DIFFERENCES IN DEPRESSION IN COMMUNITY DWELLING ADULTS AND ADULTS POST MYOCARDIAL INFARCTION

by

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Abstract

Depression is a comorbid condition related to myocardial infarction (MI) risk, is prevalent post MI, and is associated with poorer cardiovascular outcomes. This research study examined depression in a community sample of adults and compared depression scores to adults three to seven years post MI. A cross-sectional descriptive design was used to address the following research question: Is there a difference in depression in community dwelling adults without heart disease compared to an age-matched sample of adults who have had an MI in the last three to seven years? Community participants (n = 40) were recruited using snowball sampling and met the following inclusion criteria: community dwelling adults age 21 and older who have not had a previous MI or heart surgery. All participants completed a demographic health form and the Center for Epidemiological Studies Depression Scale (CES-D) via interview using paper forms. Age-matched controls (n = 40) were randomly selected from an established data base of adults who were 3 to 7 years post MI and completed the Reoccurrence of Myocardial Infarction (ROMI) study. The results of an independent t-test indicated that CES-D scores of community dwelling adults (M = 11.45, SD = 4.8) did not differ significantly from that of those from the ROMI sample (M = 11.56, SD = 11, N = 39), t(77) = .060, p = .95. There was no significant difference between depression scores in groups of individuals with and without history of MI. More research is indicated to develop practical interventions to manage depression symptoms in both community dwelling adults and those with history of MI.

Keywords: myocardial infarction, community dwelling, depression scores

Table of Contents

Differences in Depression in Community Dwelling Adults and Adults Post Myocardial Infarction

One of the most prevalent health concerns in American society that has persisted over time is coronary heart disease (CHD). It is estimated that a total of 16.5 million people at least 20 years of age in the United States are living with CHD (Benjamin, 2018). Coronary heart disease is an umbrella term that includes myocardial infarction (MI), angina pectoris (AP), and heart failure (Potter, Perry, Stockert, & Hall, 2017). According to Libby and Theroux (2005), CHD occurs when the endothelium of the arterial blood vessels encounters inflammatory agents such as bacterial products, vasoconstrictor hormones found with hypertension, and dyslipidemia. This inflammation attracts leukocytes to adhere to the endothelial surface of the arteries. The inflammatory response in the arterial blood vessel builds upon itself and processes such as calcification and apoptosis can occur, resulting in an atherosclerotic plaque. If the cycle of inflammation continues, these plaques can build up to the point that they can partially or completely occlude the coronary arteries that supply blood to the heart, resulting in angina or an MI.

In 2018, it is estimated that 720,000 Americans will have an MI or death from an MI, and 335,000 will have a recurrent cardiac event (Benjamin, 2018). Despite these alarming data, mortality rates have dropped by 34.4% from 2005-2015 and are predicted to continue declining (Benjamin, 2018). Both primary and secondary prevention of CHD are needed to continue to affect mortality rates related to cardiac events. The implementation of various prevention methods in the clinical and community settings could facilitate the decline.

The incidence of MI is different by race and sex. Whites have a higher rate of MI occurrence (5.04 per 1,000 person-years) than Blacks (3.24), and this racial difference is expected to persist (Benjamin, 2018). Benjamin (2018) also noted that there is a difference between males and females in incidence of CHD, with males having 7.4% disease prevalence as compared to 5.3% prevalence in females. Female incidence of CHD is higher than the national average in the Black and Hispanic populations (Benjamin, 2018). Benjamin (2018) states that "approximately every 40 seconds, an American will have an MI". This is a staggering statistic that warrants further research to prevent MI, improve clinical outcomes, and decrease disparities that exist.

One comorbid condition that is related to MI risk and is prevalent post MI is depression. Psychological well-being can greatly benefit outcomes for patients with CHD (Potter et al., 2017). Major depressive disorder (MDD) is a frequently occurring psychological disorder that is characterized by persisting cognitive and physical symptoms over a period of two weeks (Brody, Pratt, & Hughes, 2018). In fact, according to Brody et al. (2018), the incidence of depression is higher than CHD at 8.1% incidence in any given 2-week period. The major concern with MDD, especially in those with heart disease, is that it contributes to more impairments in activities of daily living (ADLs) than other chronic diseases such as diabetes and arthritis (Brody et al., 2018). Brody and colleagues' recent 2018 study also found that approximately 80% of adults diagnosed with MDD reported some level of difficulty with activities at work, at home, or socially.

Determining associations between MI and risk factors, such as depression, is essential in affecting recurrent MIs and mortality. Although MDD can have severe ramifications for those with CHD or even be a risk factor for CHD, other studies have supported that even mild

depressive symptoms, without an MDD diagnosis, are associated with poorer cardiovascular outcomes. Results from one study noted 47% of those with no depressive symptoms had had an MI, 51% of those with depressive symptoms at a minimum of 2 interviews had and MI, and 63% of those with depressive symptoms at only one interview had an MI (Duivus et al., 2013). This indicates that those with only depressive symptoms, aside from clinical diagnosis, were at higher risk for MI. A separate study found that untreated depressive symptoms, when combined with hopelessness, could predict MI incidents up to 18 years later (Pössel et al., 2015). It is clear that aside from MDD, even seemingly minor depressive symptoms have been shown to affect a person's risk for MI.

Depression is a crucial area for research, as it can contribute to a significant decline in patients' quality of life, especially in those with CHD whose quality of life is already reduced (AbuRuz, 2018). Furthermore, the negative effects MDD can have on ADLs can prevent those people from making the lifestyle changes necessary to prevent recurrent MIs, such as participating in physical activity (Brody et al., 2018). Depression and depression symptoms can be a significant obstacle for those with existing CHD, complicating their disease and preventing them from achieving optimum treatment implementation and outcomes.

Depression has been recognized as a notable risk factor for CHD, either contributing to or further complicating the disease. Depressive symptoms and diagnosis are even more concerning when paired with ischemic heart disease. A depression diagnosis after diagnosis of heart disease is associated with double the risk of death in those patients (Canady, 2017). In Canady's 2017 study, depression was the strongest predictor of mortality than anything else evaluated, including: dyslipidemia, hypertension, smoking, diabetes, kidney disease, and multiple MI. Even though depression is found as a risk factor for CHD, a study by Canady (2017) found that 15%

of the sample of patients with CHD were diagnosed with depression post-CHD diagnosis, rather than before. Furthermore, it was found that depression diagnosed post-CHD was significantly associated with mortality, even after the study was adjusted for characteristics and risk factors (Canady, 2017). On its own, depression is a dangerous psychiatric condition that has clear somatic effects. A study by Charlson and colleagues (2013), found that globally, there were 3.5 million years of life lost and 250,000 years lived with disability attributable to depression. Charlson et al.'s study (2013) found that the pooled relative risk of patients with clinically diagnosed depression developing ischemic heart disease was 1.56. This same study found that 2.95% of disability-adjusted life years related to ischemic heart disease cases could be attributed to depression alone (Charlson et al., 2013).

Clearly, this comorbid combination of depression warrants attention of the health care world. Coronary heart disease and depression both alone and combined, are a threat to clinical outcomes and quality of life. Depressive symptoms should be continuously monitored even after the first year following CHD diagnosis (Canady, 2017), and further research is indicated on instituting more precaution through primary prevention in community dwelling adults.

Literature Review

To more fully understand the relationship between CHD and depressive disorders in the context of community dwelling adults, literature considering the relationship between depression and CHD were reviewed in preparation for this study. These articles were all (N = 24) published in research journals published from 2011 to 2017. A Boolean search was utilized to obtain the research articles, using search terms including but not limited to "heart disease", "depression", "myocardial infarction", "coronary heart disease" and "inflammation". The vast majority of articles reviewed were quantitative (n = 23), and sample sizes ranged from 60 to 134,811. The

only qualitative study reviewed had 30 participants. The majority of research articles in this review included both men and women (n = 22), with two sampling women exclusively (O'Neil et al., 2016; Webster-Fink & Jacobs, 2017) The studies reviewed were varied by race, and most studies' participants were of unknown race (n = 16). The majority of research studies reviewed included participants over the age of 65 (n = 21). Zhang (2015) had an unknown age range of their sample, and Kourkoveli and colleagues (2015) did not report ages, but because it was a study targeting individuals with congenital heart disease rather than acquired CHD, the ages were younger. The other study excluding adults over 65 had a large age range (18-65) and sample size (4181) but had no apparent reason for excluding older adults (Kinley et al., 2015). Of the literature reviewed, 11 used observational data collection methods, six used a questionnaire to obtain data, three were experimental, and four used observation and questionnaires. Ten of the 24 articles were cross-sectional, and the majority of reviewed studies were longitudinal (n = 13). The following details major topics of this review: inflammation, education and intervention, demographics, and other psychiatric conditions.

Inflammation

Inflammation is considered one of the somatic markers of mental illness and is something that is both a complicator and a cause of existing CHD. Four of the studies reviewed examined serum levels of known markers of inflammation in those with known comorbid CHD and depressive symptoms. Two studies examined both interleukin 6 (IL-6) and C-reactive protein (CRP), inflammatory factors in the blood (Nikkheslat et al., 2015; Xiong et al., 2015). Serum blood tests were included in all four of these studies, but methods to quantify depression varied. Two of the studies (n = 2) used the Beck Depression Inventory (BDI) (Nikkheslat et al., 2015;

Xiong et al., 2015), but another used the Patient Health Questionnaire (PHQ-9) (Duivus et al., 2013). One did not identify how they measured depression (Watts, 2014).

Overall, those with CHD and comorbid MDD have a higher association with serum inflammatory markers than those with only CHD (Xiong et al., 2015). Studies examining IL-6 and CRP found that both levels were elevated in those with MDD diagnosed using the BDI (Nikkheslat et al., 2015; Xiong et al., 2015), and IL-6 was found to increase based on severity of MDD (Xiong et al., 2015). IL-6 was consistently elevated in those with depression as compared to those without depression in one study (Nikkheslat et al., 2015), but CRP in Xiong et al.'s (2015) study was elevated even in those with no depressive symptoms. Nikkheslat et al. (2015) found that all participants with CHD (n = 83) had elevated CRP of above 3 mg/mL, but levels were even more elevated in those with depressive symptoms (5.2 mg/L).

Watts (2014) and Duivus et al. (2013) measured different serum markers of inflammation: red blood cell distribution width (RDW) and white blood cells (WBC). An increased RDW indicates an elevated risk for depression in those with pre-existing heart disease, and those with an RDW level higher than 12.9% are more at risk for developing depression, despite the fact that this "elevated" level actually falls within the normal RDW range of 11.6-14.6% (Watts, 2014). Watts (2014) found this to hold true, even when controlling for medications and other disease processes. Duivus et al. (2013) found that those who had clinical manifestations of depression at two or more interviews over a five-year period had the highest levels of WBC. This correlation, however, is limited, as WBC cannot predict impending clinical manifestations of depression in individuals with CHD at baseline. When the study was adjusted for sleep quality as a possible mediator between depression and high WBC counts, the association between the two was no longer present (Duivus et al., 2013).

Chronic inflammation and presence of inflammatory factors in those with CHD can perpetuate depressive symptoms, which prompts the body to produce further inflammatory agents (Nikkheslat et al., 2015). Inflammatory markers are easily measurable components that can provide clinical evidence of these conditions and their effect on the body. Inflammation is a point of concern with comorbid CHD and depression because it can cause a snowball effect of worsening symptoms with those already suffering with these two conditions.

Education and Intervention

Patient education and intervention are important to improve clinical outcomes associated with CHD and comorbid depressive symptoms. Intervention and assessment are frequently done in the clinical setting, but further investigation into primary prevention methods and interventions for community dwelling adults are indicated. There were several articles (n = 8) reviewed that focused on education and interventions for those with CHD and comorbid depressive symptoms. Six of these studies used tools to measure depression. Research done by Gasse, Laursen, and Baune (2014) used International Classification of Diseases, Revision 8 (ICD-8) and International Classification of Diseases, Revision 10 (ICD-10) to code for already-diagnosed depression. The study by Thornton, Agarwal, and Sambamoorthi (2015) did not disclose any tools used to quantify depression. Articles regarding education and intervention methods that used scales to score depression used the Hospital Anxiety and Depression Scale (HADS) (Gasse et al., 2014; Simmonds, Tylee, Walters, & Rose, 2013), Beck Depression Inventory II (BDI-II) (Webster-Fink & Jacobs, 2017), Patient Health Questionnaire 9 (PHQ-9) (Gasse et al., 2014), Patient Health Questionnaire 2 (PHQ-2) (Pols, van Dijk, Bosmans, Hoekstra, & van Marwijk, 2017), Brief Symptom Inventory (BSI) (Thornton et al., 2015), Self-Rating Depression Scale (Zhang, 2015), and Montgomery-Asburg Depression Rating Scale

(MADRS) (Mehta, Bhatt, Vaghela, & Parikh, 2013). Two articles reported measuring knowledge and cognition: CHD Knowledge Tool for Women (Webster-Fink & Jacobs, 2017) and the Mini Mental Status Exam (MMSE) (Webster Fink & Jacobs, 2017; Zhang, 2015). Though the tools used were varied, all helped to quantify depression and cognition in these studies.

The vast majority ($n = 7$) of studies focused on education and intervention methods were quantitative. One study was qualitative (Simmonds et al., 2013). Four of the studies were conducted with a population of community dwelling adults, while the remaining articles ($n = 4$) were conducted in a clinical setting.

One intervention commonly discussed was the use of invasive cardiac procedures and the impact on health. Invasive cardiac procedures were found to be significantly decreased by 34% in those with depression, despite the fact that mortality rates were elevated by 34% in those with ischemic heart disease (Gasse et al., 2014). Zhang (2015) and Mehta et al. (2013) both suggested that cardiac procedures supported better outcomes in patients with CHD and depression. Mehta et al. (2013) also found that 39.8% of patients undergoing either percutaneous transluminal coronary angioplasty or coronary artery bypass graft (CABG) had depression, and that the type of procedure had no impact on depression scores. Additionally, Zhang (2015) suggested that psychological intervention should be implemented post-percutaneous coronary intervention to improve psychiatric outcomes and patients' quality of life. Suggested interventions included health education, continuous observation of vitals, communication with medical personnel about what's on their mind, relaxation therapy such as deep-breathing exercises for up to 30 minutes five times a day, and continued contact after discharge (Zhang, 2015). Zhang et al. (2015) also found that anxiety and depression scores in the group with stent placement and psychological

interventions were comparatively lower at the time of discharge (38.25, 36.48) than the non-intervention (56.37, 55.37) and non-stent (48.24, 50.54) groups.

Medication was another intervention discussed in the literature. Of the two studies that examined medication regimen as an intervention for comorbid CHD and depression, both found that few people with depression agree to adhere to a medication regimen (Simmonds et al., 2013; Thornton et al., 2015). In Simmonds et al.'s (2013) study, 66% of participants refused to take antidepressant drugs because they felt they were already taking too many drugs for their CHD. Of the 33% of participants who took antidepressants previously or currently, no one favored taking them because of the undesirable side effects they produced when combined with CHD medications and their lack of benefit. Thornton et al. (2015) found that 42.5% of their sample did not use drug therapy for depressive symptoms.

Two studies found alternative interventions effective for those with comorbid CHD and depression (O'Doherty et al., 2014; Simmonds et al., 2013). One study found their intervention to be ineffective (Pols et al., 2017). Simmonds et al. (2013) found that participants preferred interventions that included social interaction and support when managing their CHD, especially cardiac rehabilitation post-MI, which combined physical exercise with social stimulation and a group environment. Additionally, participants reported that they coped with depression using personal strategies such as counting blessings, meditation, and yoga, which were especially helpful when feeling anxious (Simmonds et al., 2013). O'Doherty et al. (2014) found that mindfulness-based cognitive therapy (MBCT) was effective in reducing depression scores over a six-month period. At the six-month follow-up assessment after MBCT regimen, 71% of the group that participated in MBCT based on random assignment was considered clinically recovered from depression in comparison with the control group. Both HADS and BSI scores

decreased steadily throughout treatment (O'Doherty et al., 2014). Pols et al.'s (2017) study on the Step-Dep intervention found that there was no statistically significant evidence to support the Step-Dep intervention over 12 months in a clinical setting for affecting depression or minimizing the severity of depressive symptoms. Of the intervention group using Step-Dep, 6% had major depressive disorder at six months and 10.1% of them had MDD at the 12-month mark, suggesting a worsening rather than improvement of outcomes (Pols et al., 2017). However, this study could have been limited by its loose criteria, as Step-Dep could potentially be more effective in populations with more severe depressive symptoms.

Interventions and education are crucial to study in populations with comorbid CHD and depression. Because they are the clinical application piece, they are important to improve patient outcomes. We must focus on intervention and education, especially primary prevention, among community dwelling adults to reduce rates of CHD and depression individually and in combination with each other.

Demographics

A total of 11 articles discussed demographic differences in patients with both depression and CHD. Demographic differences are especially important to study when working with community dwelling populations to improve outreach and help close the gap with health care disparities. All of the studies that cited differences in demographics were quantitative studies. Of the studies, all but one (Duivus et al., 2013) found demographic differences in depression. Duivus et al. (2013) instead found that demographics were not a factor in increased WBC indicating inflammation, even when adjusting for disease severity and levels of inflammatory cytokines. The main demographic differences discussed in the other 10 articles included gender (n = 7) and/or age (n = 5), while no racial differences were noted in this review of literature.

The majority of articles on demographics ($n = 9$) used a sample with both a male and female population. However, two of the articles included only women in their sample (O'Neil et al., 2016; Webster-Fink & Jacobs, 2017). Webster-Fink and Jacobs (2017) studied knowledge about the CHD disease process in community dwelling women using the CHD Knowledge Tool for Women and found that they scored an average low score of 63%. Though women scored low on this assessment, women with a higher level of education had significantly more CHD knowledge (Webster-Fink & Jacobs, 2017). When studying women specifically, O'Neil et al. (2016) found that depression was a risk factor for CHD that is completely independent in women and that the association strength between depression and CHD was greater than any other risk factor for women.

Articles that included both genders ($n = 5$) found more disparities for women in depression and more complications for men regarding CHD. Women were generally found to be more at risk for depression and health care disparities regarding depression than their male counterparts (Konrad, Jacob, Rapp, & Kostev, 2016; Thornton et al., 2015). Konrad et al. (2016) suggested that being female is a risk factor associated with a higher risk of developing depression, though past depressive episodes was found to be the strongest risk factor for CHD. According to a separate experimental trial, women overall are less likely to be prescribed an effective drug regimen for treatment of depression (Thornton et al., 2015). In contradiction to these studies, Mehta et al. (2013) claimed that depression rates were higher in males with CHD than females with CHD, and Kourkoveli et al. (2015) noted that neither age nor gender had an effect on depressive symptom scores. Regarding increased male risk for CHD, one study found that old age and smoking had less of an effect on elevated CRP in women as opposed to men (Bjerkeset, Romild, Davey Smith, & Hveem, 2011). Another study found that Framingham CHD

risk scores were higher in all men (5.3% in those with depression and 5.0% in those without) than women (1.7% and 1.5% in those with and without depression) (Jang et al., 2017).

Age was also a demographic topic of interest in many of the studies reviewed. The studies reviewed that explored age (n = 3) found old age (over age 55) to be an additional risk factor for both CHD and depression (Jang et al., 2017; Konrad et al., 2016; Terakura, Fujisaki, Suda, Sagawa, & Sakamoto, 2013). Jang et al. (2017) found that when CHD risk scores were reassessed after 8 years, scores were higher in women over age 55 and men regardless of age. Another study by Gasse et al. (2016) contradicted this by suggesting that CHD risk is highest in the age group of those 15 to 59 years of age. In Kourkoveli et al.'s (2015) study, 28.3% of participants were depressed according to scores on the BDI. This finding is significant considering the mean participant age of 28.9 and depressive symptoms are generally more prevalent in aging adults.

The 11 articles that explored demographics surrounding depression and CHD highlight some of the disparities that exist around these comorbidities. They provide a context for instituting primary and secondary prevention in groups more at risk that may not have adequate access to healthcare.

Anxiety

Anxiety was usually measured when depression was (n = 6). All studies measuring anxiety were quantitative (n = 6), and four used tools to measure patients' feelings of anxiety. The most commonly used assessment tool among these was the HADS (Pols et al., 2017; Watkinds et al., 2013). The Self-Rating Anxiety Scale (Zhang, 2015) and the Composite International Diagnostic Interview (CIDI) (Kinley et al., 2015) were also used. Other studies

used clinical diagnosis of anxiety disorder to quantify those with anxiety (O'Neil et al., 2016; Scott et al., 2013).

Three of the six articles reviewed suggested that anxiety is likely to be an even stronger risk factor for CHD than depression (Kinley et al., 2015; Scott et al., 2013; Watkinds et al., 2013). Scott et al. (2013) found a faster onset time from diagnosis of panic disorder (16.9 years) and generalized anxiety disorder (GAD) (17.2 years) until heart disease onset than that of depression (17.8 years). It was noted that a score of eight or above on the HADS anxiety subscale could be associated with higher mortality risk (2.27) than that of an eight or above on the HADS depression subscale (2.18) (Watkinds et al., 2013). Kinley and colleagues' 2015 study found that anxiety disorders were associated with increased likelihood of cardiac conditions, while depression was not. This same study found that 84.5% of those with MI had a preexisting anxiety disorder, while only 20% had preexisting clinically diagnosed depression (Kinley et al., 2015). Two of these studies found that a combination of anxiety and depression created a higher risk for developing CHD and higher mortality from CHD than they do individually (Scott et al., 2013; Watkinds et al., 2013). Another study (O'Neil et al., 2016) found that a baseline diagnosis of depression with comorbid CHD predicted anxiety. Scott et al. (2013) suggested that an increased risk for heart disease is associated with an increased number of mental disorders experienced by an individual.

Treatment compliance is decreased in those with both anxiety and depression. Kinley et al. (2015) found that depression and anxiety were associated with poor treatment compliance among patients. Anxiety scores were after stent placement and psychological interventions at the time of discharge (38.3) than those in the non-intervention (56.4) and non-stent (48.2) groups just as depression scores were lower (Zhang, 2015).

Because anxiety and depression are comorbid, as CHD and depression, it is important to focus on the anxiety when measuring depression. The two are both important conditions to be assessed in those with CHD. Anxiety may be an even more prominent indicator of CHD development in community dwelling populations than depression.

In summary, depression and depressive symptoms are important when examining cardiovascular risk. While we know depression is prevalent post MI, we do not know if those who are 3 to 6 years post MI depressive symptoms differ from depressive symptoms in a community sample. This information would assist in understanding depression and depressive symptoms in cardiovascular populations and may guide secondary prevention interventions in clinical practice.

Methods

The purpose of this study was to examine differences in depression scores in community dwelling adults with history of MI and those without history of MI or heart surgery. This study was approved by the East Carolina University Institutional Review Board. Participants, who were community dwelling with no history of an MI or heart surgery, were recruited from North Carolina and South Carolina and compared the depression scores to depression scores from a sample of adults post MI.

The eligibility criteria for this study included male and female community dwelling adults age 21 and older who have not had a previous MI or heart surgery. A cross-sectional descriptive design was used to address the following research question: Is there a difference in depression in community dwelling adults without heart disease compared to an age-matched sample of adults who have had an MI in the last three to seven years?

We developed a recruitment script to encourage people to participate in our study. Our sample was a convenience sample of community dwelling adults, and additionally, we used snowball sampling to increase our ability to recruit participants. We recruited a sample size of 40 community dwelling adults age matched to participant's data from the Reoccurrence of Myocardial Infarction (ROMI) study (n = 40) for comparison.

Those who agreed to participate and signed a consent form participated in this research study by completing a demographic health care form (see Appendix A) and the Center for Epidemiological Studies Depression Scale (CES-D) instrument (see Appendix B). Additionally, fatigue was measured because it is a high correlate to depression. Completion of data instruments took approximately 20 minutes of the individuals' time.

Depression was measured using the CES-D to provide quantitative measures of depression. This questionnaire provides 10 statements about depressive symptoms and asks the participant to rate how often that statement impacted their life over the past week using the following choices: Rarely or none of the time (less than 1 day), some or a little of the time (1-2 days), occasionally or a moderate amount of time (3-4 days), and all of the time (5-7 days) (Radloff, 1977). The CES-D is applicable to a wide range of individuals, especially in a general community population (Van Dam & Earleywine, 2010). Scores range from 0 to 60 with higher scores indicating more depressive symptoms. A cut-point of 16 indicates a positive screen for depression. The CES-D has strong reliability (Cronbach's α = 0.85-0.90) and validity (.44 to .54) (Radloff, 1977). Cronbach's alpha for this study was .811.

All data were recorded on paper forms and kept in a locked, secure place for the duration of the study. Data were collected using identification (ID) numbers that correlate with each

participant. A document listing the names and associated ID numbers was kept on a separate computer as an encrypted file and was destroyed as soon as analysis of data was complete.

Results

The final combined sample of both the ROMI (comparison) group and community dwelling group (N = 80) was comprised of 50% males and 50% females. These individuals had a mean age of 58.31 (*SD* = 11.5). Racially, 66.3% of our sample identified as White, 31.3% identified as Black, and 2.5% identified as other. The majority (75%) were married, 12.5% were single and never married, 10% were divorced or separated, and 2.5% were widowed. High school or GED was the highest level of schooling completed by 31.3% of our participants, while 11.3% completed technical school, 22.5% completed some college, 18.8% completed a baccalaureate degree, and 16.3% completed a graduate degree or higher (see Table 1).

Table 1

Demographics of Community and ROMI Samples

Demographic Variables	Community (*n* = 40)	ROMI (*n* = 40)
Age *M* (*SD*)	58.75 (14.236)	57.88 (8.064)
Race *n* (%)		
White	32 (80)	21 (52.5)
Black	8 (20)	17 (42.5)
Other	0 (0)	2 (5)
Education *n* (%)		
Less than High School	1 (2.5)	5 (12.5)
High School	5 (12.5)	18 (45)
Greater than High School	34 (85)	17 (42.5)

The average CES-D score of both the ROMI and community dwelling samples combined (N = 80) was 11.51 (*SD* = 8.4). The average CES-D score for the community sample alone was

11.45 (*SD* = 4.8), and the average CES-D score for the ROMI (control) sample was 11.56 (*SD* = 11.01). The results of the independent *t*-test indicated that CES-D scores of community dwelling adults did not differ significantly from those of the ROMI sample, $t(77) = .060$, $p = .95$. The 95% confidence interval used to find the difference in mean CES-D scores between the groups ranged from -3.67 to 3.90. Of all participants (N = 80), 22% scored $\geq$16, indicating a positive screen for depression. There was a difference in positive screen for depression between groups with higher number of persons from the ROMI group with depression scores $\geq$ 16 ($X^2 = 3.90$ (1); $p = .048$).

One of the demographic questions asked the interviewee to self-report their recreational physical activity in comparison to others their own age as much less, less, same as, more, or much more. Those reporting much less physical activity ($n = 12$) had an average depression score of 15, those reporting less physical activity ($n = 17$) had an average depression score of 13.5, those reporting physical activity the same as others their own age ($n = 21$) had an average depression score of 8. The mean depression score for those reporting more physical activity ($n = 22$) was 12, and the mean depression score for those reporting much more physical activity ($n = 8$) was 9 (see Figure 1). There was no significant difference in mean CES-D scores and recreational activity $F = 2.01$ (4, 74); $p = .102$.

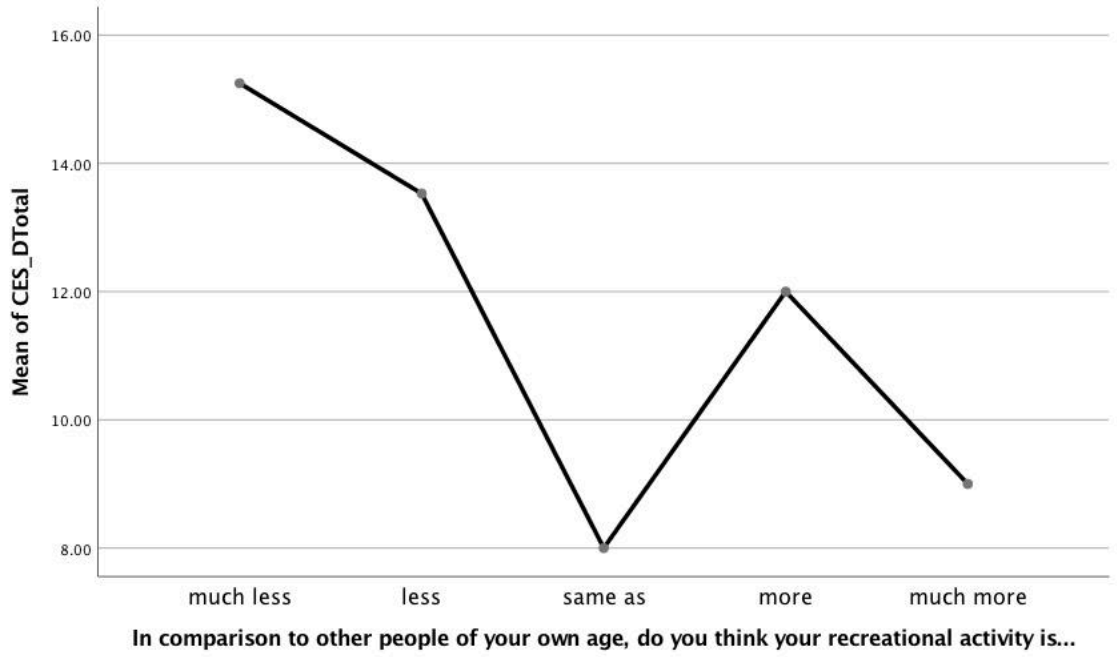

Figure 1. Plot of mean CES-D scores for individuals reporting much less, less, same as, more, and much more self-perceived physical activity in comparison to other people their age.

Discussion

This study found no significant difference in depression scores between groups of individuals with and without history of MI. The lack of difference in depression scores between groups could be related to the length of time post-MI, which was 3-7 years after MI occurrence for our ROMI sample (n = 40). This may indicate that depressive symptoms have normalized at the 3-7 year mark for individuals with history of MI.

Data could have also been influenced by the demographic differences between areas in which the ROMI sample and the community sample were obtained. All ROMI data were obtained from individuals living in Central North Carolina, while half of the community data were obtained in Raleigh, North Carolina and the other half were obtained in Eastern North Carolina. The demographic differences between the two areas could have resulted in inconsistencies. Regional research is indicated in this area of study.

Average depression scores were higher in those reporting more or much more recreational activity than those who reported the same as others their age. While this is a surprising finding, it could be related to various factors. First, exercise is a known intervention for depression (Potter et al., 2017). It is that exercise helps decrease depression symptoms. Thus, individuals already experiencing depression symptoms could be exercising more than others their age in an effort to control their symptoms of depression. This could also be related to the fact that as you age, there are multiple physiological changes including an increase in comorbid conditions. Because our samples of both the ROMI group and the community dwelling group had a combined mean age of over 55 years of age, these individuals could have higher depression scores with more exercise as the prevalence of depression increases with age (Brody, Pratt, & Hughes, 2018).

Because 21% of our sample scored $\geq$ 16, a positive score for depression, depression screening should occur in the community setting (Van Dam & Earleywine, 2010). This is a higher percentage than the US population of 7.1%. Screening for depression, especially in those who are post MI, is important to provide an opportunity for referral to psychiatric services for determination of diagnosis and treatment if indicated. Screening could also identify those with higher scores that do not screen positive for depression and assess their secondary prevention methods, such as participation in physical activity. Future studies are also indicated to investigate how small changes in depression screening scores affect health behaviors focused on preventing an initial or recurrent MI, as well as prevention strategies to manage depression symptoms in both community dwelling adults and those with history of MI.

Lastly, this is a cross sectional study, so no causal relationships between MI and depression scores could be determined. A similar longitudinal study would determine if

depression symptoms precipitate MI or if the two exacerbate one another. The overall findings of this study would be augmented by future studies exploring this prevalent topic in further detail.

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Appendix A

Demographic and Health Form

ID: _____

Date: ___/___/_____

Community Sample:

Reoccurrence of MI Survey Please place an X in the box for each response

Demographics

1. Are you a: ☐[1] Woman ☐[2] Man

2. What was your age on last birthday? _____

3. What is your ethnicity/race?

   ☐[1] African-American/Black

   ☐[2] Caucasian/White

   ☐[3] Multi-racial (Ask "Which do you consider most?") _____

   ☐[4] Other _____

4. How would you describe your current marital status?

   ☐[1] Single and never married

   ☐[2] Living with partner

   ☐[3] Married

   ☐[4] Divorced or separated

   ☐[5] Widowed

5. What is the highest level of schooling completed?

☐ 1 8 years or less

☐ 2 9-11 years

☐ 3 High school graduate (or GED)

☐ 4 Some technical school

☐ 5 Technical school

☐ 6 Some college

☐ 7 Baccalaureate degree

☐ 8 Some graduate

☐ 9 Graduate degree or higher

6. What is your occupation?

☐ 1 Housewife

☐ 2 Work or volunteer outside the home _____

☐ 3 Other _____

☐ 4 Retired-- If yes, what position before retired?

_____

7. Is your work or volunteering outside the home?

☐ 1 Part time

☐ 2 Full time

☐ 3 Not Applicable, **Skip to question #10**

8. After work or volunteering, are you physically tired?

☐ 1 Never

☐ 2 Seldom

☐ 3 Sometimes

☐ 4 Often

☐ 5 Always

12. In comparison with other people (women or men) of your own age, do you think your recreational physical activity is …

☐ 1 Much less

☐ 2 Less

☐ 3 Same as

☐ 4 More

☐ 5 Much more

For the following questions, think about activities such as **walking briskly, jogging, taking aerobics classes, working out on a cross-trainer or elliptical machine, biking, playing tennis, dancing, swimming, and other such types of physical activity.**

13. During the **past month**, did you participate in any of the above activities or in any similar activities **not** included in the list?

☐ 1 Yes

☐ 2 No, **Skip to question # 15**

14. Which sport or exercise did you do **most frequently in the past month**?

_____ *Specify only on activity*

a. How many **hours a week** did you usually do this activity?

☐ 1 Less than 1 hour per week

☐ 2 At least 1 hour, but less than 2 hours per week

☐ 3 At least 2 hours, but less than 3 hours per week

☐ 4 At least 3 hours, but less than 4 hours per week

☐ 5 At least 4 hours per week

b. Did you do any other exercise or play any other sport in the **past month**?

☐ 1 Yes

☐ 2 No, **Skip to question #15**

c. What was the second most frequent sport or exercise you did in the past month? _____ *specify only one activity*

d. How many **hours a week** did you usually do this activity?

☐ 1 Less than 1 hour per week

☐ 2 At least 1 hour, but less than 2 hours per week

☐ 3 At least 2 hours, but less than 3 hours per week

☐ 4 At least 3 hours, but less than 4 hours per week

☐ 5 At least 4 hours per week

e. Did you do any other exercise or play any other sport in the **past month**?

☐ 1 Yes

☐ 2 No, **Skip to question # 15**

f. What was the third most frequent sport or exercise you did in the past month? _____ *Specify only on activity*

g. How many **hours a week** did you usually do this activity?

☐ 1 Less than 1 hour per week

☐ 2 At least 1 hour, but less than 2 hours per week

☐ 3 At least 2 hours, but less than 3 hours per week

☐ 4 At least 3 hours, but less than 4 hours per week

☐ [5] At least 4 hours per week

20. We are interested if people in this study have enough money to buy medication and take care of themselves.

For that reason, I would like to know **your** approximate average *combined* yearly household income?

☐ [1] Less than $10,000

☐ [2] $10,000 - $19,999

☐ [3] $20,000 - $29,999

☐ [4] $30,000 - $39,999

☐ [5] $40,000 - $49,999

☐ [6] $50,000 - $59,999

☐ [7] $60,000 - $69,999

☐ [8] $70,000 - $79,999

☐ [9] $80,000 - $89,999

☐ [10] $90,000 - $99,999

☐ [11] Over $100,000

☐ [12] Don't know

☐ [13] Refused

21. What best describes your health insurance status? *(Select all that apply)*

☐ [1] Private/Employer Based

☐ [2] Medicare/Medicaid

☐ [3] Medicare Plus

☐ [4] Military/Veteran

☐ [5] None

Health Status

22. In general, how would you describe your current health?

☐ 1 Excellent

☐ 2 Very Good

☐ 3 Good

☐ 4 Fair

☐ 5 Poor

23. In the past 12 months, how often have you been to:	Number of times
a. Emergency Department	
b. Hospitalized for more than 24 hours	
c. Doctor visits	

26. Has your doctor or health care provider told you that you have an abnormal heartbeat?

☐ 1 Yes

☐ 2 No

27. Has your doctor or health care provider ever told you that you have high blood pressure?

☐ 1 Yes

☐ 2 No

28. Has your doctor or health care provider ever told you that you have high blood cholesterol?

☐ 1 Yes

☐ 2 No

29. Does or did your mother, father, aunts, uncles, or other family have a history of - - **X** the box if the answer is yes:

	Heart Attack	Stroke	High Blood Pressure	Diabetes
a. Mother	☐ 1	☐ 2	☐ 3	☐ 4
b. Father	☐ 1	☐ 2	☐ 3	☐ 4
c. Aunt/Uncle	☐ 1	☐ 2	☐ 3	☐ 4
d. Grandparent	☐ 1	☐ 2	☐ 3	☐ 4
e. Other:	☐ 1	☐ 2	☐ 3	☐ 4

30. Have you ever smoked more than 5 packs of cigarettes in your life, chewed tobacco or dipped snuff?

☐ 1 Yes

☐ 2 No, **Skip to question #34**

31. How many years did you smoke, dip or chew? _____ Years

32. Do you currently smoke (dip or chew)?

☐ 1 Yes

☐ 2 No, **Skip to question #34**

33. How many cigarettes do you presently smoke per day? _____/day

34. Do you or did you live around people who smoke (d) every day?

☐ 1 Yes

☐ 2 No

35. How much alcohol do you drink?

☐ 1 None

☐ 2 1 – 3 drinks/month

☐ 3 1 – 3 drinks/week

☐ 4 4 – 6 drinks/week

☐ 5 7 – 10 drinks/week

☐ 6 > 11 drinks/week

36. Do you have diabetes or need medication to control your blood sugar?

☐ 1 Yes

☐ 2 No

37. Which of the following types of medications do you take at least daily:	NO	YES	List Drug and Dosage on your prescription bottle
a. Antihypertensive to lower blood pressure	☐1	☐2	
b. Insulin or oral hypoglycemic to lower blood sugar	☐1	☐2	
c. Cholesterol lowering drug	☐1	☐2	
d. Drug to treat angina/chest pain	☐1	☐2	
e. Arthritis	☐1	☐2	
f. Sinus or allergy medication	☐1	☐2	
g. Water pill	☐1	☐2	
h. Thyroid medication	☐1	☐2	

i. Vitamins	☐[1]	☐[2]	
j. Stomach pills	☐[1]	☐[2]	
k. Aspirin	☐[1]	☐[2]	
l. Pill for nerves	☐[1]	☐[2]	
m. Hormones	☐[1]	☐[2]	
n. Other medication Specify: Ask “any herbal products?	☐[1]	☐[2]	

48. Chronic Condition …**X box if yes**	**Healthcare Provider Told you**	**Taking medication for condition**	**Name of medication**	**Medication Side effect = Fatigue**
a. Heart disease	☐1	☐2		☐4
b. Respiratory illness	☐1	☐2		☐4
c. Asthma or Rheumatism	☐1	☐2		☐4
d. Rheumatoid arthritis	☐1	☐2		☐4
e. Cancer	☐1	☐2		☐4
f. Parkinson's	☐1	☐2		☐4
g. Hypertension	☐1	☐2		☐4
h. Diabetes	☐1	☐2		☐4
i. Epilepsy	☐1	☐2		☐4
j. Asthma/Rhinitis/Allergies	☐1	☐2		☐4
k. Acne	☐1	☐2		☐4
l. Ulcers	☐1	☐2		☐4
m. Glaucoma	☐1	☐2		☐4
n. Gout/Hyperuricemia	☐1	☐2		☐4
o. High cholesterol	☐1	☐2		☐4
p. Migraines	☐1	☐2		☐4
q. Tuberculosis	☐1	☐2		☐4
r. Peripheral vascular disease	☐1	☐2		☐4
s. Cerebrovascular disease (stroke or TIA)	☐1	☐2		☐4

t. Liver disease	☐1	☐2		☐4
u. Hemiplegia/Paralysis	☐1	☐2		☐4
v. Renal disease	☐1	☐2		☐4
w. Obesity	☐1 Yes	☐2 No		
	☐1	☐2		☐4

Appendix B

CES-D

Center for Epidemiologic Studies Depression Scale (CES-D), NIMH

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

	During the Past Week			
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	☐	☐	☐	☐
2. I did not feel like eating; my appetite was poor.	☐	☐	☐	☐
3. I felt that I could not shake off the blues even with help from my family or friends.	☐	☐	☐	☐
4. I felt I was just as good as other people.	☐	☐	☐	☐
5. I had trouble keeping my mind on what I was doing.	☐	☐	☐	☐
6. I felt depressed.	☐	☐	☐	☐
7. I felt that everything I did was an effort.	☐	☐	☐	☐
8. I felt hopeful about the future.	☐	☐	☐	☐
9. I thought my life had been a failure.	☐	☐	☐	☐
10. I felt fearful.	☐	☐	☐	☐
11. My sleep was restless.	☐	☐	☐	☐
12. I was happy.	☐	☐	☐	☐
13. I talked less than usual.	☐	☐	☐	☐
14. I felt lonely.	☐	☐	☐	☐
15. People were unfriendly.	☐	☐	☐	☐
16. I enjoyed life.	☐	☐	☐	☐
17. I had crying spells.	☐	☐	☐	☐
18. I felt sad.	☐	☐	☐	☐
19. I felt that people dislike me.	☐	☐	☐	☐
20. I could not get "going."	☐	☐	☐	☐