usually First Diagnosed in Infancy, Childhood, or Adolescence</td>
<td>2.2%</td>
</tr>
</tbody>
</table>

Upon review of participants’ health records, participants were identified as having diagnoses of hypertension (53.8%), respiratory disorders (47.3%), obesity (34.4%), lipid disorders (29.0%), gastrointestinal disorders (26.9%), arthritis (24.7%), diabetes (23.7%), heart disease (15.1%), infectious disorders (5.4%), and cerebrovascular disease (6.5%). Although seizure disorders were one of the health conditions specifically looked for in participants’ health records, none of the participants had a diagnosed seizure disorder.

Refer to Table 3 for a summary of health conditions documented in participants’ electronic health record at baseline.
Table 3

Prevalence Rates of Health Conditions (N=93)

<table>
<thead>
<tr>
<th>Health Condition</th>
<th>Prevalence (N=93)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>53.8%</td>
</tr>
<tr>
<td>Respiratory Disorder</td>
<td>47.3%</td>
</tr>
<tr>
<td>Obesity</td>
<td>34.4%</td>
</tr>
<tr>
<td>Lipid Disorder</td>
<td>29.0%</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>26.9%</td>
</tr>
<tr>
<td>Arthritis</td>
<td>24.7%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>23.7%</td>
</tr>
<tr>
<td>Heart disease</td>
<td>15.1%</td>
</tr>
<tr>
<td>Cerebrovascular Disorder</td>
<td>6.5%</td>
</tr>
<tr>
<td>Infectious Disease</td>
<td>5.4%</td>
</tr>
<tr>
<td>Seizure Disorder</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Measures

Data included both archival data abstracted from participants’ clinical health records and data collected during the MI intervention. When participants were recruited for the study, consent forms and a Health-Related Behavior Questionnaire were collected. This consent form included permission to obtain physical health indicators from participants’ electronic medical record. At a three month follow up, an identical Health-Related Behavior Questionnaire was completed by the participant in person or over the phone in order to assess change after the initial encounter. Participants’ clinical health records were also consulted to determine demographic and program eligibility.
information, objective indicators of physical health obtained by primary care staff, and
documented physical health conditions. During the MI session, notes were taken to
document participant verbalizations.

**Demographic and Eligibility Data.** Demographic and program eligibility data
were collected from individuals during the Zepf Center’s intake process and updated
when team members periodically reassessed their existing caseloads. This information
included demographic information (i.e., gender, ethnicity, age, employment status,
marital status), medical conditions, and psychiatric diagnoses.

**Health-Related Behaviors Questionnaire.** A validated measure that met desired
criteria (i.e., low literacy measure assessing self-reported nutrition, physical activity, and
smoking behaviors that is sensitive to change over a 3-month period) was not found in
prior literature. As a result, a brief questionnaire regarding health-related behaviors was
developed for the present study, the Health-Related Behaviors Questionnaire (see
Appendix A).

This Health-Related Behaviors Questionnaire was developed by adapting items
from the the Behavioral Risk Factor Surveillance System (BRFSS), a questionnaire
administered by the Centers for Disease Control and Prevention (CDC) to measure
personal health practices and behaviors related to the leading causes of death (Centers for
Disease Control and Prevention, 2012). The BRFSS was selected for adaptation due to its
low literacy language and assessment of the key areas needed in the present study:
nutrition, physical activity, and smoking behavior. The BRFSS is typically administered
by the CDC via phone to samples of adults in the United States and territories. Due to the
length of this CDC questionnaire and the long time frames used (e.g., assessing a health
behavior over the last month or year), only items from the areas of nutrition, physical activity, and smoking behavior were used and shorter time frames (e.g., assessing a health behavior over the last day or week) were used in order to detect change over a 3-month period.

Pierannunzi, Hu, and Balluz (2013) conducted a review of 32 studies assessing reliability and validity of components of the BRFSS. With regard to physical activity, this review states that test/retest reliability was high and validity when compared to other surveys (e.g., National Health Interview Study, NHIS; National Health and Nutrition Examination Survey, NHANES), respondent logs, and accelerometers were high while validity when compared to physical measures was moderate. With regard to tobacco use, validity when compared to other national surveys (e.g., NHIS and NHANES) and physical health measures were moderate. No studies regarding reliability and validity of eating behaviors were included in Pierannunzi, Hu, and Balluz (2013).

Additionally, Stein, Lederman, & Shea (1993) evaluated the test-retest reliability of the BRFSS questionnaire and found the reliability for health-related behaviors was relatively high. Reliability of the BRFSS was assessed by ethnicity. Reliability coefficients for behavioral risk factors included in the measure were typically above 0.70 which supports the use of this measure for research purposes. When looking closer at behavioral risk factors included in this study’s measure, Stein, Lederman, & Shea (1993) found that the reliability coefficient for smoking items ranged from 0.73 to 0.83 and for exercise ranged from 0.45 to 0.57. Additionally, Nelson, Holtzman, Bolen, Stanwyck, & Mack (2001) indicate that the BRFSS questionnaire demonstrated high validity in
assessing current smoking behavior and moderate validity in assessing physical activity and nutrition.

In addition to questions about participants’ current habits in the targeted areas (i.e., nutrition, physical activity, and smoking), questions were added to assess participants’ history of health-related behavior change were added to the Health-Related Behaviors Questionnaire. For example, participants were asked whether they had “thought about improving” or “attempted to improve” their nutrition, physical activity, and/or smoking behaviors recently. Questions about participants’ current habits included questions such as, “On an average day, how many servings of fried foods (e.g., fried chicken, french fries, onion rings, chicken strips) do you eat?” and “On an average day, how many cigarettes do you smoke?” Questions about participants’ history of behavior change in these areas included questions such as, “What is the longest period of time that you maintained a consistent exercise routine?” or “How many times have you tried to quit smoking in your lifetime?” Each category also included questions asking whether the participant has ever thought about changing each health-related behavior and, if so, whether this occurred in the past week, past month, past year, or more than a year ago. Each category also included questions asking whether the participant has ever attempted to change each health-related behavior and, if so, whether this occurred in the past week, past month, past year, or more than a year ago.

Although the Health-Related Behaviors Questionnaire was adapted from items and with a format similar to an existing similar measure with good reliability and validity, the specific reliability and validity of the Health-Related Behaviors Questionnaire developed for the current study has not been established. In order to assess
the reliability of the newly developed Health-Related Behaviors Questionnaire, Cronbach’s alpha was computed. The items on this questionnaire were divided into three sections: Nutrition, Physical Activity, and Tobacco Use. Items within these sections varied with regard to their design (e.g., Likert, dichotomous) and direction (e.g., positive, negative). When assessing reliability using Cronbach’s alpha, these differences in items were taken into account and used to group items for evaluation. Cronbach’s alpha was performed on items assessing: 1) thoughts and attempts to change, 2) healthy behaviors, and 3) unhealthy behaviors. Cronbach’s alpha for thoughts and attempts to change was 0.86, healthy behaviors was 0.02, and unhealthy behaviors was 0.14. The reliability of healthy items was found to improve to 0.33 if item 14 (“And when you took part in this activity, for how many minutes did you usually keep at it?”) was removed. Similarly, the reliability of unhealthy items would improve to 0.56 if item 23 (“On an average day, how many cigarettes do you smoke?”) was removed. Although the internal consistency for the items assessing “thoughts and attempts to change” was found to be good, the internal consistency of the groups of items that assessed health or unhealthy behaviors was found to be poor across items. As a result, items on the Health-Related Behaviors Questionnaire should be evaluated individually versus added together or combined in some way as a single scale. For this reason, the items on the Health-Related Behaviors Questionnaire were evaluated individually in the present study.

Physical Health Data. Longitudinal (pre-post) physical health data was collected by Zepf Center primary care staff via objective physical health measures (i.e., blood pressure, heart rate, height and weight). Baseline measures of these physical health indicators were assessed within two weeks of each individual's study start date (i.e., date
that baseline Health-Related Behaviors Questionnaire was administered) and at a 3-month follow up. Algorithms available for the screening of adverse health outcomes in individuals with psychiatric illness suggest intervals of every 3 months minimum to detect these health changes, particularly when individuals are taking psychotropic medications (Waterreus & Laugharne, 2009). This health information was recorded by the medical professional, documented in each participant’s electronic medical record, and discussed with the individual during the treatment process. Additionally, physical health diagnoses were updated and documented by a primary care staff member at these same time intervals.

Hypertension is often missed in individuals with SPMI (Mackin, Bishop, & Watkinson, 2007). Resting blood pressure is noted in terms of systolic blood pressure (SBP) and diastolic blood pressure (DBP). SBP refers to the pressure blood exerts on arterial walls while the heart is contracting. DBP refers to this pressure when the heart is resting as it refills with blood after contraction. Diagnosis of hypertension can happen as a result of elevations in SBP and/or DBP. If an individual has a resting SBP of 140 mmHg or higher and/or a DBP of 90 mmHg or higher, they meet criteria for hypertension (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2003). Additionally, medical providers may inform a person when they are considered pre-hypertensive (i.e., SBP of 121-139 mmHg and/or a DBP of 81-89 mmHg). Individuals considered to have pre-hypertension or hypertension require lifestyle changes to prevent cardiovascular disease (Chobanian, Bakris, Black, Cushman, Green, Izzo, … Roccella, 2003).
Heart rate (HR), or pulse, is the rhythmic expansion and contraction that occurs within the arteries as blood is pumped by the heart. HR is a measure of the number of heart beats per minute. Heart rate can be measured at the wrist, side of the neck, inside of the elbow, and top of the foot. Resting heart rate measures the lowest amount of beats per minute, as the heart pumps slower when an individual has not recently exercised. Resting heart rate is normally 60 to 100 beats per minute. Heart rates lower than 60 are typically not of concern; however, it is recommended that individuals consult their doctor if their resting HR is above 100 beats per minute (i.e., tachycardia) or below 60 beats per minute (i.e., bradycardia) (American Heart Association, 2014).

Body Mass Index (BMI) is calculated using weight and height and is used to determine an individual’s body fat. BMI cutoffs have been developed as guidelines to determine whether individuals have overweight or obesity concerns. Overweight is defined as a BMI of 25 kg/m² to 29.9 kg/m². Obesity is defined as a BMI of ≥30 kg/m² (Jensen, Ryan, Apovian, Ard, Comuzzie, Donato, … Yanovski, 2013). Obesity increases individuals risk for numerous preventable health conditions, such as hypertension, heart disease, lipid disorders, diabetes, cerebrovascular disease, respiratory disorders, and osteoarthritis. Overweight and obesity are highly prevalent in the United States, particularly within racial and ethnic minorities and low SES populations.

**Motivational Interviewing Responses.** Within session data was collected for the TAU + MI group during the brief MI intervention. Participants in the TAU + MI condition were asked to select a health behavior change to target in their MI session. The health behavior chosen was documented. To gauge participants’ readiness to change the health-related behavioral selected, participants were given a Readiness Ruler (Miller and
Rollnick, 2012). Readiness Rulers (e.g., ratings of readiness to change a behavior on a scale of 0 to 10) have been clearly supported in the literature as a measure of readiness to change a behavior (Maisto, Krenek, Chung, Martin, Clark, & Cornelius, 2011; Williams et al., 2007). Use of Readiness Rulers have demonstrated a more consistent pattern of evidence for both concurrent and predictive validity (e.g., predicting drinking outcomes) than other measures of readiness to change. When compared to other measures of readiness to change, such as the Stages of Change and Treatment Eagerness Scale (SOCRATES) and clinician classification of a participant within Prochaska’s Stages of Change, the use of a Readiness Ruler has been found to have the best clinical utility given its brevity and ease of use (Maisto et al., 2011). Crittenden et al. (1998) indicate that the reliability and stability of motivation and confidence scales are sensitive enough to detect change in participants’ readiness and motivation to change while also being brief and having low literacy requirements.

Participant ratings of both the “importance of” and “confidence in” making a behavior change were obtained to maintain clinical utility with this low-SES population. Participants were asked, “On a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” and told to indicate the level of importance of this change on the ruler. The ruler included numbers from 0 to 10, with 0 indicating the lowest importance to change this health behavior and 10 indicating highest motivation. Next, participants were asked, “On a scale of 0 to 10, how confident are you that you can make a change to your [chosen behavior] assuming that you want to do so?” and told to indicate the level of confidence in this change on the ruler. Participants responded to these two questions both before and after the MI intervention.
Procedure

A longitudinal (pre-post) research design was used in this study. Health Home services were provided by primary care and behavioral health employees at the Zepf Center. The researchers and research assistants all followed the same semi-structured MI protocol form while implementing MI interventions to maintain fidelity. Responses to MI session questions provided by participants in the TAU + MI group were documented at the time of the MI session on the MI protocol sheets. All data was collected by physical and behavioral health care providers at the agency, including the researcher and research assistants. Objective physical health measurement data and physical health diagnoses were collected during participants’ regularly scheduled appointments with primary care staff. Baseline health behavior questionnaires were collected in-person during primary care and MI sessions. Demographic data was retrieved from participants’ clinical record at the agency.

All participants in the proposed study received Health Home services at one of two Zepf Center locations for the duration of the study. The study was reviewed and approved by a University Institutional Review Board for protection of research participants. All participants were adults and, although experiencing SPMI, were legally competent and able to sign for themselves (See Appendix B for Informed Consent form). Participants engaged in one of two conditions: 1) TAU (i.e., Health Home services) or 2) TAU + MI (i.e., Health Home services with an adjunct of brief MI regarding health-related behaviors). Participants in the TAU + MI group received a single session of MI regarding a health behavior (i.e., nutrition, exercise, or smoking) in addition to their engagement in Health Home services at the Zepf Center. These particular health
behaviors were chosen for the study as they underlie many of the physical health problems commonly experienced by individuals receiving services at the Zepf Center (e.g., diabetes, obesity, COPD, and hypertension). Participants in the TAU group consisted of individuals who were engaged in Health Home services but who did not receive the MI intervention.

**Health Home Services.** The Zepf Center and their NHA partners provide a model of integrated care involving co-located primary care and behavioral health services. Services available to Health Home participants include: direct medical care, referral to specialty medical care, and follow-up medical care as needed; assessment for possible chronic disease processes (e.g., heart disease, diabetes, and COPD); comprehensive care management and coordination, including transitional care from inpatient to other settings and appropriate follow-up; occasional brief health education and prevention services; access to Wellness Management and Recovery programs; referral to community and social support services, including appropriate follow-up; and direct mental health services, including psychiatry, case management, and therapy services. The combination and frequency of these services provided to each participant varied based on their unique clinical needs and treatment plan.

**Motivational Interviewing Intervention.** The researcher and research assistants providing MI sessions were supervised by a licensed clinical psychologist who is also trained in this modality. All persons providing MI sessions followed the same semi-structured MI protocol (Appendix C). Summaries of participant verbalizations during these sessions were documented on this protocol form. MI sessions occurred on the same day as a participant’s medical visit in the Health Home or, when this was not possible, MI
sessions were scheduled at the participant’s convenience. MI sessions were conducted individually in offices within Zepf’s Health Home in close proximity to the primary care and behavioral health services participants were already engaged in.

While a standardized and replicable MI intervention method is needed to evaluate its efficacy, one that is too tightly structured may fail to honor the uniqueness of each participant. In the present study, the MI provider introduced herself to the participant and informed the participant that they were being asked to participate in research investigating health-related thoughts and behaviors. The consent form was reviewed and signed consent was obtained. The participant was handed a menu of health-related behaviors (i.e., Nutrition, Physical Activity, and Smoking) and asked to choose one that would be most helpful to talk about that day. Next, the clinician asked the participant to talk about their health and how this chosen health behavior fits in or affects his/her health. The MI provider summarized these statements. The participant was then handed a Readiness Ruler numbered from 0 to 10 and was asked two questions: 1) “On a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” and 2) “On a scale of 0 to 10, how confident are you that you can make a change to your [chosen behavior] assuming that you want to do so?” At this point in the intervention, a decision whether to focus on the importance of this health behavior change or the participant’s confidence in making this change was decided based on their rating of importance. If the participant reported low or moderate importance (i.e., importance rating of 0-7 on 0-10 scale), the following questions focused on discussing importance in an effort to increase importance of this change. If the change was rated as high importance (i.e., 8-10 on 01-10 scale), the following questions focused on discussing
confidence in an effort to increase participants’ perceived efficacy in making a change is already highly important to them. With regard to either importance or confidence, participants were asked, “Why did you not choose a lower number, like 1 or 2?” and “what would it take to get you to a higher number?” to elicit change talk and discrepancies between participants’ current behavior and personal values or goals. The MI provider summarized these statements.

Next, the clinician asked the participant to articulate the “good things” and “not so good things” about their current [chosen behavior] and the clinician summarized the participant’s statements. The MI provider then utilized the Elicit-Provide-Elicit MI technique by asking what the participant already knows about changing this health behavior, the provider offering some ideas (verbally and in the form of a handout) for making this behavior change that have worked for other people in the past, and then eliciting the participants thoughts on these ideas through neutrally-worded questions, such as “what does this have you thinking?” and/or “where does this leave you now?” The MI provider summarized these statements. Before completing the session, the clinician again asked 1) “On a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” and 2) “On a scale of 0 to 10, how confident are you that you can make a change to your [chosen behavior] assuming that you want to do so?” Finally, the MI provider inquired about any additional questions the participant might have about the health behavior discussed. Occasionally study participants asked whether they could take home the informational handouts for health-behaviors not discussed in session. When this occurred, participants were permitted to do so.
Impact of Motivational Interviewing

It was hypothesized that participants in the TAU + MI intervention group would show significant improvements in their self-ratings of the *importance* of and their *confidence in* changing a health behavior over the course of a brief MI session. Participants in the TAU+MI condition were given the choice of discussing one of three different health-behaviors during the session: Eating habits, physical activity, or smoking. When presented with this option, 39.5% of participants chose to talk about smoking, 34.9% chose to talk about eating habits, and 25.6% chose to talk about physical activity.

**Importance.** Within the TAU + MI group, a paired dependent *t*-test was conducted to determine whether MI participants reported a significant change in ratings of the importance of the health-related behavior change from the beginning of the MI session to the end of the session. On average, participants reported a small, but statistically non-significant, increase in their ratings of importance from the beginning of the MI session ($M = 8.12, SD = 2.13$) to the end of the session ($M = 8.49, SD = 2.11$), $t(41) = -1.850, p = 0.07, r = 0.28$. At the end of the brief MI session, 28.7% reported an increase in their rating of importance, 61.9% reported no change, and 9.6% reported a decrease in their rating of importance. The majority of participants receiving MI (81.3%) reported an importance rating between 7 and 10 on a 0 to 10 scale at baseline. On average, participants who received the MI intervention reported a change in ratings of importance of 0.37 points. If looking only at individuals who reported an increase in importance, the average increase was 1.88 points.
Confidence. A paired dependent $t$-test was also be conducted to determine whether those receiving MI reported a significant change in ratings of confidence in changing the health-related behavior from the beginning of the MI session to the end of the session. On average, participants reported a significant difference in their confidence from beginning of the session ($M = 5.26, SD = 3.16$) to the end of the session ($M = 6.21, SD = 3.16$), $t(41) = -3.409, p = 0.001, r = 0.15$. This represents a small effect size. At the end of the brief MI session, 45.2% reported an increase in their rating of confidence, 52.4% reported no change, and 2.4% reported a decrease in their rating of confidence. Among participants receiving MI, 38.1% reported a confidence rating between 7 and 10 on a 0 to 10 scale at baseline. On average, participants who received the MI intervention reported a change in ratings of confidence of 0.95 points. If looking only at individuals who reported an increase in confidence, the average increase was 2.37 points.

Overall Sample Analyses

Objective Physical Health Outcomes. It was hypothesized that a significant main effect for time would be found, such that the overall sample (both TAU and TAU+MI conditions) would experience significant improvements in objective physical health measures over the course of 3-months of treatment. Objective measures of physical health (i.e., systolic blood pressure, diastolic blood pressure, heart rate, weight, and body mass index) were collected at baseline and a 3-month follow-up. Due to attrition, objective physical health measures were available for both baseline and 3-month follow-up for 69 study participants. Attrition in objective physical health outcomes is attributed to participants discontinuing services at the Zepf Center or the lack of an attended appointment in which these measures were documented during the targeted 3-
month follow-up period. The objective physical health measures were first evaluated with regard to the overall sample over time, as seen in Table 4.

Table 4

<table>
<thead>
<tr>
<th>Time</th>
<th>Baseline</th>
<th>3-Month Follow-Up</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic BP</td>
<td>129.53</td>
<td>17.40</td>
<td>2.57**</td>
<td>69</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>83.29</td>
<td>14.64</td>
<td>3.30**</td>
<td>69</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>81.13</td>
<td>12.62</td>
<td>-2.04*</td>
<td>68</td>
</tr>
<tr>
<td>Weight</td>
<td>213.43</td>
<td>58.04</td>
<td>1.31</td>
<td>68</td>
</tr>
<tr>
<td>BMI</td>
<td>33.64</td>
<td>9.12</td>
<td>1.33</td>
<td>68</td>
</tr>
</tbody>
</table>

Note. *p<.05; **p<.01

**Blood Pressure.** To determine whether there was a significant change in systolic and/or diastolic blood pressure for the overall sample over time (i.e., baseline to 3-month follow-up), two paired samples t-tests were conducted. On average, study participants experienced a significant decrease in systolic blood pressure from baseline ($M = 129.53$, $SD = 18.56$) to the 3-month follow-up ($M = 123.70$, $SD = 17.40$), $t(69) = 2.57$, $p < 0.01$, $r = 0.30$. This represents a medium effect size. Similarly, on average, study participants experienced a significant decrease in diastolic blood pressure from baseline ($M = 83.29$, $SD = 11.48$) to the 3-month follow-up ($M = 77.53$, $SD = 14.64$), $t(69) = 3.30$, $p < 0.01$, $r = 0.37$. This represents a medium effect size.

At baseline, SBP ranged from 97.00 to 180.00, and at the 3-month follow-up SBP ranged from 99.00 to 183.00. The average SBP at baseline and 3-month follow-up fell within the pre-hypertensive range. At baseline, DBP ranged from 57.00 to 108.00 and at
the 3-month follow-up, DBP ranged from 40.00 to 140.00. The average DBP at baseline fell within the pre-hypertensive range; however, the average DBP at the 3-month follow-up fell in the normal range for blood pressure. Diagnosis of pre-hypertension and hypertension can happen as a result of elevations in SBP and/or DBP. At baseline, 25.3% participants’ blood pressure fell into the normal range, 31.0% fell into the pre-hypertension range, and 43.7% fell into the hypertension range. At the 3-month follow-up, 40.5% participants’ blood pressure fell into the normal range, 32.4% fell into the pre-hypertension range, and 27.0% fell into the hypertension range.

**Heart Rate.** To evaluate participants’ heart rate and the presence of brachycardia and tachycardia, the researcher gathered data on participants’ pulse at baseline and the 3-month follow-up. A paired sample t-test was conducted to determine whether heart rate significantly changed from baseline to a 3-month follow-up. On average, study participants experienced significantly lower heart rate at baseline ($M = 81.13$, $SD = 11.53$) than at a 3-month follow-up ($M = 83.86$, $SD = 12.62$), $t(68) = -2.04$, $p < 0.05$, $r = 0.11$. This represents a small effect size.

The average heart rate for study participants at both baseline and 3-month follow-up are within the normal range. At baseline, participants’ heart rate ranged from 60.00 to 107.00 beats per minute with 0.0% falling into the brachycardia range and 7.1% falling into the tachycardia range. At the 3-month follow-up, participants’ heart rate ranged from 54.00 to 120.00 beats per minute with 2.8% falling into the brachycardia range and 10.9% falling into the tachycardia range.

**Weight.** On average, study participants did not experience a significant change in their weight from baseline ($M = 213.43$, $SD = 56.42$) to 3-month follow up ($M = 210.72$, $SD = 55.34$).
$SD = 58.04), \ t(68) = 1.31, \ p = 0.20$. At baseline, participants’ weight ranged from 110.00 to 400.00 pounds. At the 3-month follow-up, participants’ weight ranged from 99.00 to 400.00.

**Body Mass Index.** To evaluate participants’ body mass index (BMI) and determine levels of overweight and obesity, the researcher gathered data on participants’ weight and height at baseline and the 3-month follow-up. On average, study participants did not experience a significant change in their BMI from baseline ($M = 33.64, SD = 9.10$) to 3-month follow up ($M = 33.42, SD = 9.12$), $t(68) = 1.33, p = 0.19$. The average BMI for study participants at both baseline and 3-month follow-up are within the obesity range. At baseline, participants’ BMI ranged from 17.99 to 62.20 with 19.5% falling into the normal range, 23.0% falling into the overweight range (i.e., BMI 25 kg/m² to 29.9 kg/m²), and 57.5% falling into the obesity range (i.e., BMI ≥ 30 kg/m²). At the 3-month follow-up, participants’ BMI ranged from 19.58 to 62.81 with 16.4% falling into the normal range, 24.7% falling into the overweight range (i.e., BMI 25 kg/m2 to 29.9 kg/m²), and 58.9% falling into the obesity range (i.e., BMI ≥ 30 kg/m²).

**Self-Report Outcomes.** It was hypothesized that a significant main effect for time would be found, such that the overall sample (both TAU and TAU+MI conditions) would experience significant improvements in self-reported health-related behaviors (as measured by the Health-Related Behaviors Questionnaire) over the course of 3-months of treatment. The self-reported health-related behaviors assessed include nutrition, physical activity, and smoking behavior.

Due to attrition, self-report measures were available for both baseline and 3-month follow-up for 32 study participants. A larger attrition occurred in the study’s self-
report outcomes. Some attrition in these outcomes occurred due to participants discontinuing services at the Zepf Center and difficulty contacting or meeting with participates to complete the Health-Related Behaviors Questionnaire during the targeted 3-month follow-up period; however, much of the attrition above and beyond that present in the objective physical health outcomes was due to a period in time in which the study assistant collecting administering these outcomes failed to do so for multiple months. When the primary investigator was not informed of this issue, too much time had lapsed to collect this questionnaire.

**Nutrition.** To evaluate participants’ eating habits, the researcher administered the Health-Related Behaviors Questionnaire which included questions about how many servings were consumed per week in seven food categories, how recently participants thought about and/or attempted to improve their eating habits, the longest period of time they have maintained healthy eating habits, and how often they utilize calorie information to make food-related decisions.

Paired samples t-tests were conducted to determine whether the number of servings consumed in each food category significantly changed over a 3-month period, as shown in Table 5. On average, participants denied significant differences in their consumption of bread/rolls, vegetables, regular soft drinks/sweetened fruit drinks, fried foods, dairy, and “junk foods” (e.g., potato chips and snack cakes) over a 3-month period. On average, participants reported a significant difference in their consumption of fruit, in that participants reported consuming more fruit at 3-month follow-up ($M = 1.40, SD = 0.92$), than at baseline ($M = 1.05, SD = 1.15$), $t(30) = -2.041, p = .05, r = 0.17$. This represents a small effect size. Additionally, a Wilcoxon signed-rank test determined that
there was no significant difference in the use of calorie information to inform decision-making within the overall sample over the 3-month period, $T = 7, p = 0.55$.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>3-Month Follow-Up</th>
<th>$t$</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread/Rolls</td>
<td>1.81</td>
<td>1.33</td>
<td>32</td>
<td>1.32</td>
</tr>
<tr>
<td>Fruits</td>
<td>1.05</td>
<td>0.92</td>
<td>31</td>
<td>1.40</td>
</tr>
<tr>
<td>Vegetables</td>
<td>1.59</td>
<td>1.04</td>
<td>32</td>
<td>1.70</td>
</tr>
<tr>
<td>Sweetened Drinks</td>
<td>2.88</td>
<td>2.60</td>
<td>29</td>
<td>2.66</td>
</tr>
<tr>
<td>Fried Foods</td>
<td>1.19</td>
<td>1.44</td>
<td>30</td>
<td>1.69</td>
</tr>
<tr>
<td>Dairy</td>
<td>1.71</td>
<td>1.34</td>
<td>32</td>
<td>2.13</td>
</tr>
<tr>
<td>“Junk Foods”</td>
<td>1.63</td>
<td>1.27</td>
<td>31</td>
<td>1.85</td>
</tr>
</tbody>
</table>

Note. *$p \leq .05$; **$p \leq .01$.

To determine whether the proportion of participants who had *thought about* or *attempted to* improve their eating habits during their lifetime significantly changed over a 3-month period, two McNemar tests (i.e., an analysis of change in paired dichotomous, categorical variables) were planned; however, there were not sufficient data in the contingency table cells (i.e., frequency <5) to meet the assumptions underlying this test.

At baseline, 86.0% of participants reported they had *thought about* improving their eating before, and at 3-month follow-up 87.5% reported they had *thought about* improving their eating before. A Wilcoxon signed-rank test determined there were no significant differences in the time frame in which participants last thought about improving their eating habits over a 3-month period, $T = 7, p = 0.55$. 


At baseline, 79.6% of participants reported they have attempted to improve their eating habits before, and at 3-month follow-up 77.4% reported having attempted to improve their eating before. A Wilcoxon signed-rank test determined that there were no significant differences in the time frame (i.e., in the past week, past month, past year, or more than 1 year ago) in which participants last made an attempt to improve their eating over a 3-month period, $T = 8, p = 0.21$. Additionally, no significant differences were found in the overall sample’s total number of attempts to change their eating habits during their lifetime, $p = 0.69$, or the longest length of consistent health eating over the 3-month period, $p = 0.74$.

**Physical Activity.** The Health-Related Behaviors Questionnaire included questions about the number of times participants engaged in physical activity per week, how long people kept at physical activity per occasion, number of times participants engaged in other health activities (e.g., yoga, tai chi, meditation) per week, how recently participants thought about and/or attempted to increase their physical activity, and the longest period of time they have maintained a consistent exercise routine.

Paired samples $t$-tests were conducted to determine whether participants’ level of physical activity significantly changed from baseline to 3-month follow-up, as shown in Table 6. On average, participants reported a significant increase in the number of occasions they were physically active per week from baseline ($M = 2.02, SD = 1.91$) to the 3-month follow up ($M = 4.18, SD = 3.25$), $t(27) = -3.43, p < 0.01, r = 0.38$. This represents a medium effect size. No significant differences were found in the number of minutes participants remained active per occasion from baseline ($M = 33.67, SD = 49.92$) to the 3-month follow-up ($M = 48.15, SD = 42.84$), $t(26) = -1.61, p = 0.12$. No significant
differences were found in the number of occasions participants engaged in other health activities (e.g., yoga, tai chi, meditation) per week from baseline \((M = 0.24, SD = 0.76)\) to the 3-month follow-up \((M = 0.76, SD = 1.71)\), \(t(30) = -1.46, p = 0.16\).

Table 6

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th></th>
<th></th>
<th>3-Month Follow-Up</th>
<th></th>
<th></th>
<th>(df)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M)</td>
<td>(SD)</td>
<td>(N)</td>
<td>(M)</td>
<td>(SD)</td>
<td>(N)</td>
<td></td>
</tr>
<tr>
<td>Occasions Per Week</td>
<td>2.02</td>
<td>1.91</td>
<td>28</td>
<td>4.18</td>
<td>3.25</td>
<td>28</td>
<td>-3.43*</td>
</tr>
<tr>
<td>Minutes Per Occasion</td>
<td>33.67</td>
<td>49.92</td>
<td>27</td>
<td>48.15</td>
<td>42.84</td>
<td>27</td>
<td>-1.61</td>
</tr>
<tr>
<td>Other Health Activities</td>
<td>0.24</td>
<td>0.76</td>
<td>31</td>
<td>0.76</td>
<td>1.71</td>
<td>31</td>
<td>-1.46*</td>
</tr>
</tbody>
</table>

Note. *\(p \leq 0.05\); **\(p \leq 0.01\)

To determine whether the proportion of participants who had thought about increasing their physical activity significantly changed from baseline to the 3-month follow-up a McNemar test was planned; however, there were not sufficient data in the contingency table cells (i.e., frequency <5) to meet the assumptions underlying this test. At baseline, 74.7.0% of participants reported having thought about increasing their physical activity and at 3-month follow-up 71.9% reported having thought about increasing their physical activity. A Wilcoxon signed-rank test determined that there was no significant difference in the time frame in which participants last thought about increasing their physical activity over a 3-month period, \(T = 3, p = 0.39\).

A McNemar test determined that there was no significant difference in the proportion of times participants had attempted to increase their physical activity from baseline to the 3-month follow-up, \(p = 0.58\). At baseline, 67.8% of participants reported they had made a previous attempt to increase their physical activity, and at 3-month
follow-up 71.9% reported had made a previous attempt to improve their eating habits. A Wilcoxon signed-rank test determined there was no significant difference in the time frame in which participants last made an attempt to increase their physical activity over a 3-month period, \( T = 4, p = 0.26 \). Additionally, no significant difference was found in the total number of attempts to increase their exercise in their lifetime, \( p = 0.51 \), or the longest length of a consistent exercise routine from baseline to the 3-month follow-up, \( p = 0.08 \).

**Tobacco Use.** The Health-Related Behaviors Questionnaire also included questions about whether participants have ever smoked in their lifetime and whether they are currently smoking. If participants were currently smoking, they were also asked how long it had been since their last cigarette, how recently they thought about and/or attempted to quit smoking, total number of quit attempts made in one’s lifetime, and the longest period of time one has ever quit smoking. No significant differences were found in the number of cigarettes participants smoked per day, \( t(24) = -0.91, p = 0.37 \), or the length of time since participants’ last cigarette, \( t(22) = -1.01, p = 0.32 \), over the 3-month period as shown in Table 7.

Table 7

<table>
<thead>
<tr>
<th>Time</th>
<th>Baseline</th>
<th>3-Month Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( M )</td>
<td>( SD )</td>
</tr>
<tr>
<td>Cigarettes Per Day</td>
<td>14.04</td>
<td>10.38</td>
</tr>
<tr>
<td>Length of Time Since Last Cigarette (Min)</td>
<td>5.87</td>
<td>18.97</td>
</tr>
</tbody>
</table>

*Note.* **\( p \leq .05 \); \*\*\( p \leq .01 \)
To determine whether the proportion who reported they had *thought about* and/or *attempted to* quit smoking significantly changed from baseline to the 3-month follow-up, a McNemar test was planned; however, the assumptions of this test were not met. At baseline, 81.7% of participants reported having smoked in their lifetime with 71.6% reporting they are current smokers. Of those participants who currently smoke, 89.2% reported having *thought about* quitting before when asked at baseline, and 92.3% reported having *thought about* quitting at the 3-month follow-up. A Wilcoxon signed-rank test determined that no significant differences in the time frame in which participants *last thought about* quitting were found over a 3-month period, \( T = 5, p = 0.72 \).

Of those participants who currently smoke, 67.8% acknowledged they had made a previous *attempt to* quit smoking when asked at baseline, and 84.6% reported that they had made a previous *attempt to* quit when asked 3-months later. A Wilcoxon signed-rank test determined there was no significant difference in the time frame in which participants last made a quit attempt over the 3-month period, \( T = 8, p = 0.15 \).

**Analyses by Treatment Condition**

**Objective Physical Health Outcomes.** It was hypothesized that a significant interaction effect would be found, such that participants in the TAU + MI condition would demonstrate significantly better objective physical health outcomes when compared to participants in the TAU condition after a 3 month period. As shown in Table 8, Mixed Model ANOVAs were conducted to evaluate each objective physical health measure (i.e., blood pressure, heart rate, weight, and BMI) by treatment condition over time.
Table 8

Two-Way Mixed ANOVA Comparing Objective Physical Health Measures Over Time by Treatment Condition

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>F</th>
<th>$\eta^2$</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic BP</td>
<td>68</td>
<td>0.77</td>
<td>0.01</td>
<td>0.38</td>
</tr>
<tr>
<td>Diastolic BP</td>
<td>68</td>
<td>0.10</td>
<td>&lt;0.01</td>
<td>0.76</td>
</tr>
<tr>
<td>Heart Rate</td>
<td>67</td>
<td>1.08</td>
<td>0.02</td>
<td>0.30</td>
</tr>
<tr>
<td>Weight</td>
<td>67</td>
<td>1.51</td>
<td>0.01</td>
<td>0.22</td>
</tr>
<tr>
<td>BMI</td>
<td>67</td>
<td>0.91</td>
<td>0.01</td>
<td>0.34</td>
</tr>
</tbody>
</table>

*Note. *$p$<.05; **$p$<.01

**Blood Pressure.** Blood pressure changes in each treatment group over time were evaluated by looking at blood pressure data in both a continuous and categorical fashion. The continuous data evaluated included systolic and diastolic blood pressure. A categorical variable was also established by converting the continuous systolic and diastolic blood pressure values into one categorical variable indicating whether individuals meet typical thresholds for healthy blood pressure, pre-hypertension, or hypertension.

To evaluate whether changes in continuous systolic blood pressure data from baseline to 3-month follow-up were the same in the two treatment conditions, a two-way Mixed Model ANOVA was conducted. Although results of the two-way Mixed Model ANOVA suggest a significant main effect for time, $F(1,68) = 6.85, p = 0.01$, no significant interaction effect for time and treatment condition on systolic blood pressure was found, $F(1,68) = 0.77, p = 0.38$. Contrary to the hypothesis, this suggests the overall sample experienced improvement in systolic blood pressure over time but that changes in
systolic blood pressure did not significantly differ between the two treatment conditions from baseline (TAU $M = 123.62$, $SD = 15.11$; TAU+MI $M = 136.15$, $SD = 20.01$) to the 3-month follow-up (TAU $M = 119.68$, $SD = 16.51$; TAU+MI $M = 128.21$, $SD = 17.50$), as shown in Figure 1. No significant differences were found between genders or ethnicities.

To evaluate whether changes in continuous diastolic blood pressure data from baseline to 3-month follow-up is the same in the two treatment conditions, a two-way Mixed Model ANOVA was conducted. Although results suggest a significant main effect for time, $F(1,68) = 10.86$, $p < 0.01$, no significant interaction effect for time and treatment condition on diastolic blood pressure was found, $F(1,68) = 0.10$, $p = 0.76$. Contrary to the hypothesis, this indicates that the overall sample experienced improvement in diastolic blood pressure over time, but that changes in diastolic blood pressure over time did not significantly differ between the two treatment conditions from baseline (TAU $M = 79.95$, $SD = 11.15$; TAU+MI $M = 87.03$, $SD = 10.82$) to the 3-month

*Figure 1. Mean Systolic Blood Pressure as a Function of Time and Treatment Condition (TAU $N=37$; TAU+MI $N=33$).*
follow-up (TAU $M = 74.70$, $SD = 13.14$; TAU+MI $M = 80.70$, $SD = 15.75$), as shown in Figure 2. No significant differences were found when evaluated by gender or ethnicity.

![Figure 2](image)

Figure 2. Mean Diastolic Blood Pressure as a Function of Time and Treatment Condition (TAU $N= 37$; TAU+MI $N= 33$).

Blood pressure was categorized into healthy, pre-hypertension, and hypertension categories to simulate the manner in which hypertension is diagnosed. Individuals with a resting SBP of 140 mmHg or higher and/or a DBP of 90 mmHg or higher were categorized as having hypertension, and individuals with SBP of 121 to 139 mmHg and/or a DBP of 81 to 89 mmHg were categorized as having pre-hypertension. Within the TAU group, 32.0% appear to have healthy blood pressure, 36% met criteria for pre-hypertension, and 32.0% met criteria for hypertension at baseline, while 59.5% had healthy blood pressure, 16.2% met criteria for pre-hypertension, and 18.0% met criteria for hypertension at the 3-month follow-up. Within the TAU+MI group, 16.2% appear to have healthy blood pressure, 24.3% met criteria for pre-hypertension, and 59.5% met criteria for hypertension at baseline, while 59.5% had healthy blood pressure, 16.2% met criteria for pre-hypertension, and 24.3% met criteria for hypertension at the 3-month
follow-up. In both treatment conditions, the proportions of participants with potentially problematic blood pressure (i.e., pre-hypertension and hypertension) reduced over a 3-month period.

**Heart Rate.** To evaluate changes in heart rate over time for each treatment condition, two-way Mixed Model ANOVA was conducted. The two-way Mixed Model ANOVA determined that there was not a significant main effect for time (i.e., baseline and 3-month follow-up), $F(1,67) = 3.83, p = 0.06$. There was a significant main effect for treatment condition (i.e., TAU versus TAU+MI), $F(1,67) = 4.09, p = 0.047$, such that participants in the TAU group displayed significantly lower heart rate ratings at baseline ($M = 78.11, SE = 1.83$) than the TAU+MI group ($M = 84.63, SE = 1.97$). No significant interaction effect was found, $F(1,67) = 1.08, p = 0.30$. Contrary to the hypothesis, this suggests that changes in heart rate did not significantly differ between the two treatment conditions from baseline (TAU $M = 78.11, SD = 12.95$; TAU+MI $M = 84.63, SD = 8.56$) to the 3-month follow-up (TAU $M = 82.19, SD = 12.09$; TAU+MI $M = 85.88, SD = 13.13$), as shown in Figure 3. No significant difference was found by ethnicity or gender.
The average heart rate for the TAU + MI and the MI groups at both baseline and 3-month follow-up are within the normal range. At baseline, the TAU + MI group’s heart rate ranged from 68.00 to 103.00 beats per minute with 0.0% falling into the brachycardia range and 11.2% falling into the tachycardia range. At baseline, the TAU group’s heart rate ranged from 60.00 to 107.00 beats per minute with 0.0% falling into the brachycardia range and 4.0% falling into the tachycardia range. At the 3-month follow-up, the TAU + MI group’s heart rate ranged from 59.00 to 120.00 beats per minute with 2.7% falling into the brachycardia range and 13.5% falling into the tachycardia range. At the 3-month follow-up, the TAU group’s heart rate ranged from 54.00 to 106.00 beats per minute with 2.7% falling into the brachycardia range and 8.1% falling into the tachycardia range.

Weight. To assess changes in weight over time for each treatment condition, a two-way Mixed Model ANOVA was conducted. The two-way Mixed Model ANOVA determined that there was no significant main effect for time (i.e., baseline and 3-month follow-up), $F(1,67) = 1.86, p = 0.18$, or treatment condition (i.e., TAU versus TAU+MI),
Contrary to the hypothesis, no interaction effect was found, $F(1,67) = 1.51, p = 0.22$, indicating that changes in weight (lbs.) did not significantly differ between the two treatment conditions from baseline (TAU $M = 199.79$, $SD = 56.65$; TAU+MI $M = 228.30$, $SD = 53.08$) to the 3-month follow-up (TAU $M = 199.51$, $SD = 56.53$; TAU+MI $M = 222.96$, $SD = 58.03$), as seen in Figure 4. No significant difference was found by gender or ethnicity.

At baseline, the TAU + MI participants’ weight ranged from 126.00 to 357.00 pounds, and the TAU participants’ weight ranged from 110.00 to 400.00 pounds. At the 3-month follow-up, the TAU + MI participants’ weight ranged from 99.00 to 349.00 pounds, and the TAU participants’ weight ranged from 115.00 to 400.00 pounds.

**BMI.** To determine changes in BMI over time for each treatment condition, a two-way Mixed Model ANOVA was conducted. The two-way Mixed Model ANOVA determined that there was not a significant main effect for time (i.e., baseline and 3-month follow-up), $F(1,67) = 1.87, p = 0.18$, or treatment condition (i.e., TAU versus
Contrary to the hypothesis, no significant interaction effect was found, $F(1,67) = 0.91, p = 0.34$, indicating that changes in BMI did not significantly differ between the two treatment conditions from baseline (TAU $M = 31.77, SE = 1.49$; TAU+MI $M = 35.69, SE = 1.56$) to the 3-month follow-up (TAU $M = 31.70, SE = 1.50$; TAU+MI $M = 35.30, SE = 1.57$), as shown in Figure 5.

Figure 5. Mean BMI as a Function of Time and Treatment Condition (TAU $N=36$; TAU+MI $N=33$).

When evaluated by ethnicity, the two-way Mixed Model ANOVA indicated there was a significant interaction effect between time and treatment condition on the BMI of European Americans only, $F(1,26) = 5.93, p = 0.02$, in that European Americans in the TAU+MI condition were significantly more likely to experience an improvement in BMI than in European Americans in the TAU condition from baseline (TAU $M = 32.42, SD = 10.22$; TAU+MI $M = 36.50, SD = 7.74$) to 3-month follow-up (TAU $M = 32.78, SD = 10.06$; TAU+MI $M = 35.55, SD = 7.51$), as shown in Figure 6. No significant difference was found by gender.
Figure 6. Interaction Effect of Time and Treatment Condition (TAU \( N = 17 \); TAU+MI \( N = 11 \)) on BMI for European Americans only.

The average BMI for the TAU + MI and the MI groups at both baseline and 3-month follow-up are within the obesity range. At baseline, the TAU + MI participants’ BMI ranged from 20.97 to 35.80 with 5.4% falling into the normal range, 24.3% falling into the overweight range (i.e., BMI 25 kg/m\(^2\) to 29.9 kg/m\(^2\)), and 70.2% falling into the obesity range (i.e., BMI \( \geq 30 \) kg/m\(^2\)). At baseline, the TAU participants’ BMI ranged from 17.99 to 62.20 with 30.0% falling into the normal range, 22.0% falling into the overweight range, and 48.0% falling into the obesity range. At the 3-month follow-up, the TAU + MI participants’ BMI ranged from 23.10 to 54.78 with 5.4% falling into the normal range, 24.3% falling into the overweight range, and 70.3% falling into the obesity range. At the 3-month follow-up, the TAU participants’ BMI ranged from 19.58 to 62.81 with 27.8% falling into the normal range, 24.6% falling into the overweight range, and 47.6% falling into the obesity range.
Self-Reported Outcomes. It was hypothesized that a significant interaction effect would be found, such that participants in the TAU + MI condition would demonstrate significantly greater improvement in self-reported health-behaviors (as measured by the Health-Related Behaviors Questionnaire) over a 3 month period when compared to participants in the TAU condition.

Nutrition. To evaluate whether changes in eating habits from baseline to 3-month follow-up significantly differed depending on treatment condition, a series of two-way Mixed Model ANOVAs were conducted. Each two-way Mixed Model ANOVA evaluated the interaction effects between time and treatment condition on the target eating habit.

To determine whether changes in the number of servings consumed in each food category over a 3-month period significantly differed depending on treatment condition, a series of two-way Mixed Model ANOVAs were conducted. Contrary to the hypothesis, no significant interaction between time and treatment condition was found for the self-reported consumption of bread/rolls, vegetables, fruit, regular soft drinks/sweetened fruit drinks, fried foods, dairy, and “junk foods” (e.g., potato chips and snack cakes) over a 3-month period, as shown in Table 9. When explored by gender, there was a significant interaction for females’ consumption of bread, in that females in the TAU+MI condition experienced a significant decrease in bread consumption over a 3-month period when compared to females in the TAU condition, $F(1,16) = 5.32, p = 0.04$. 
Table 9

Two-Way Mixed Model ANOVA Comparing Consumption of Food Servings Over Time

<table>
<thead>
<tr>
<th>Food Category</th>
<th>df</th>
<th>$F$</th>
<th>$\eta^2$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread/rolls</td>
<td>30</td>
<td>4.04</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>Fruit</td>
<td>29</td>
<td>0.89</td>
<td>0.03</td>
<td>0.35</td>
</tr>
<tr>
<td>Vegetables</td>
<td>30</td>
<td>0.79</td>
<td>0.03</td>
<td>0.38</td>
</tr>
<tr>
<td>Sodas/sweetened drinks</td>
<td>27</td>
<td>&lt;0.01</td>
<td>&lt;0.00</td>
<td>~1.00</td>
</tr>
<tr>
<td>Fried foods</td>
<td>28</td>
<td>0.40</td>
<td>0.01</td>
<td>0.53</td>
</tr>
<tr>
<td>Dairy</td>
<td>30</td>
<td>0.974</td>
<td>0.03</td>
<td>0.33</td>
</tr>
<tr>
<td>Junk foods</td>
<td>29</td>
<td>0.36</td>
<td>0.01</td>
<td>0.56</td>
</tr>
</tbody>
</table>

To determine whether the number of attempts made to change eating habits over participants’ lifetime differed between treatment conditions over time, a two-way Mixed Model ANOVA was conducted. Contrary to the hypothesis, no interaction effect was found, $F(1,21) = 0.06, p = 0.80$, indicating that changes in the number of attempts made to change eating habits did not significantly differ between the two treatment conditions from baseline (TAU $M = 1.19, SD = 1.15$; TAU+MI $M = 10.30, SD = 14.63$) to the 3-month follow-up (TAU $M = 3.15, SD = 3.76$; TAU+MI $M = 10.65, SD = 14.44$), as shown in Figure 7.
To determine whether there were significant differences in the *longest period of consistently healthy eating* (in days) between treatment conditions over time, a two-way Mixed Model ANOVA was conducted. Contrary to the hypothesis, no interaction effect was found, $F(1,26) = 1.00, p = 0.33$, indicating that changes in the *longest period of consistently healthy eating* did not significantly differ between the two treatment conditions from baseline (TAU $M = 1336.40, SD = 3864.28$; TAU+MI $M = 905.54, SD = 1170.97$) to the 3-month follow-up (TAU $M = 1583.40, SD = 4124.95$; TAU+MI $M = 328.08, SD = 598.41$).

To determine the proportions of participants in each treatment condition reporting they had previously *thought about* improving their eating at baseline and a 3-month follow-up, crosstabulations were conducted. The percentage of participants in the TAU+MI condition reporting they had *thought about* improving their eating habits increased from baseline (93.0%) to the 3-month follow-up (100.0%), while the
percentage in the TAU condition slightly decreased from baseline (80.0%) to the 3-month follow-up (77.8%). Refer to Table 7 for crosstabulations.

Table 10

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 93)</th>
<th>3-Month Follow-Up (N = 32)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAU</td>
<td>80.0% (N = 40)</td>
<td>20.0% (N = 10)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>93.0% (N = 40)</td>
<td>7.0% (N = 3)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last thought about improving their eating habits (i.e., past week, past month, past year, or more than 1 year ago) changed over a 3-month period, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last thought about this change did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 1.80, p = 0.18$. The time frame in which participants in the TAU+MI condition last thought about this change did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 0.50, p = 0.48$.

To determine the proportions of participants in each treatment condition reporting that they had previously attempted to improve their eating habits over a 3-month period, crosstabulations were conducted. The percentage of participants in the TAU+MI condition reporting they had previously attempted to improve their eating habits remained approximately the same from baseline (72.0%) to the 3-month follow-up (72.2%), while the percentage in the TAU condition slightly decreased from baseline (88.4%) to the 3-month follow-up (84.6%). Refer to Table 11 for crosstabulations.
Table 11

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 93)</th>
<th>3-Month Follow-Up (N = 31)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAU</td>
<td>72.0% (N = 36)</td>
<td>28.0% (N = 14)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>88.4% (N = 38)</td>
<td>26.3% (N = 5)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last attempted to improve their eating (i.e., past week, past month, past year, or more than 1 year ago) changed over a 3-month period, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last attempted this change did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 3.57, p = 0.06$. The time frame in which participants in the TAU+MI condition last attempted this change did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 0.20, p = 0.66$.

**Physical Activity.** To evaluate whether changes in physical activity from baseline to 3-month follow-up significantly differed by treatment condition, a series of two-way Mixed Model ANOVAs were conducted. Each two-way Mixed Model ANOVA evaluated interaction effects between time and treatment condition on the target physical activity measure, as shown in Table 12.
Table 12

Two-Way Mixed Model ANOVA Comparing Physical Activity Over Time

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>F</th>
<th>$\eta^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasions Per Week</td>
<td>26</td>
<td>0.49</td>
<td>0.02</td>
<td>0.49</td>
</tr>
<tr>
<td>Minutes Per Occasion</td>
<td>25</td>
<td>2.76</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>Other Health Activities</td>
<td>29</td>
<td>0.35</td>
<td>0.01</td>
<td>0.56</td>
</tr>
</tbody>
</table>

Note. *p ≤ .05; **p ≤ .01

Contrary to the hypothesis, no significant interaction between time and treatment condition was found for number of occasions (days) participants were physically active per week over the 3-month period, $F(1,26) = 0.49, p = 0.49$, or the average number of minutes of physical activity per occasion (day) over the 3-month period, $F(1,25) = 2.76, p = 0.11$. Similarly, contrary to the hypothesis, no significant interaction between time and treatment condition was found for the self-reported days of other health activities (e.g., yoga, tai chi, meditation) per week over the 3-month period, $F(1,29) = 0.35, p = 0.56$.

To determine whether the total number of attempts made to increase physical activity over participants' lifetime differed between treatment conditions over the 3-month period, a two-way Mixed Model ANOVA was conducted. Contrary to the hypothesis, no interaction effect was found, $F(1,20) = 0.04, p = 0.84$, indicating that changes in the total number of attempts made to increase physical activity did not significantly differ between the two treatment conditions from baseline (TAU $M = 2.38$, $SD = 3.07$; TAU+MI $M = 6.20$, $SD = 5.92$) to the 3-month follow-up (TAU $M = 3.58$, $SD = 3.55$; TAU+MI $M = 8.45$, $SD = 15.19$), as shown in Figure 8.
Figure 8. Mean Number of Attempts to Increase Physical Activity Over Participants’ Lifetime as a Function of Time and Treatment Condition (TAU N= 12; TAU+MI N= 10).

To determine whether there were significant differences in the longest period of a consistent physical activity regimen (days) over the 3-month period between treatment conditions, a two-way Mixed Model ANOVA was conducted. Contrary to the hypothesis, no interaction effect was found, $F(1,21) = 1.61, p = 0.22$, indicating that changes in the longest period of time a consistent exercise routine was maintained did not significantly differ between the two treatment conditions from baseline (TAU $M = 1006.00$, $SD = 2816.98$; TAU+MI $M = 447.91$, $SD = 783.67$) to the 3-month follow-up (TAU $M = 1933.33$, $SD = 4004.19$; TAU+MI $M = 615.55$, $SD = 850.85$).

To determine the proportions of participants in each treatment condition reporting they have thought about increasing their physical activity at baseline and the 3-month follow-up, crosstabulations were conducted. The percentage of participants in the TAU+MI condition reporting they have thought about increasing their physical activity increased from baseline (74.4%) to the 3-month follow-up (85.7%), while the percentage
in the TAU condition decreased from baseline (75.0%) to the 3-month follow-up (61.1%), as shown in Table 13.

Table 13

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 91)</th>
<th>3-Month Follow-Up (N =32)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAU</td>
<td>75.0% (N = 36)</td>
<td>25.0% (N = 12)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>74.4% (N = 32)</td>
<td>25.6% (N = 11)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last thought about increasing their physical activity (i.e., past week, past month, past year, or more than 1 year ago) changed from baseline to 3-month follow-up, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last thought about this change did not significantly differ from baseline to 3-month follow-up $\chi^2(1) = 0.50, p = 0.48$. Similarly, the time frame in which participants in the TAU+MI condition last thought about this change did not significantly differ from baseline to 3-month follow-up $\chi^2(1) = 0.67, p = 0.41$.

To determine the proportions of participants in each treatment condition reporting they have previously made an attempt to increase their physical activity at baseline and the 3-month follow-up, crosstabulations were conducted. The percentage of participants in the TAU+MI condition reporting they have previously made an attempt remained approximately the same from baseline (69.8%) to the 3-month follow-up (71.4%), while the percentage in the TAU condition decreased from baseline (66.0%) to the 3-month follow-up (50.0%), as shown in Table 14.
Table 14

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 90)</th>
<th>3-Month Follow-Up (N = 32)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>TAU</td>
<td>66.0% (N = 31)</td>
<td>34.0% (N = 16)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>69.8% (N = 30)</td>
<td>30.2% (N = 13)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last attempted to increase their physical activity (i.e., past week, past month, past year, or more than 1 year ago) changed over the 3-month period, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last attempted to change did not significantly differ from baseline to 3-month follow-up $\chi^2(1) = 1.00, p = 0.32$. The time frame in which participants in the TAU+MI condition last attempted to change did not significantly differ from baseline to 3-month follow-up $\chi^2(1) = 0.33, p = 0.56$.

**Tobacco Use.** Of the participants who reported they have smoked cigarettes in their lifetime (N = 28), the same number of TAU+MI participants reported currently smoking (83.3%; N = 10) at both baseline and the 3-month follow-up. Within the TAU group, 93.3% of participants (N = 14) reported they were currently smoking at baseline while 100.0% reported they were smoking at the 3-month follow-up. Contrary to the hypothesis, no significant interaction between time and treatment condition was found for the number of cigarettes smoked on an average day, $F(1,23) = 0.49, p = 0.49$, or length since last cigarette, $F(1,21) = 1.77, p = 0.20$, as shown in Table 15.
Contrary to the hypothesis, no significant interaction effect was found for the total number of previous attempts made to quit smoking over participants’ lifetime as a function of treatment condition and time, $F(1,21) = 0.04, p = 0.85$, indicating that changes in the number of attempts to quit smoking did not significantly differ between treatment condition from baseline (TAU $M = 2.38$, $SD = 1.39$; TAU+MI $M = 23.55$, $SD = 40.58$) to the 3-month follow-up (TAU $M = 3.58$, $SD = 4.61$; TAU+MI $M = 22.45$, $SD = 40.63$), as shown in Figure 9.

*Figure 9.* Mean Number of Attempts to Quit Smoking Over Participants’ Lifetime as a Function of Time and Treatment Condition (TAU $N= 13$; TAU+MI $N= 10$).

Table 15

<table>
<thead>
<tr>
<th>Smoking Behavior</th>
<th>df</th>
<th>$F$</th>
<th>$\eta^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cigarettes Per Day</td>
<td>23</td>
<td>0.49</td>
<td>0.02</td>
<td>0.49</td>
</tr>
<tr>
<td>Length of Time Since Last Cigarette (Min)</td>
<td>21</td>
<td>1.77</td>
<td>0.08</td>
<td>0.20</td>
</tr>
</tbody>
</table>
To determine whether there were significant differences in the *longest period of time participants stayed quit (days)* over time (i.e., baseline to 3-month follow-up) between treatment conditions, a two-way Mixed Model ANOVA was conducted. Contrary to the hypothesis, no interaction effect was found, $F(1,22) = 0.02, p = 0.89$, indicating that changes in the *longest period of time participants stayed quit* smoking did not significantly differ between the two treatment conditions from baseline ($\text{Tau} M = 123.05, SD = 241.27$; $\text{Tau+MI} M = 330.50, SD = 453.42$) to the 3-month follow-up ($\text{Tau} M = 235.77, SD = 365.70$; $\text{Tau+MI} M = 364.30, SD = 440.46$), as shown in Figure 10.

![Figure 10: Mean Longest Period of Time Stayed Quit Smoking (days) as a Function of Time and Treatment Condition (Tau N= 14; Tau+MI N= 10).](image)

To determine the proportions of participants in each treatment condition reporting they had previously *thought about* quitting smoking at baseline to 3-month follow-up, crosstabulations were conducted. As shown in Table 16, the percentage of participants in the Tau+MI condition reporting they had *thought about* quitting smoking increased from baseline (90.0%) to the 3-month follow-up (100.0%), while the percentage in the
TAU condition slightly decreased from baseline (93.3%) to the 3-month follow-up (87.5%).

Table 16

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 25)</th>
<th>3-Month Follow-Up (N = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TAU</td>
<td>93.3% (N = 14)</td>
<td>6.7% (N = 1)</td>
</tr>
<tr>
<td></td>
<td>87.5% (N = 14)</td>
<td>87.5% (N = 14)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>90.0% (N = 9)</td>
<td>10.0% (N = 1)</td>
</tr>
<tr>
<td></td>
<td>100.0% (N = 10)</td>
<td>0.0% (N = 0)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last thought about quitting smoking (i.e., past week, past month, past year, or more than 1 year ago) changed from baseline to 3-month follow-up, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last thought about quitting did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 1.00, p = 0.32$. The time frame in which participants in the TAU+MI condition last thought about this change did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 0.67, p = 0.41$.

To determine the proportions of participants in each treatment condition reporting they had previously made an attempt to quit smoking at baseline to 3-month follow-up, crosstabulations were conducted. As seen in Table 17, the percentage of participants in the TAU+MI condition reporting they had previously made an attempt to quit remained the same from baseline (90.0%) to the 3-month follow-up (90.0%), while the percentage in the TAU condition slightly decreased from baseline (86.7%) to the 3-month follow-up (81.3%).
Table 17

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Baseline (N = 25)</th>
<th>3-Month Follow-Up (N = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>TAU</td>
<td>86.7% (N = 13)</td>
<td>13.3% (N = 2)</td>
</tr>
<tr>
<td>TAU+MI</td>
<td>90.0% (N = 9)</td>
<td>10.0% (N = 1)</td>
</tr>
</tbody>
</table>

To determine whether the time frame in which participants’ last attempted to quit smoking (i.e., past week, past month, past year, or more than 1 year ago) changed from baseline to 3-month follow-up, a Friedman’s ANOVA was conducted on each treatment group. The time frame in which participants in the TAU condition last attempted to quit did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 3.57$, $p = 0.06$. The time frame in which participants in the TAU+MI condition last attempted to quit did not significantly differ from baseline to 3-month follow-up $\chi^2 (1) = 0.67$, $p = 0.41$. 
Changes in Motivation

Participants who received a brief MI session were given the choice of discussing one of three different health-behaviors during the session: Eating habits, physical activity, or smoking. When presented with this option, the largest proportion chose to discuss smoking (39.5%), followed by eating habits (34.9%), and physical activity (25.6%). Although all three of these health-behaviors were likely important foci for most adults receiving services at the Zepf Center, the relative proportions of participants choosing each one may have been influenced by a number of factors. One potential explanation is that quitting smoking was the most important health-related change to the largest number of adult participants. Another potential explanation, is that (despite efforts to present study participation and MI session options in a neutral, nondirective manner) anecdotal experiences of the researcher during implementation suggest that referral sources may have been particularly suggestive regarding participants choosing smoking as the topic of conversation. The researcher was clear with participants when beginning the session that the choice of topic was their choice alone; however, this type of influence from referral sources may have impacted their choice.

Importance. Each adult who received a MI session was asked to rate their desire to change and perceived efficacy for change both before and after they received the session. Their desire to make a change in the health-related behavior area chosen was assessed by asking participants “on a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” Before the MI session,
on average, participants rated the importance of a change as an 8 on a 0 to 10 scale, with 81.3% of participants stating the importance was at least a 7 prior to receiving the session. These rating suggest that adults receiving services at the Zepf Center, and more specifically adults willing to participate in a MI session, were highly motivated to make a health-related change prior to their engagement in the study.

It was hypothesized that participants who received a single MI session would show significant improvements in their self-ratings of the importance of changing the health behavior from the beginning of the MI session to the end of the session, supporting the fidelity of the MI intervention in promoting increased motivation to change. Following the single MI session, 28.7% of participants reported that their desire to change had increased. This suggests that for more than one-fourth of participants with SPMI, a single brief session of MI was enough to increase their desire to make a needed lifestyle change. In the context of the greater MI literature, it appears the present study’s semi-structured MI intervention did succeed in its intended purpose: assisting people in moving from a lower stage of change to a higher stage of change (Miller & Rollnick, 2012). It is suspected that the detected magnitude of improvement in the desire to change was limited by a ceiling effect wherein most individuals reported high desire prior to the intervention assessed. For only those individuals who reported an increase in desire to change, the average increase in desire to change was almost two points. When this outcome was evaluated to determine whether the single MI session was more beneficial in promoting desire to change for some health-related behaviors more than others, it appeared participants noted similar increases in desire to change across the three behaviors.
Slightly troubling was the finding that 9.6% of participants reported their desire to change decreased by at least one point on a 0 to 10 scale over the course of the MI session. These participants reported a decline in their desire to change. Anecdotally, it appeared that discussing necessary health-related changes could trigger negative emotional states (e.g., worry, sadness, overwhelmed) through increasing awareness of the problem and focusing participants’ attention on the ways their current lifestyle/behavior has impacted their health or the steps that may be needed to improve their health or lifestyle. Such emotional states may have impacted participants’ short-term desire to make a change. Another possible explanation is that participants’ initial ratings of desire to change could have been impacted by social desirability characteristics. Participants may have wanted to make a positive impression on or provide the researcher with a response perceived as desirable at the beginning of the intervention, resulting in higher ratings of initial importance than were accurate. There did not seem to be a relationship between the health behavior chosen for the session and decline in desire to change.

**Confidence.** Perceived efficacy (i.e., confidence) in making a behavior change was assessed both before and after the MI session by asking participants “on a scale of 0 to 10, how confident are you that you can make the change assuming that you want to do so?” Before the session, on average, participants rated their confidence in making a change as a 5 on a 0 to 10 scale, with only 38.1% of participants stating their confidence was at least a 7 prior to receiving the session. These rating suggest that the majority of participants receiving services at the Zepf Center, and more specifically participants willing to participate in a MI session, were not highly confident that they had the ability to change their health-related behavior prior to their engagement in the study.
It was hypothesized that participants who received a single session of MI would show significant improvements in their self-ratings of their confidence in changing the health behavior from the beginning of the MI session to the end of the session. Following the single MI session, 45.2% of participants reported that their efficacy to change had increased. This suggests that for almost half of the participants with SPMI, a single brief session of MI was enough to increase their perceived efficacy in making a needed lifestyle change. For only those individuals who reported an increase in confidence, the average increase in confidence was approximately two and one-half points. Another notable finding was that all but one participant reported their confidence stayed the same or increased. This is a very promising finding in that a large proportion of participants noted a notable increase in confidence to change, a finding that suggests MI is efficacious in increasing confidence, a vital component to one’s motivation for change, when used with adult SPMI populations.

**Objective Physical Health Changes**

As previously stated, prior literature indicates participants living with SPMI experience excess morbidity and mortality when compared to the general population (DeHert et al., 2011; Saha, Chant, & McGrath, 2007; Scott & Happell, 2011). Much of this excess morbidity is attributed to preventable health conditions (Cook, 2011; Laursen, Munk-Olsen, & Vestergaard, 2012). Blood pressure, heart rate, weight, and body mass index were used as objective physical health indicators assessed over time to detect changes in health with treatment intervention. It was hypothesized that a significant main effect for time would be found, such that the overall sample would experience significant improvements in objective physical health measures from the study start date (i.e., date
baseline measures were administered) to a 3-month follow-up appointment, as evidenced by objective physical health measures (e.g., blood pressure, heart rate, and body mass index). It was also hypothesized that a significant interaction effect would be found, such that participants who received a single session of MI would demonstrate significantly better objective physical health outcomes at the 3-month follow-up compared to those who received Health Home services only.

**Blood pressure.** Within the overall sample of participants studied at the Zepf Center, the majority had blood pressure consistent with hypertension (43.7%) or pre-hypertension (31.0%) when they began participating in the present study (baseline). Approximately one-fourth of participants in the study had blood pressure within the normal range. High rates of hypertension were anticipated at baseline, as prior literature regarding the health of individuals living with SPMI indicates hypertension is found more frequently in individuals with SPMI than in the general population (Best Practices in Schizophrenia Treatment Center, 2011; De Leon et al., 2005; Kennedy et al., 2005; Van Hasselt et al., 2013). The present study’s prevalence of hypertension appears higher than the prevalence rates found by previous studies evaluating presence of hypertension using self-report and objective measures of blood pressure (Best Practices in Schizophrenia Treatment Center, 2011; De Leon et al. 2005; Kennedy et al., 2005). This is a concerning finding and suggests hypertension is a preventable health condition that should be targeted with particular vigor at the Zepf Center.

Following a 3-month period of typical Behavior Health Home services, the overall sample displayed a lower prevalence rate of hypertension (27.0%) than at baseline. Participants experienced moderate, significant reductions in both their systolic
and diastolic blood pressure over time. This result is consistent with prior literature suggesting that integrated care services improves clinical outcomes, such as decreased levels of hypertension (Blout, 2003; Katon, 1995; Simon & VonKorff, 1997). This result is also encouraging; as it suggests typical Health Home services (regardless of participation in MI) were an effective clinical intervention for improving blood pressure for participants living with SPMI over a relatively brief period (in this case, three months).

It was anticipated that adding a session of MI targeting either eating habits, physical activity, or smoking to these typical Health Home services would result in notably greater improvement in participants’ blood pressure over time; however, the results of the present study suggest, a brief MI session was not effective in improving blood pressure above and beyond typical Health Home services. This information is useful with regard to agency decision-making regarding allocation of resources. These results suggest that participants’ hypertension can be addressed in a meaningful way through participation in a Health Home and, although participants reported notable increases in their motivation to make health-related changes over the course of an MI session (as discussed above), the clinical benefits of one brief MI session were negligible with regard to participants’ blood pressure outcomes. It is suspected that a larger dose of MI may be needed to detect meaningful changes in blood pressure.

**Heart rate.** Within the overall sample, the majority of participants had a heart rate that would be considered healthy when they began participating in the present study. No study participants had a heart rate consistent with brachycardia (0.0%) and only 7.1% had tachycardia. Following the 3-month period, the overall sample displayed a higher
prevalence of both brachycardia (2.8%) and tachycardia (10.9%) than at baseline. Adults in the overall sample experienced a small, yet significant increase in heart rate over time. This suggests that participants who engaged in Health Home services, regardless of participation in MI, appeared to experience some worsening of heart rate over a 3-month period (i.e., 2.8% falling into the brachycardia range and 10.9% falling into the tachycardia range). The present MI session did not impact this trend.

The rates of problematic heart rate at baseline appears somewhat inconsistent with prior literature stating that participants with SPMI are at high risk for cardiovascular mobidity and often engage in behaviors that are considered to be serious cardiovascular risk factors (e.g., smoking). Adults with SPMI are at particularly high risk due to the potential side effects of psychotropic medications which can increase individuals’ vulnerability to cardiovascular issues. More specifically, many commonly prescribed psychotropic medications (e.g., atypical antipsychotic medications) interact with receptors centrally and peripherally in a way that can result in adverse cardiovascular side effects (e.g., brachycardia) (Mackin, 2008). However, in general, heart rate is impacted by many factors and despite its link to cardiovascular disease, in many cases, tachycardia is quite normal (American Heart Association, 2014). Benign factors that can increase likelihood of tachycardia during a single blood pressure check include a brisk walk and an overdose of caffeine. As a result, presence of tachycardia should be taken in the context of one’s medical history, lifestyle, and other symptoms (American Heart Association, 2014).

Weight. Weight is an objective physical health measure that, in isolation, does not lend itself to comparison across populations or to categorizing into healthy versus
unhealthy due to its relationship with ones’ height and muscle mass. For the purpose of the present study, weight was used primarily to evaluate change in BMI; however, it is notable that, study participants did not experience a notable change in weight (in a positive or negative manner) over a 3-month period. This was the case regardless of the treatment they received (typical Health Home services or Health Home services with an adjunctive session of MI), as well as their gender and ethnicity.

BMI. Within the overall sample of participants studied at the Zepf Center, the majority had a body mass index consistent with obesity (57.5%) and an additional 23.0% were overweight when they began participating in the present study (baseline). Only one-fifth of participants in the study had a body mass index within the normal range. Although this is a highly concerning finding, high rates of obesity at baseline were anticipated in the present study’s participants, as a large body of prior literature regarding the health of individuals living with SPMI indicates obesity is highly prevalent in this population due to a number of patient-related and provider-related factors (Brunero & Lamont, 2010; Flegal, Carroll, & Ogden, 2010). The present study’s prevalence of obesity appears consistent with the prevalence rates found by prior literature, such as Brunero and Lamont (2010) who evaluated a similar population of individuals living with SPMI in a community setting. As previously stated, this high rate of obesity places this population at high risk for a number of chronic medical conditions (e.g., heart disease, Type II diabetes, and lipid disorders) which was confirmed through archival review of documented health conditions in their electronic health records (Daumit et al., 2002).

After engaging in typical Health Home services (regardless of participation in an MI session) for a 3 month period, these participants living with SPMI maintained similar
levels of overweight and obesity. This suggests that this somewhat brief engagement in typical Health Home services did not result in clinically meaningful improvements in participants’ body mass index. It was anticipated that an adjunctive session of MI would improve obesity outcomes above and beyond that of typical Health Home services at the Zepf Center. Despite participant reports that the MI session increased motivation for health-related change (as discussed above), this increased motivation did not translate into a clinically meaningful impact on their body mass index. It is suspected that a larger dose (e.g., longer session or multiple sessions) of MI may be needed in order to impact body mass index using MI with this population given the large number of socioeconomic and psychiatric barriers to changes in eating and activity level.

When explored further, European American participants appeared to be a subpopulation within participants with SPMI whose body mass index was impacted in a meaningful way when the brief MI intervention was added to their typical treatment. Previous literature addressing ethnicity and weight management suggests that African American populations experience higher rates of obesity than non-minority populations (Carliner et al., 2014; Smedley, Stith, & Nelson, 2003). It also appears African American populations may be less responsive to traditional weight management interventions than non-minority populations, in that African American populations often lose less weight and lose weight more slowly than non-minority populations (Wadden & Stunkard, 2002). More research is needed to better understand adaptations needed to make this brief MI intervention more effective with both minority and non-minority participants.
Self-Reported Health Behavior Changes

The current study sought to determine whether participation in Health Home services and/or MI resulted in changes in participants’ health-related behaviors (particularly their eating, physical activity, and smoking behaviors). These three health-related behaviors are particularly important in the present study due to their status as risk factors that are modifiable (contrary to non-modifiable risk factors, like age and heredity) and most commonly underlying the chronic medical conditions experienced by adults living with SPMI (Kolbasovsky, 2008). It was hypothesized that a significant main effect for time would be found, such that the overall sample would report significant improvements in self-reported health behavior changes from the study start date (i.e., date baseline measures were administered) to a 3-month follow-up appointments. It was also hypothesized that a significant interaction effect would be found, such that participants who received a single session of MI would demonstrate significantly better self-reported health behavior changes at the 3-month follow-up compared to those who received Health Home services only.

Eating Habits. As previously stated, a diet high in saturated fat and refined sugar and low in fiber, fruits, and vegetables is known to contribute to poor physical health for individuals living with SPMI (Dipasquale et al., 2013; Henderson et al., 2006; Scott & Happell, 2011). On average, participants receiving services at the Zepf Center reported eating fewer servings of breads, fruit, and vegetables than is recommended by the American Heart Association (2014) based on a 2,000 calorie diet. On average, participants reported eating near the amount of dairy products recommended per day. Participants also reported consuming approximately 3 soft drinks/sweetened fruit drinks
and approximately 2 “junk foods” (e.g., potato chips, items from a vending machine, snack cakes) per day. This far exceeds the recommendation of 5 or less sweets and added sugars per week (American Heart Association, 2014). In general, the eating habits reported by participants at the Zepf Center were poorer than recommended eating habits and consistent with SPMI populations previously studied (Dipasquale et al., 2013; Henderson et al., 2006; Scott & Happell, 2011). This suggests poor eating habits are contributing to these participants poor physical health and would be a worthwhile target of behavioral interventions in treatment settings.

Following a 3-month period of engagement in typical Health Home services, participants displayed eating habits very similar to their eating habits when they began participation in the study. Participants’ consumption of fruit was the only food category assessed in which the overall sample of participants (regardless of their engagement in an MI session) experienced a change. On average, participants experienced a small, but significant, increase in their fruit consumption from approximately one serving of fruit per day to one and a half servings of fruit per day. This suggests that participants who engaged in Behavioral Health services appeared to eat slightly closer to the recommended amount of fruit per day over a relatively brief treatment period but made no noticeable change in their other eating habits. This lack of detectable change may mean that involvement in Health Home services for a 3-month period is not sufficient to improve the eating habits of participants living with SPMI and significant socioeconomic barriers. Furthermore, given the complexity of these participants’ health conditions and the finite time available in healthcare appointments, it is probable that the multidisciplinary
providers in the Health Home focus very little time directly targeting participants’ eating habits.

It was anticipated that individuals who received MI would feel more motivated to make more improvements in their eating habits than participants who received only typical Health Home service given MI’s focus more directly on eating habits (if chosen by the participant). Despite the MI session specifically targeting change in eating behaviors, this intervention was not associated with notable behavior change three months later. When explored by gender, women who received MI reported a notable decrease in consumption of bread/rolls and men who received MI reported an increase in their consumption of “junk foods” when compared to their respective genders who received Health Home services only. Given the number of food categories assessed, it is speculated that these changes in eating habits may have occurred by chance alone rather than as a specific result of the MI intervention.

The present study sought to evaluate how often participants receiving services at the Zepf Center were already thinking about and attempting to change their eating habits and whether the interventions employed could increase their focus on these changes. On average, the majority of the overall sample reported that they had already thought about improving their eating habits (86.0%) at some point during their lifetime and already made at least one actual attempt to improve their eating habits (79.6%) at some point during their lifetime prior to participation in the study (baseline). Given the large number of participants reporting that they had made attempts at improving their eating, it suggest that this change was important to the majority of participants receiving Health Home services at the Zepf Center at some point in their lives.
The study sought to determine whether receiving three months of Health Home services, and in some cases one session of MI, would increase the number of participants thinking about or making actual attempts to change aspects of their eating habits. After a 3-month period of engagement in Health Home services, the overall sample denied notable changes in whether they thought about or attempted to change their eating. This lack of detectable change in focus on eating may mean that relatively brief participation in Health Home services is ineffective in activating noticeable improvements in eating. Another possible explanation is that so many individuals indicated they had thought or acted on this change at baseline, creating a ceiling effect and leaving limited room for interventions to increase these aspects.

Additionally, it seems that one session of MI did not impact the likelihood that participants would think about or make an actual attempt to improve their eating. Given the low socioeconomic status of participants receiving services at the Zepf Center, it is likely that efforts toward improving eating are affected by accessibility of healthy food options. Anecdotal participant statements during the MI sessions suggest that many participants viewed financial strain and low accessibility to inexpensive healthy foods as a barrier to making improvements in eating.

In summary, the majority of participants in the present study reported that changing their eating habits has been important to them at times in their lifetime; however, neither three months of Health Home services nor a single MI session appeared to move participants toward action to make these changes. It is possible that there were benefits to participants eating habits from these treatment services that were not detected by the measures used in the current study, in addition to the potential short-term benefits.
to participants’ motivation are discussed above. Also notable, it is possible changes in participants’ eating habits were not detectable due to lack of education regarding making such changes instead of lack of impact of the present study’s interventions. Future research should include assessment of participants’ health literacy to assess this as a potential barrier to change.

Physical Activity. As previously mentioned, lack of physical activity is known to contribute to poor physical health for individuals living with SPMI and underlies many of the preventable health conditions this population experiences (Jerome et al., 2009; Scott & Happell, 2011). On average, participants receiving services at the Zepf Center reported exercising less than is recommended by the American Heart Association (i.e., 30 minutes per day, five days a week), which is consistent with the body of literature suggesting that adults living with SPMI tend to live sedentary lifestyles (Jerome et al., 2009; Scott & Happell, 2011). Low levels of activity are undoubtedly contributing to these participants’ poor physical health and would also be a worthwhile target of behavioral interventions in clinical settings.

One heartening finding is that following 3-months of engagement in typical Health Home services, the overall sample reported they had moderately increased the number of days per week they engaged in physical activity. On average, participants increased the number of days from two to four days of physical activity per week. Although the overall sample denied significant increases in the number of minutes per day, this increase in days per week certainly suggests participants were engaging in a healthier amount of activity per week. This is a notable and clinically meaningful impact on the physical activity level of participants with SPMI in a relatively short period of
This finding suggests that the Zepf Center (and other community agencies serving participants with SPMI) could impact their consumers’ activity level by engaging them in this integrated model of care. Future research should attempt to replicate this finding and evaluate whether longer periods of engagement in Health Home services leads to both increased days of physical activity as well as notable improvement in physical health as a result. One brief MI session did not result in improvement above and beyond what was found with Health Home services only.

The present study sought to evaluate how often participants receiving services at the Zepf Center reported that they were already thinking about and/or making actual attempts to change their level of physical activity. On average, the majority of participants receiving typical Health Home services (regardless of participation in MI) reported that had already thought about increasing their physical activity (74.7%) at some point during their lifetime and had also already made at least one attempt to increase their physical activity (67.8%) at some point during their lifetime prior to participation in this study (baseline). Given the large number of participants reporting they have made actual attempts to increase their physical activity, it suggest that this change has been important to the majority of participants receiving Health Home services at the Zepf Center at some point in their lives.

After a 3-month period of engagement in Health Home services, the overall sample denied notable changes in whether they thought about or made an actual attempt to increase their physical activity. The same was true for participants who received both typical Health Home services and one brief MI session. This lack of detectable change may mean that three months of Health Home services and/or one session of brief MI are
ineffective in increasing individuals’ motivation for changing their physical activity; however, another plausible explanation (given the reported increase in activity per week discussed above) is that so many individuals indicated they had thought about or acted on this change at baseline that it created a ceiling effect leaving limited room for the present study’s measures to detect noticeable change in this self-report item.

When participants received one brief MI session in addition to the typical Health Home services, the proportion of participants who had thought about increasing their physical activity, increased from 74.4% to 85.7%; however, this did not lead to a notable increase in actual attempts to increase physical activity. Prior literature on the use of MI for promoting increased physical activity suggests brief MI approaches result in modest advantages over comparison conditions (e.g., no treatment, information-only, treatment as usual) when targeting the general population in medical settings (Dunn et al., 2001; Lundahl et al., 2013). Prior MI outcomes varied depending on length and number of MI sessions. Lack of change in physical activity for this population of participants may be related to the severity of sedentary behavior present at baseline, lack of perceived resources to increase physical activity (e.g., lack of access to gyms, unsafe neighborhoods to walk in), and/or potentially lower effectiveness of this intervention in SPMI populations. Unfortunately, very little prior literature addresses the use of MI in motivating health-related behavior change in SPMI populations. As discussed with many small or marginal MI session outcomes noted above, it is logical that a larger dose of MI (e.g., longer sessions or multiple sessions) may be needed to demonstrate more clinically meaningful changes in the activity level of participants living with SPMI.
In summary, participants in the present study reported that changing their level of physical activity has been important to them at times in their lifetime; however, neither three months of Health Home services nor a single MI session appeared to move participants toward much notable action toward making these changes. One exception is that receiving three months of typical Health Home services was associated with an increase in the number of days per week that participants were physically active. This movement toward healthier behavior is encouraging and may lead to notable improvements in objective physical health measures with longer lengths of treatment.

**Tobacco Use.** Adults with SPMI are more likely to smoke cigarettes than participants in the general population and excess smoking rates greatly contribute to poorer physical health and increased mortality rates for individuals living with SPMI (Compton et al., 2006; Miller et al., 2006; Scott & Happell, 2011). The majority of adult participants reported they have smoked in their lifetime and 71.6% acknowledged being a current smoker at baseline. On average, participants smoked 13 cigarettes per day and had their most recent cigarette minutes prior to participation. This is highly consistent with prior literature, in that prior literature suggest individuals with SPMI are highly likely to be current smokers (i.e., approximately 70% of this population) and approximately half of those who smoke cigarettes are considered to be heavy smokers (i.e., smoking 20-30 cigarettes per day) (Dixon et al., 2007; Kelly & McCreadie, 1999).

It is highly apparent that participants receiving services at the Zepf Center have experienced feelings of concern about their smoking habits. The majority of those who smoke (89.2%) indicated that they had *already thought about* quitting prior to engagement in this study, with participants reporting they have made an average of 7
prior quit attempts before engagement in the present study. This high number of quit attempts is also consistent with prior literature assessing adults with SPMI. Dixon et al. (2007) suggested adults with SPMI reported an average of 6.1 quit attempts in their lifetime, with the majority of participants having tried nicotine replacements (e.g., nicotine patches and/or nicotine gum) to aid in quit attempts. The high rates of smoking among participants receiving services at the Zepf Center are problematic. Increasing motivation for smoking cessation is crucial for this population, as smoking clearly contributes to their poor physical health and increased mortality. Furthermore, it is a very worthy target of agency resources and direct intervention, as consumers are stating that quitting smoking is a change that is both important to them while also being very challenging to achieve.

Prior research by Butler et al. (1999) evaluated the efficacy of brief MI sessions compared to brief medical advice in promoting smoking cessation with a general population. Butler et al. (1999) indicated that adults in the general population who received brief MI reported increased desire to quit, increased attempts to quit, and increased likelihood of non-smoking 6-months later. In the present study, following a 3-month period of receiving Health Home services, the overall sample denied notable changes in motivation to change smoking behavior, current smoking status, or number of cigarettes smoked per day. Furthermore, when participants received one MI session did not impact smoking behavior above and beyond that of typical Health Home services only.

One notable and positive finding is that participants who received one MI session in addition to their typical Health Home services were more likely to report they had
thought about quitting smoking over a 3 month period than those who engaged in typical Health Home services only. Unfortunately, this did not lead to an increase in the number of actual quit attempts over the 3-month treatment period. Interestingly, previous research by Butler et al. (1999) found that brief MI targeting smoking behavior was most beneficial to adults in the general population who were classified as least ready to quit (i.e., precontemplation). Given that the majority of the present study’s participants reported a high desire to change prior to engaging in MI, it is possible that the MI session may have resulted in a more notable increase in motivation if a larger proportion of participants started a lower level of desire to change. As discussed in the context of both eating and physical activity, another possible explanation for this lack of detectable change may be related to the brief course of treatment intervention with regard to both Health Home services and MI.

In summary, the vast majority of participants in the present study reported that quitting smoking has been important to them at times in their lifetime. The participants who received MI appeared to consider making this change more than those who received typical Health Home services only; however, neither treatment condition moved this population of participants living with SPMI toward actual quit attempts. It is possible that there were benefits to adults smoking habits from these treatment services that were not detected by the measures used in the current study. Also notable, it is possible changes in participants’ smoking behavior were not detectable due to lack of education regarding making reductions or quit attempts instead of lack of impact of the present study’s intervention. Given the high level of interest in quitting smoking and high rates of prior
actual quit attempts, additional research on adaptations leading to successful smoking cessation and maintenance of cessation for this population is needed.

Limitations of the Present Research

The present study presents with some limitations due to the nature of its design. First, given the nature of service provision and limited availability of participants, it was not possible to utilize a comparison control group consisting of individuals randomly assigned to neither Health Home services nor brief MI services. As a result, the study was not equipped to evaluate the outcomes of Health Home services compared to no treatment or a waitlist control group. Additionally, participants were not restricted from receiving other psychiatric and medical services outside of the interventions provided for the present study. Although the data provided useful information about the impact of MI on physical health and health-related behaviors, these improvements may be attributable, in part, to the participant’s involvement in other services. The data did, however, give us a depiction of the physical health of individuals involved in the Health Home and indication of the average impact of the Health Home program and MI on their physical health and health-related behaviors.

Another limitation relates to the Zepf Center Health Home services being newly implemented when the study began. Many individuals receiving behavioral services at the Zepf Center prior to this shift in programming available were shifted directly into Health Home services in November 2013. Thus, there was anecdotal evidence that individuals receiving Health Home services had relatively little knowledge about these services and the scope of services available to them as a recipient of Health Home services. Small changes in providers and services offered (e.g., Walking Group) occurred
throughout the data collection period which is a further source of variability in participant experience and outcome. Furthermore, the environment inherent in this newly implemented integrated care program was a work in progress. As a result, unexpected issues arose such as the lapse in collection of follow-up data which likely occurred due to the rapid changes occurring in employees duties. The unexpected level of attrition in the Health-Related Behaviors Questionnaire resulted in lower numbers of participants available with both baseline and follow-up data. The number of participants available for these outcomes was not enough to detect a small effect. It is likely that a larger population needs to be evaluated in future studies to be sensitive to a small effect. Ultimately, research outcomes from a newly implemented Health Home site may not be generalizable to other Health Homes.

In the present study, the length of participants’ MI sessions were not timed and documented. As a result, participants all received the same semi-structured brief MI protocol but the length of time spent with the MI clinician discussion each portion of the protocol was variable. This flexible approach to the semi-structured protocol was used to maintain the spirit of MI while also ensuring participants received a relatively similar intervention. In future studies, length of each individual MI session should be recorded to allow for evaluation of the relationship between length of session and outcomes.

Originally the present study’s design was to collect data from individuals who were newly engaging in services at the Zepf Center, specifically the Health Home. As the investigator began recruitment in this way, there was a very high rate of “no shows” for the MI sessions. After discussion with potential participants and other providers at the agency, it became apparent that individuals new to the Health Home were scheduled for
several future follow-up appointments for both primary care and behavioral health services during the intake and that scheduling participation in an MI intervention at that time was a strain on potential participants’ resources (e.g., transportation, time). As a result, the researcher decided to accept participants who were either new to the Health Home or already receiving ongoing Health Home services. With this change in recruitment came an additional source of variability in participant experience and outcome.

The method of referrals to the MI treatment condition may have contributed to difficulty in detecting significant increases in motivation for change. Participants who received MI were typically individuals who were willing to agree to participation in an intervention that would take additional time, energy, and sometimes resources (e.g., transportation costs) to complete. As might be expected and was confirmed by the baseline reports of motivation, it appears that those who participated were most often individuals who had high motivation (e.g., high ratings of importance on scale of 0-10) prior to the intervention. This appears to have created a ceiling effect, in that significant increases in importance of making a change were not found. It is suspected that significant increases in the importance of making a change may be found if the brief MI session was provided to individuals with a lower baseline level of motivation; however, future research is needed to evaluate this hypothesis.

Although the Health-Related Behaviors Questionnaire was based on a questionnaire with moderate to high reliability and validity coefficients, there is not yet research conducted on the reliability and validity of this new questionnaire. Although the measure has face validity, additional research is needed to assess whether this measure
has appropriate test-retest reliability and validity when compared to other measures available. Following the administration of the newly developed Health-Related Behaviors Questionnaire for the present study, some issues related to administration and associated recommendations are needed for future administers of this measure. When used with a low literacy population, it is recommended that those administering the questionnaire offer to read the questions aloud for the participant if needed for improved accuracy of the responses. This technique was utilized in the present study and many participants opted to have the questionnaire read to them when offered which suggests they may have experienced difficulty but not acknowledged this if this option was not provided.

Furthermore, some items developed for the Health-Related Behaviors Questionnaire were difficult for participants to answer with accuracy: 10) “How many times have you tried to improve your eating habits in your lifetime,” 11) “What is the longest period of time that you maintained healthy eating habits,” 18) “How many times have you tried to increase your exercise in your lifetime,” 19) “What is the longest period of time that you maintained a consistent exercise routine,” 26) “How many times have you tried to quit in your lifetime,” and 27) “What is the longest period of time that you stopped smoking.” These items should be altered if this questionnaire is used in the future.

It is unclear whether the outcomes evaluated in the present study captured the changes or improvements related to the interventions provided. Given the socioeconomic barriers to change present for the population studied, it is possible that participation in Health Home services and/or brief MI was associated with outcomes not measured (e.g., improved adherence to scheduled primary care or behavioral health appointments; increased satisfaction with services; seeking additional information about how to make a
desired change; accessing community resources listed in handouts given during MI protocol). Future studies should consider evaluating additional areas of outcomes to better capture full range of associated change.

**Implications and Recommendations for Future Research**

Given the health risk factors and comorbid medical conditions common to individuals with SPMI, it is pertinent that studies investigate the efficacy of Health Home services, brief MI interventions, and other health-related interventions in reducing physical health problems in this specific population. Although a large body of evidence supports the use of MI to promote health-related behavior changes within the general population, there is still very limited research on the efficacy of MI interventions for adults with SPMI – particularly MI geared toward motivating health-related behavior changes in this highly complex population.

This particular research study assisted the Zepf Center, a community mental health center who partners with a local federally-qualified health center, in evaluating the health outcomes of their Health Home services. The present study established a picture of the physical health of Health Home participants, provided estimates of the average progress achieved in health outcomes over the course of a 3-month period, and providing valuable information about the efficacy of a brief MI intervention to increase the confidence in making a change for low-income adults with SPMI in this type of community setting. This research study also demonstrated the feasibility of a brief MI program targeting health-related behavior change in a Health Home setting that is new and experiencing frequent change.
The results and recommendations of the present study will be shared with the Zepf Center in hopes that they may promote increased understanding of this clinical population and the agency’s current treatment practices:

- The majority of Zepf consumers reported 1) it was very important to them to make a health-related behavior change prior to receiving MI, 2) they had only low or moderate confidence in their ability to make this type of desired change, 3) MI resulted in a modest increase in participants’ desire to make a health-related change, and 4) for almost half of them MI resulted in an increase in their confidence that they could successfully change.

- It appears adults with SPMI may experience greater health benefits over a longer course of Health Home services and/or a larger dose of MI. ‘Larger doses’ of MI may include increasing the number of MI visits (e.g., several brief MI sessions strategically coordinated with other consumer appointments in order to accommodate the pace of the healthcare setting and limited patient resources) and/or increasing the length of a single session (e.g., increasing the session to a 1 hour individual MI session or multiple hour group MI sessions).

- Given the complex socioeconomic barriers to change for this population, it is recommended that a behavioral provider be assigned to providing Motivational Interviewing and other behavioral interventions to consumers in a more flexible, on-demand manner. The purpose of offering more flexible visits to discuss health-related behaviors would be to increase access to this intervention to adults who are interested but find it difficult to adhere to scheduled appointments. This could be achieved through developing a
schedule for a behavioral provider in which every other appointment slot is left open for on-demand MI visits for individuals seeing other providers with interest in staying after other appointments to discuss these topics. With such scheduling, these individuals may also be able to utilize the service more often when highly motivated or in need of this additional support and less often when experiencing lower motivation or in a maintenance phase of change.

- Although Zepf Center consumers reported high desire to make health-related behavior changes, these changes were difficult to make. Focus groups of Zepf Center consumers should be conducted to better understand barriers to change within this clinically complex, low-income population. Those providing MI sessions at the Zepf Center noted that consumers expressed difficulty working toward change due to financial strain, lack of transportation, difficulty accessing or limited understanding of materials and facilities needed to make health-related changes (e.g., exercises facilities, safe parks, and inexpensive healthy foods), and knowledge of the steps that may be involved in working toward these changes (e.g., healthier cooking methods). Focus group discussions between agency program developers and real-world consumers could generate creative ideas on ways to increase accessibility to desired healthy foods, physical activity facilities, and smoking cessation aids or supports.
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Appendix A

Health-Related Behaviors Questionnaire

Client name: ________________________________
Date: ___________________

Health-Related Behaviors Questionnaire
Adapted from the Behavioral Risk Factor Surveillance System Questionnaire (CDC, 2011)

Everyone has different nutrition, exercise, and smoking habits. We would like to ask you about your nutrition, exercise, and smoking habits to better understand your health. Please answer the following to your best ability.

Nutrition:

1) On an average day, how many servings of bread/rolls do you eat? _____

2) On an average day, how many servings of fruit (e.g., 100% pure fruit juices, fresh, frozen, and canned fruit) do you eat? _____

3) On an average day, how many servings of vegetables (e.g., broccoli, lettuce, sweet potatoes, corn, potatoes) do you eat? _____

4) On an average day, how many regular sodas/soft drinks and sweetened fruit drinks (e.g., Kool-Aid, cranberry juice, lemonade) do you drink? _____

5) On an average day, how many servings of fried foods (e.g., fried chicken, french fries, onion rings, chicken strips) do you eat? _____

6) On an average day, how many servings of dairy (e.g., milk, cheese) do you eat? _____

7) On an average day, how many servings of “junk foods” (e.g., potato chips, items from a vending machine, snack cakes) do you eat? _____

8) Have you thought about improving your eating habits?
   Yes
   No
   If yes, when? In the past week _____ Past month _____ Past year _____ More than 1 year ago _____

9) Have you attempted to improve your eating habits?
   Yes
   No
   If yes, when? In the past week _____ Past month _____ Past year _____ More than 1 year ago _____
10) How many times have you tried to improve your eating habits in your lifetime? 

11) What is the longest period of time that you maintained healthy eating habits? 

12) When calorie information is available, how often does this information help you decide what to order?
   - Always
   - Most of the time
   - About half the time
   - Sometimes
   - Never

**Physical Activity:**
13) During the past week, how many times did you participate in any physical activities or exercise (e.g., running, gardening, walking for exercise, aerobics, bicycling, sit-ups, strenuous housework)? 

14) And when you took part in this activity, for how many minutes did you usually keep at it? 

15) During the past week, how many times did you participate in other health activities (e.g., yoga, tai chi, meditation)? 

16) Have you thought about increasing your physical activity or exercise?
   - Yes
   - No
   - If yes, when? In the past week ___ Past month ___ Past year ___ More than 1 year ago 

17) Have you attempted to increase your physical activity or exercise?
   - Yes
   - No
   - If yes, when? In the past week ___ Past month ___ Past year ___ More than 1 year ago 

18) How many times have you tried to increase your exercise in your lifetime? 

19) What is the longest period of time that you maintained a consistent exercise routine? 

**Tobacco Use:**
20) Have you ever smoked cigarettes in your lifetime?
   - Yes
   - No
   - If no, please STOP here. If yes, please CONTINUE with questions 21-27.
21) Do you currently smoke cigarettes?
   Yes
   No

22) How long has it been since your last cigarette? _____ (hours, days, weeks, months, years)

23) On an average day, how many cigarettes do you smoke? _____

24) Have you thought about quitting smoking?
   Yes
   No
   If yes, when? In the past week _____ Past month _____ Past year _____ More than 1 year ago _____

25) Have you attempted to quit smoking?
   Yes
   No
   If yes, when? In the past week _____ Past month _____ Past year _____ More than 1 year ago _____

26) How many times have you tried to quit in your lifetime? _______

27) What is the longest period of time that you stopped smoking? _______
ADULT RESEARCH SUBJECT - INFORMED CONSENT FORM

Evaluating the Effectiveness of Brief Motivational Interviewing as an Adjunct to Behavioral Health Home Services

Principal Investigator: Wesley Bullock, Ph.D., Principal Investigator/Faculty Advisor, 419-530-2719
          Brittany Tenbarge, M.A., Student Investigator, 419-530-2727

Purpose: You are invited to participate in the research project entitled, Evaluating the Effectiveness of Brief Motivational Interviewing as an Adjunct to Behavioral Health Home Services, which is being conducted at the University of Toledo under the direction of Wesley Bullock, Ph.D., and Brittany Tenbarge, M.A. The purpose of this study is to assess changes in physical health and health-related behaviors during participation in integrated healthcare and Motivational Interviewing interventions.

Description of Procedures: This research study will take place in the Zepf Center over the course of 2 visits lasting no more than two hours each. You will be asked to complete questionnaires about your nutrition, exercise, and smoking habits. You will be asked to respond to questions regarding how important making changes in these health-related behaviors are to you. Another important component of the proposed study is that you will be asked to allow the present researchers to access information from your clinical records at the Zepf Center regarding aspects of your physical health (such as blood pressure, height, weight) that are collected by a medical professional during your Behavioral Health Home appointments at the Zepf Center. After you have completed the 2 visits involved in the present study, you will be entered in a drawing to win a $50.00 gift card for compensation of your time and participation.

After you have completed your participation, the research team will debrief you about the data, theory and research area under study and answer any questions you may have about the research.

Potential Risks: There are minimal risks to participation in this study, including loss of confidentiality. In taking part in the interview process you will be answering questions about your health-related behaviors and allowing physical health measurements to be taken (such as blood pressure, height, weight). It is possible that you may experience short-term anxiety in discussing aspects of your health-related behaviors or allowing these physical health measurements to be taken. However, the investigator you will be working with is trained to encourage and support you in obtaining a positive experience.
through your participation. Furthermore, your information will remain confidential and will not be available to anyone outside of the research team and your treatment providers at the agency.

**Potential Benefits:** A potential direct benefit to you if you participate in this research is that you may learn more about your current physical health and reflect on your health-related behaviors. You may also learn more about the importance you place on particular health-related behaviors and your confidence in making changes in these areas. Others may benefit by learning about the results of this research.

**Confidentiality:** The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is. The consent forms with signatures will be kept separate from responses. Questionnaires will be labeled with your participant number, not your name. In reports on the results of the study, only group or aggregate data will be presented, not individuals data. Although we will make every effort to protect your confidentiality, there is a low risk that this might be breached.

**Voluntary Participation:** Your refusal to participate in this study will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo or your current treatment provider or the Zepf Center. In addition, you may discontinue participation at any time without any penalty or loss of benefits.

**Contact Information:** Before you decide to accept this invitation to take part in this study, you may ask any questions that you might have. If you have any questions at any time before, during or after your participation or experience any physical or psychological distress as a result of the research you should contact a member of the research team (Brittany Tenbarge, M.A., 419-530-2727; Wesley Bullock, Ph.D., 419-530-2719).

If you have questions beyond those answered by the research team or your rights as a research subject or research-related injuries, the Chairperson of the SBE Institutional Review Board may be contacted through the Office of Research on the main campus at (419) 530-2844.

Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

**SIGNATURE SECTION – Please read carefully**

You are making a decision whether or not to participate in this research study. Your signature indicates that you have read the information provided above, you have had all your questions answered, and you have decided to take part in this research.

The date you sign this document to enroll in this study, that is, today's date must fall between the dates indicated at the bottom of the page.

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<tr>
<td>Name of Person Obtaining Consent</td>
<td>Signature</td>
<td>Date</td>
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</tbody>
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Appendix C

Semi-Structured MI Protocol

Participant: ______________________________________
Clinician: ______________________________________
Date: ________________________

☐ Introduce self…. “Everyone who sees the doctor is given the opportunity to meet with me too to talk about health behaviors. We are also trying to see how much this is useful for people as part of a research study. Would you mind if I got a consent for you to meet with me and use your feedback to help us with this study?”

☐ Obtain signed consent.

☐ Provide menu of health-related behaviors.

   “Let me lay out for the two of us what we could talk about today and you can choose. [Hand menu] Which of those might be most helpful for use to talk about today?”

Chosen behavior:  Nutrition
                 Exercise
                 Smoking

☐ “Please tell me about your health and how [chosen behavior] fits in or affects your health.”

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

☐ So, for the past couple of minutes you have been telling me that…. [summary].
“One of the techniques that we use here is a ruler, and I’m curious…. [Hand participant MI ruler]…

“On a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” _____

“On a scale of 0 to 10, how confident are you that you can make a change to your [chosen behavior] assuming that you want to do so?” _____

[Reflect back # given for importance unless importance is an 8+]. Why did you not choose a lower number, like 1 or 2?

____________________________________________________________________

____________________________________________________________________

“[Reflect back # given for importance unless importance is an 8+]. Why did you not choose a lower number, like 1 or 2?”

____________________________________________________________________

____________________________________________________________________

What would it take to get you to a higher number?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Summary

“What are the ‘good things’ and ‘not so good things’ about [chosen behavior]?”

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

Summarize the participant’s statements about these ‘good things’ and ‘not so good things’.
What do you know about changing [behavior chose]?

If the participant has articulated concern about the behavior (i.e., was able to list ‘not so good things’ above), say “I have some ideas that have worked for clients of mine in the past. Would it be ok if I told you about some more helpful ways to make a change in your [chose behavior]?"

Client response:  
Yes  **(If yes, hand client handout on resources & review with them).**

No

“What does that have you thinking?” and/or “what do you make of this?” and/or “where does this leave you now?”

_____________________________________________________________________

_____________________________________________________________________

Summary

Hand participant MI ruler.

“On a scale of 0 to 10, with 10 being the highest, how important is it to you to change your [chosen behavior] habits?” _____

“On a scale of 0 to 10, how confident are you that you can make a change to your [chosen behavior] assuming that you want to do so?” _____

“Is there anything else about [chosen behavior] that you want to talk about in the time we have left?”