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Relation Between Depression Symptoms and Suicide Risk in Adults and Older Adults

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Relation Between Depression Symptoms and Suicide Risk in Adults and Older Adults

Ruifeng Cui

Doctoral Dissertation submitted
to the Eberly College of Arts & Sciences
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in partial fulfillment of the requirements for the degree of

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ABSTRACT

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Ruifeng Cui

Suicide consistently ranks among the top 10 leading causes of death in the United States. Depressive disorders as well as depression symptoms are risk factors for suicide. Depression symptoms typically fall under a cognitive affective domain and a somatic domain. Males and older adults may have a more somatic presentation of depression. Among those with physical health problems, these somatic symptoms may be confounded with symptoms of physical conditions. Not all symptoms of depression are equally useful for predicting suicide risk. The types of depression symptoms that are risk factors may vary depending on the characteristics of the sample and how depression typically presents in these samples. The present study sought to investigate the utility of cognitive affective and somatic symptoms of depression in predicting suicide risk and whether this relation is moderated by age, gender, and physical health problems. Additionally, the study sought to investigate whether a measure designed specifically to assess depression in men adds predictive utility over and above convention depression screeners.

Participants were recruited from Amazon's Mechanical Turk. A total of 1009 participants were recruited. Inclusion criteria were being 18 or older and being from the United States. Participants were excluded for taking the study survey multiple times, not completing the survey, or failing three or more attention checks. The final sample consisted of 944 participants who met inclusion and exclusion criteria. Depression was assessed with the Center for Epidemiological Studies Depression 11 (CES-D11), Patient Health Questionnaire-9 with item 9 excluded (PHQ-8), and Male Depression Risk Scale. Suicide risk was assessed using the Suicidal Behaviors Questionnaire-Revised. Physical health was assessed with a health conditions checklist.

The sample comprised of primarily middle aged ($M = 51.77$), Caucasian (86.4%), females (53.3%) who were partnered (51.6%). Cognitive affective and somatic symptoms of the CES-D11 and PHQ-8 both added independent predictive utility in predicting suicide risk. The predictive utility of cognitive affective and somatic symptoms was not moderated by gender or health conditions. Age was found to moderate the relation between cognitive affective as well as somatic symptoms of depression and suicide risk. Younger age exacerbated the negative effect of both cognitive affective and somatic symptoms on suicide risk. The male depression screener predicted suicide risk over and above conventional depression screeners. This effect was moderated by gender with females demonstrating higher levels of risk as compared to their male counterparts with similar levels of male depression symptoms. Across the CES-D11 and PHQ-8, negative affect, psychomotor retardation, and sleep problems emerged as the individual depression symptoms that were significantly related to suicide risk.

Taken together, findings indicate that both cognitive affective and somatic symptoms of depression are important suicide risk factors among males and females and those with many as well as few health problems. Cognitive affective and somatic symptoms pose a risk for suicide among younger and older adults although younger age seems to amplify the risk that depression symptoms convey. The symptoms of depression that convey the greatest risk overall were negative affect, psychomotor retardation, and sleep difficulties. Lastly, symptoms hypothesized to be a part of the male depression phenotype serve as risk factors for both men and women who endorse these atypical depression symptoms.

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Relation Between Depression Symptoms and Suicide Risk in Adults and Older Adults

Suicide consistently ranks among the top 10 leading causes of death in the United States (Heron, 2015; McKeown, Cuffe, & Schulz, 2006; Rockett & Caine, 2015). Further, suicide accounts for 1.4% of total mortality worldwide (Värnik, 2012). Middle aged and older adults are at high risk for suicide in the U.S., with older adult white males having the highest rate of suicide among all age and gender groups (Conwell, Van Orden, & Caine, 2011; McKeown et al., 2006). Survey studies report that approximately .5% of adults in the U.S. will make a suicide attempt in a given year with the lifetime prevalence of attempts being 4.6% (Crosby, Gfroerer, Han, Ortega, & Parks, 2011; Kessler, Borges, & Walters, 1999). Suicidal ideation is even more prevalent with a lifetime prevalence rate of between 8.4 - 9.7% among adults; 21.7% of adults with ideation will progress to an attempt (Baca-Garcia et al., 2010). Data from the 2001 - 2007 WHO World Mental Health Surveys found that the prevalence rates for suicidality were 2.0% for suicidal ideation, .06% for suicide plans, and .03% for suicide attempts (Borges et al., 2010). The lifetime prevalence rates of suicidal ideation and suicide attempts were between 6.5 - 7.3% and 2.1 - 2.3%, respectively, for middle aged adults age 45 to 64 and between 2.8 - 3.1% and .5% - .7%, respectively, for older adults age 65 plus (Baca-Garcia et al., 2010).

The identification of risk factors for suicide among adults and older adults may lead to interventions to prevent suicide specifically targeted toward at-risk individuals as well as the identification of factors to target and treat in interventions. Depressive disorders are prevalent among the general population. A meta-analysis of data from 30 countries found a lifetime prevalence of depression to be 10.8% (Lim et al., 2018). Twelve-month prevalence rates for a depressive disorder in the U.S. is estimated to be as high as 9% (Centers for Disease Control and Prevention, 2010). A large population-based study of 12,312 older adults in the U.S. found that

the Major Depressive Disorder (MDD) diagnosis prevalence rate during a one year time frame was 5.6% for adults age 55 and older (7.4% for adults age 55 - 64, 4.6% for ages 65 - 74, 3.9% for ages 75 - 84, and 4.2% for ages 85+; Reynolds, Pietrzak, El-Gabalawy, Mackenzie, & Sareen, 2015). Suicide research has consistently identified depression as a major risk factor for suicide. Studies have typically found that the severity of depression is a major risk factor for suicide attempts and death by suicide in western countries (Cukrowicz et al., 2011; Hawton, Comabella, Haw, & Saunders, 2013; Phillips et al., 2007; Simon et al., 2013; Wilcox et al., 2010). A longitudinal study conducted in Sweden found that the long-term suicide risk for adults with depression was 3.1% for individuals with moderate MDD and 13.7% for individuals with severe MDD (Brådvik, Mattisson, Bogren, & Nettelbladt, 2008). Additionally, males with severe depression showed the highest risk for suicide, at 20% (Brådvik et al., 2008). A meta-analysis of 357 studies found that depression was associated with a 148% increased odds of suicidal ideation, 138% increased odds for a suicide attempt, and 50% increased odds for dying by suicide (Ribeiro, Huang, Fox, & Franklin, 2018). In a large sample of 21,290 European older adults, depression was associated with a 260% increased odds of experiencing suicidal ideation (Almeida et al., 2012). MDD was associated with a 4740% increased odds of a suicide attempt in older adults (Wiktorsson, Runeson, Skoog, Östling, & Waern, 2010). MDD is the psychiatric disorder most associated with death by suicide among older adults (Conwell et al., 2011).

Although the presence of depression and depression symptom severity are useful in predicting suicide risk among adults and older adults, not all depression symptoms may be equally useful in determining suicide risk. Researchers have argued against conceptualizing depression severity as merely a sum of depression symptoms and differentiating depressed from non-depressed individuals by symptom total and cut-off scores (Fried & Nesse, 2015).

Depression symptoms have traditionally been conceptualized into three symptom domains; cognitive, affective, and somatic symptoms. Affective symptoms of depression typically include depressed mood, anhedonia, hopelessness, worthlessness, and inappropriate guilt. Cognitive symptoms include difficulty concentrating, indecision, and memory problems. Lastly, somatic symptoms usually include fatigue, psychomotor agitation or retardation, changes in appetite/appetite problems, and changes in sleep/sleep problems. These classifications have been supported by factor analyses conducted on various measures of depression symptoms. Factor analysis has identified a cognitive/affective factor and a somatic factor for the Beck Depression Inventory-II, a self-report measure of depression symptoms (Whisman, Perez, & Ramel, 2000). The Patient Health Questionnaire-9 (PHQ-9) is another self-report measure of depression symptoms that has demonstrated a cognitive/affective and somatic subscale through factor analysis (de Jonge, Mangano, & Whooley, 2007; Richardson & Richards, 2008). A meta-analysis of studies using the original 20 item self report Center for Epidemiological Studies Depression Scale (CES-D-20) indicated that the scale consistently demonstrates an affective, somatic, and interpersonal factor (Shafer, 2006). Research with a U.S. sample conducted by Fried and Nesse (2014) found that different affective, cognitive, and somatic symptoms of depression such as depressed mood, difficulty concentrating, and insomnia, respectively, have separate and distinct impacts on different domains of daily functioning. Different depression symptoms may thus also have distinct influences on suicide risk.

The depression and suicide literature has usually found affective symptoms of depression to be more predictive of suicide risk than somatic symptoms. A study of 280 individuals with MDD found that suicidal ideation, assessed with the 17-item Hamilton Depression Scale (HAMD; Hamilton, 1967), was higher among patients who completed suicide as compared to

patients who had not completed suicide (Schneider, Philipp, & Müller, 2001). Factor analyses of the HAMD have typically categorized suicidal ideation under an affective category with titles such as melancholia or depressed mood (Shafer, 2006). Other affective symptoms of depression have also been found to be associated with suicide risk. A nationally representative study of adults with MDD in the U.S. found that feelings of worthlessness, assessed with the National Epidemiological Survey on Alcohol and Related Conditions survey questionnaire, was the depression symptom most strongly associated with suicide attempts in both males and females (Bolton, Belik, Enns, Cox, & Sareen, 2008). Although a factor analysis has not been conducted with the depression items on the Alcohol and Related Conditions survey, factor analyses with other measures of depression such as the BDI and CES-D-20 have categorized items regarding self-worth (e.g., feeling like one's life is a failure, self-hate, etc.) into an affective factor (Shafer et al., 2006). Among Belgian psychiatric inpatients with depression, suicidal ideation was significantly predicted by worthlessness as well as depressed mood, anhedonia, and guilt which were assessed with the Beck Depression Inventory (Gastel et al., 1997). Factor analyses with the BDI have typically categorized these symptoms under a single factor called general depression or negative affect (Shafer, 2006).

A psychological autopsy study of individuals with MDD conducted using clinical interviews with suicide loss survivors found that individuals who completed suicide were more likely to have had symptoms of suicidal ideation, feelings of worthlessness, and inappropriate guilt as compared with depressed individuals who did not die by suicide (McGirr et al., 2007). These symptoms typically fall under affective categories in many depression measures (Shafer, 2006). In contrast to the affective symptoms, the relation between somatic symptoms and suicide risk in this psychological autopsy study was mixed with weight/appetite loss and insomnia being

risk factors and fatigue, hypersomnia, and weight/appetite gain being protective factors against suicide (McGirr et al., 2007). Another psychological autopsy study found that the most prevalent depression symptoms among individuals who died by suicide included depressed mood and anhedonia (Phillips et al., 2007) which are typically classified as affective symptoms in depression measures (Shafer, 2006).

Although affective symptoms are the most predictive symptoms of depression for suicide risk in the general population, it is important to note that a substantial minority of depressed patients may not present with affective symptoms. Lesse (1983), from his experiences working with depressed patients, documented that for a minority of patients, their depression was “masked.” Lesse noted that in a minority of depressed patients, the patients would present their depression as primarily psychosomatic symptoms. According to Lesse, these patients do not primarily/solely experience depression as somatic symptoms but either intentionally or unintentionally present with primarily somatic complaints (e.g., choose not to disclose depressed mood due to stigma, poor ability to recognize/label their own mood states). For other masked depression patients, Lesse posits that the patients’ experience of psychosomatic or behavioral problems (e.g., acting out, alcohol abuse, etc.) are directly associated with the underlying “depressive core” and should be considered depressive equivalent symptoms (equivalent to more typical mood/affect symptoms). Among patients whose depression is “masked” and their depression phenotypical presentation is predominantly psychosomatic or behavioral, the severity of their affective symptoms of depression may not be as useful in predicting suicide risk.

Depression Presentation and Suicide Risk in Older Adults

In the U.S., middle aged and older adults are both at risk for suicide, however the prevention of suicide is much harder among older adults as compared to other age groups. Older

adults in the U.S. are more determined to follow through with a decision to take their own life, make more carefully planned attempts and are less likely to reveal their intentions to end their own life to others as compared to younger adults (Conwell et al., 1998; Husky, Zablit, Fernandez, & Kovess-Masfety, 2016). Middle aged and older adults also tend to use more lethal methods such as firearms and are more likely to die from suicide attempts (Beghi, Rosenbaum, Cerri, & Cornaggia, 2013; Callanan & Davis, 2012). The older adult population in the U.S. is growing rapidly and is estimated to reach more than 70 million by 2030 (Ortman, Velkoff, & Hogan, 2014). Middle aged adults are currently the age group with the highest risk for suicide in the U.S. and as the Baby Boomers' generation transitions into older adulthood in the next two decades, it is estimated that the prevalence of suicide will increase among the older adult demographic (Conwell et al., 2011).

Given the difficulty in preventing suicide among older adults and the increase in the older adult population over the next several decades, there is a critical need to find more effective methods to identify older adults who are at risk for suicide. Depressive disorder and depression symptoms are associated with suicidal ideation and suicide attempts among older adults (Almeida et al., 2012; Cukrowicz, Cheavens, Van Orden, Ragain, & Cook, 2011; Wiktorsson et al., 2010). Among older adults, depression and past suicide attempts are the biggest risk factors for suicide (De Leo, Draper, Snowden, & Kőlves, 2013; Fiske, Wetherell, & Gatz, 2009). Given the importance of depression symptoms and disorders in identifying older adults at risk for suicide, the accurate assessment of depression in older adults is essential.

Numerous research studies suggest that depression may have a more somatic presentation among older adults as compared to younger adults (Fiske et al., 2009; Hegeman, Kok, Van der Mast, & Giltay, 2012). A study of participants from Denmark found that both men and women

showed an increase in somatic symptoms of depression, as assessed by the Obvious Depression Scale (ODS), in older adulthood (Barefoot, Mortensen, Helms, Avlund, & Schroll, 2001). The somatic symptoms of depression on the ODS included perceptions of health, changes in activities due to health, and specific somatic concerns (Barefoot et al., 2001). A study of adults from the U.S. found that, as compared with younger adults with the same severity of depression symptoms, older adults were less likely to present with depressed mood or anhedonia (Gallo, Anthony, & Muthén, 1994). Further, a study with Australian older adults found that they were more likely to endorse psychomotor retardation and insomnia, as assessed by the Goldberg Anxiety and Depression Scales (GADS; Goldberg, Bridges, Duncan-Jones, & Grayson, 1988), as compared to younger adults with similar levels of depression (Christensen et al., 1999). The GADS was designed to have an anxiety subscale and depression subscale and factor analyses with older adults have not identified a separate somatic subscale (Koloski, Smith, Pachana, & Dobson, 2008). Nonetheless, factor analyses of commonly used depression scales such as the CES-D-20 have typically categorized psychomotor retardation and insomnia under the somatic category (Shafer, 2006). Research has found that among adults from the U.S., greater age was associated with a decrease in the reporting of depression symptoms on the affective subscale but not depression symptoms on the somatic subscale of the BDI and HAMD (Lyness et al., 1995). A study of 2725 Australian adults aged 18 to 79 from the community found that depression symptoms, as assessed by the GADS, decreased with age with the exception of psychomotor retardation and insomnia (Henderson et al., 1998). Another study of 3401 community dwelling older adults from the U.S. found that effort required to engage in tasks and restless sleep, as assessed by the 20 item CES-D, were the most common depression symptoms endorsed by Caucasian older adults (Blazer, Landerman, Hays, Simonsick, & Saunders, 1998). Effort and

sleep items on the CES-D-20 typically fall under a somatic category in factor analyses of the measure (Shafer, 2006). A treatment study by Hybels, Blazer, Landerman, and Steffens (2011) which used the depression section of the Diagnostic Interview Schedule to measure depression symptoms found greater age to be associated with weight loss, appetite loss, and sleep difficulties, all symptoms that commonly fall in the somatic category in depression scales (e.g., BDI; Shafer, 2006). Among a population study of 4,945 Chinese older adults, greater age was associated with decreases in affective symptoms and increases in somatic symptoms on the CES-D-20 (Yu, Li, Cuijpers, Wu, & Wu, 2012). It is important to note that not all studies found only somatic symptoms of depression to increase across the lifespan. For example, a Swedish population-based study found that both affective and somatic symptoms of depression increase with age (e.g., Fiske, Gatz, & Pedersen, 2003). Another longitudinal study of 2,320 participants found that all subscales of the CES-D-20 increased after age 20 however the somatic subscale demonstrated the greatest increase (Sutin et al., 2013).

The research suggests that depression has a more somatic presentation among older adults as compared to younger adults. As depression presents more typically through somatic symptoms in older adults, the absence of cognitive affective symptoms of depression may not be indicative of the absence of depression or that the depression experienced is less severe. In fact, research with an U.S. sample has found that the presence of depression symptoms without the affective symptom of dysphoria in older adults was associated with more functional impairments and all-cause mortality than depression symptoms with dysphoria or a diagnosis of MDD (Gallo, Rabins, Lyketsos, Tien, & Anthony, 1997). This study demonstrates that the absence of affective symptoms among older adults does not necessarily suggest less severe depression but on the contrary, may even suggest more severe depression resulting in more negative outcomes.

Depression severity is typically established through a simple count of depression symptoms and has been found to be predictive of suicidal ideation and suicide completion among older adults. However, a simple count of all depression symptoms may not be the most effective way to predict suicide in this at-risk population as depression has a somatic presentation among older adults and the absence of affective symptoms may not necessarily indicate less severe depression. Affective symptoms appear to be most strongly associated with suicide risk among the adult population, however, somatic symptoms may be as important if not more important in predicting suicide risk among older adults given the type of presentation of depression in this demographic.

Depression Presentation and Suicide Risk in Male Adults

In the U.S., males have a higher rate of death by suicide among all age groups as compared to females (Curtin, Warner, & Hedegaard, 2016). Rates of death by suicide have increased from 1999 to 2014 among males of all age groups with the highest increases seen among males between the ages of 45 and 64 (Curtin et al., 2016). The prevention of suicide among males in western countries is hindered by a reluctance to seek help for suicidal ideation or mental disorders (Doherty & Kartalova-O'Doherty, 2010; Husky et al., 2016) which is partially due to stigma (Clement et al., 2015). Prevention is further hindered by the use of more lethal methods (e.g., firearms) to attempt suicide among males (Curtin et al., 2016). Depression is a risk factor for suicide, but gender differences in the presentation of depression may lead to an underdiagnoses of depression among males thus making the identification of males at risk for suicide even more difficult (Berger, Addis, Reilly, Syzdek, & Green, 2012; Rochlen et al., 2010).

The Swedish Committee for Prevention and Treatment of Depression provided a training program to all general practitioners on Gotland Island between the years of 1983 and 1984 to

identify depression and suicide risk as well as treat both mental health issues. A booster training was offered to all general practitioners from 1993 to 1995 (Rutz et al., 1997). Among the findings of these trainings was an increase in antidepressant prescriptions, likely due to better identification of depression symptoms and disorders by general practitioners. However, the increase in antidepressant prescriptions was disproportionately higher for females and although female suicide rates decreased following both trainings, male suicide rates remained unchanged (Rutz et al., 1997). As depression is a major risk factor for suicide, the identification and treatment of depression should decrease rates of suicide. Researchers have argued that the reason the trainings only decreased rates of suicide among women was because men have a different presentation of depression symptoms and thus were not identified for depression treatment resulting in no changes in suicide rates among men (Berger et al., 2012; Oliffe & Phillips, 2008; Rochlen et al., 2010).

According to the masculine depression framework, a culture's gender norms influence a person's phenotypical presentation of mental disorders including depression (Addis, 2008). Similarly, the gendered responding framework posits that the society's gender norms influence how men and women typically respond to negative emotions (Addis, 2008). As a result of societal gender norms, men may feel or be stigmatized for expressing "soft" negative emotions such as sadness but may not experience the same stigma against expressing "hard" negative emotions such as anger (Genuchi & Valdez, 2015). Researchers suggest that some of these symptoms that depressed males may present with that are not typically included in depression screeners include anger, impulsivity, agitation, aggression, substance use, engaging in risky behaviors, social withdrawal and alexithymia (Addis, 2008; Oliffe & Phillips, 2008). Several studies also suggest that depression among males may have a more somatic presentation

(Hammen & Padesky, 1977; Padesky & Hammen, 1981; Vredenburg, Krames, & Flett, 1986).

When alternative symptoms of depression commonly expressed by males (i.e., aggression, substance use, and risky behaviors) were included in assessing for the presence of a depressive disorder among a nationally representative U.S. sample, a similar number of males and females were found to meet criteria for depression (Martin, Neighbors, & Griffith, 2013).

As a result of findings from the Gotland study as well as other research into gender differences in depression, three male depression scales have been developed, the Gotland Male Depression Scale (Zierau, Bille, Rutz, & Bech, 2002), Male Depression Risk Scale (MDRS-22; Rice, Fallon, Aucote, & Möller-Leimkühler, 2013) and Masculine Depression Scale (Magovcevic & Addis, 2008). These scales place less emphasis on the typical affective presentation of depression and focus more on hypothesized male behavioral presentations of depression such as withdrawal, numb/blunted affect, aggression, agitation, substance use, and somatic problems. Depression scales specifically designed to assess depression symptomatology in males may be more accurate in determining depression severity and thus risk for suicide. As males with depression may be more willing to report somatic symptoms of depression as compared to affective symptoms, the somatic subscales of traditional depression screeners may be more effective in capturing the severity of depression among males than the affective subscales and thus may also be more predictive of suicide risk.

It is important to note that while there is ample theory supporting the construct of male depression, there is very limited empirical treatment research. Studies have not systematically investigated whether psychotherapies designed to target “male depression” are more effective than conventional psychotherapies (Spendelow, 2015). Additionally, studies have not investigated whether “male depression” symptoms improve, as measured by male depression

specific questionnaires, during pharmacotherapy, conventional psychotherapy, or psychotherapies tailored toward male depression (Spendelov, 2015). The lack of treatment outcomes research is a crucial limitation in the body of research on male depression overall as well as the validity of the male depression specific questionnaires.

Depression Presentation and Suicide Risk in Physically Ill Adults

Physical health problems are a risk factor for suicide among adults and older adults (Conwell et al., 2010; Lutz, Morton, Turiano, & Fiske, 2016). Various different health problems as well as total number of health problems were associated with suicidal ideation (Lutz et al., 2016) as well as suicide attempts (Scott et al., 2010). Lastly, physical health problems were associated with death by suicide among older adults (Conwell et al., 2010). Depression is highly comorbid with chronic physical health problems. The prevalence of having probable depression is 23% among individuals with one health problem with prevalence rates increasing for each additional physical health problem, rising to 41% among individuals with five or more chronic health problems (Gunn et al., 2012).

In addition to being a risk factor for suicide, physical health problems may inflate the somatic symptoms of depression, thus potentially compromising the predictive utility of those symptoms in predicting suicide risk. A study of U.S. adults with kidney disease found that both depressed and non-depressed individuals with kidney disease had frequently endorsed depression symptoms of fatigue, sleep problems, and appetite problems on the PHQ-9 (Drayer et al., 2006). Fatigue, sleep, and appetite symptoms consistently loaded onto a somatic factor during factor analyses in past research with the PHQ-9 (Richardson & Richards, 2008). Among the non-depressed individuals with kidney disease, less than 10% endorsed affective symptoms of depression on the PHQ-9 (e.g., depressed mood and suicidal ideation) however 47%, 32%, and

17% of the individuals endorsed somatic symptoms of fatigue, sleep problems and appetite problems, respectively (Drayer et al., 2006) suggesting that certain physical illnesses may inflate the somatic subscales of depression screeners. Similarly, research with U.S. adults with rheumatoid arthritis suggest that somatic symptoms in depression inventories may be inflated by the physical illness, resulting in depression screeners potentially overestimating the presence and severity of depression among individuals with arthritis (Matcham, Rayner, Steer, & Hotopf, 2013). For example, the majority of CES-D-20 depression items that individuals with rheumatoid arthritis differed on as compared to control participants were items that consistently load onto the somatic subscale of the CES-D-20 (i.e., psychomotor retardation, sleep problems, effort, and appetite problems; Blalock et al., 1989; Callahan et al., 1991; Shafer, 2006). Studies of individuals with heart disease found that the somatic symptoms of depression are the best predictor of cardiac outcomes (Carney & Freedland, 2012; de Jonge et al., 2006) which may be interpreted as evidence that the somatic symptoms were more of a reflection of the heart disease instead of a depressive disorder. These somatic items included insomnia, fatigue, weight loss, somatic preoccupation, and loss of libido. Individuals with a diagnosis of liver cirrhosis had significantly higher scores on the somatic subscale of the BDI-II relative to the cognitive affective subscale when compared to individuals without cirrhosis (Patterson et al., 2011). Data from the Health and Retirement Study found that physical health problems (e.g., diabetes, heart problems, arthritis, functional limitations) were associated with higher somatic symptoms on the CES-D somatic subscale even after controlling for overall depression symptoms (Ayotte et al., 2010).

Researchers have argued that part of the reason why depression is underdiagnosed in medical patients is because physicians have difficulty distinguishing whether somatic symptoms

are due to an underlying depressive disorder or to the patients' physical illness (e.g., Matcham et al., 2013; Kapfhammer, 2006). This problem in differential diagnosis is especially relevant to the diagnosing of depression among older adults, many of whom have one or more chronic physical health problems (Hegeman et al., 2012). Research with older adults in the U.S. with physical health problems found that an exclusive approach to the diagnosis of depression (i.e., excluding all somatic symptoms of depression) best identified older adults with the most severe and persistent depression (Koenig, George, Peterson, & Pieper, 1997). The exclusive approach, however, may result in an underdiagnosis of depression overall in this age group as some older adults with depression may have a primarily somatic presentation (Fiske et al., 2009). The inclusive approach to diagnosis (i.e., including all symptoms of depression) identified more individuals with MDD, however the higher rate of individuals identified may be an overestimation, resulting from the inclusion of individuals who primarily had physical health problems (Koenig et al., 1997). Thematic study of family physicians indicates that physicians dislike reliance on standardized clinical interviews and/or self-report symptom checklists for a variety of reasons, including the overlap between somatic symptoms of depression and symptoms of medical illness (Schumann, Schneider, Kantert, Löwe, & Linde, 2011). Instead, physicians preferred to rely on their heuristic knowledge of their patient and their patient's history as well as ruling out somatic symptoms due to physical illness before incorporating somatic symptoms into their evaluation of depression diagnosis and severity (Schumann et al., 2011). It is impossible to tell simply from a depression symptom checklist measure if somatic symptoms of depression endorsed are confounded by physical health problem. However, the exclusive approach has been shown to identify individuals with more severe depression, and thus it may provide more specificity with respect to detecting suicide risk in physically ill

populations. In contrast, the inclusive approach may have more sensitivity with respect to detecting depression and thus suicide risk, especially among individuals with a more somatic presentation of depression such as older adults. Additionally, even when somatic symptoms only serve as indicators of physical illness severity and not of depression per se, this may also contribute to predicting suicide risk since physical illness is a predictor of suicide risk.

Statement of the Problem

Suicide is consistently ranked among the top 10 causes of death among adults in the U.S. (Heron, 2015; Rockett & Caine, 2015). Older adults, males, and individuals with physical health problems are at an elevated risk for suicide (Conwell et al., 2011; Curtin, et al., 2016; Lutz et al., 2016). Depression diagnosis and depression symptom severity are risk factors for suicidal ideation, attempts, and death by suicide (Brådvik et al., 2008; Cukrowicz et al., 2011; Simon et al., 2013; Wilcox et al., 2010). Depression symptom severity is commonly operationalized as a simple list count of all depression symptoms endorsed (e.g. Cukrowicz et al., 2011). Using a simple symptom count to determine suicide risk is problematic, however, as certain groups of individuals may be less likely to present with certain symptoms of depression and the presence of certain symptoms of depression may be confounded by other factors unrelated to depression such as physical illness.

Affective symptoms of depression such as depressed mood, hopelessness, and worthlessness are commonly found to be the depression symptoms most strongly associated with suicide risk (Bolton et al., 2008; Hawton et al., 2013; Phillips et al., 2007). Older adults tend to have a more somatic presentation of depression (e.g., sleep problems, fatigue, psychomotor retardation; Fiske et al., 2009) and thus affective symptoms may be less prevalent as compared to affective symptoms among adults. Similarly, research suggests that males have a more somatic

presentation of depression as compared to females (Hammen & Padesky, 1977; Vredenburg, Krames, & Flett, 1986) and are less likely to endorse common affective symptoms such as depressed mood (Olfiffe & Phillips, 2008). Affective symptoms may be less useful and/or somatic symptoms may be more useful in predicting suicide risk depending on the age and gender of the individual. Lastly, somatic symptoms of depression among individuals with physical illnesses may be confounded with and inflated by the co-occurring physical illness (Ayotte et al., 2010; Drayer et al., 2006). Somatic symptoms in these individuals may not be an accurate measure of depression severity and thus may not be useful in determining suicide risk. In conclusion, the literature suggests that certain depression symptoms are more predictive of suicide risk as compared to other symptoms and that the predictive utility of different depression symptoms may differ among different populations (i.e., males, older adults, individuals with physical health problems). The present study investigated the association between cognitive affective and somatic symptoms of depression and suicide risk among adults and older adults.

Data were gathered from Mechanical Turk (MTurk) to investigate the association between different symptoms of depression and current suicide risk in a cross-sectional sample of adults and older adults. Suicide risk was measured using the Suicidal Behaviors Questionnaire-Revised (SBQ-R), a self-report measure assessing past suicidal ideation and attempts and likelihood of future attempt. A measure of male depression was included in the MTurk study to investigate the predictive utility of a male depression screener over and above traditional depression screeners in predicting suicide risk.

The present study is the first to investigate the relation between different symptoms of depression and suicide risk in older adults and individuals with physical health problems as well as the first to investigate the relation between male depression symptoms and suicide risk in a

mixed gender community dwelling sample. Findings from this study will inform the literature as to the specific symptoms of depression that are most strongly associated with suicide risk in different at-risk groups of individuals, thus improving the detection of suicide risk in these different groups.

Primary and Exploratory Aims

Primary Aim One: Cognitive/affective symptoms of depression will be predictive of current suicide risk.

Primary Aim Two: Somatic symptoms of depression will be predictive of current suicide risk.

Exploratory Aim One: Investigate the predictive utility of cognitive/affective symptoms as compared to somatic symptoms in predicting current suicide risk.

Exploratory Aim Two: Investigate whether the predictive utility of cognitive/affective symptoms in predicting current suicide risk differs among younger adults (age 59 and younger) as compared to older adults (age 60 and older). Categorizing older adults as those age 60 and older is common in the depression and suicide literature (e.g., Karch, 2011; Centers for Disease Control and Prevention).

Exploratory Aim Three: Investigate whether the predictive utility of somatic symptoms in predicting current suicide risk differs among younger adults (age 59 and younger) as compared to older adults (age 60 and older).

Exploratory Aim Four: Investigate whether the predictive utility of cognitive/affective symptoms in predicting current suicide risk differs among males as compared to females.

Exploratory Aim Five: Investigate whether the predictive utility of somatic symptoms in predicting current suicide risk differs among males as compared to females.

Exploratory Aim Six: Investigate whether the predictive utility of cognitive/affective symptoms

in predicting current suicide risk differs depending on physical health status.

Exploratory Aim Seven: Investigate whether the predictive utility of somatic symptoms in predicting current suicide risk differs depending on physical health status.

Exploratory Aim Eight: Investigate the predictive utility of conventional depression measures as compared to a measure of male depression in predicting current suicide risk.

Exploratory Aim Nine: Investigate and compare the predictive utility of all symptoms of depression in predicting current suicide risk.

Methods

Procedures

Data consisted of participants recruited from the internet through Amazon's Mechanical Turk (MTurk; Buhrmester, Talaifar, & Gosling, 2018). The MTurk dataset was used to investigate the relation between depression symptoms and suicide risk cross-sectionally.

Recruitment through MTurk is an inexpensive and swift method to recruit large samples of participants. MTurk allows researchers to recruit individuals based on a number of factors such as country of origin, race, age, and Human Intelligence Tasks (HIT) approval rate. Every HIT is a Mturk task (such as the present survey) hosted by MTurk requesters for participants to complete. The HIT approval rate is the proportion of participant's past completed Mturk tasks that were approved by the task's host. Higher HIT percentage indicates greater number of completed tasks that satisfied the standards of said task's host. The American MTurk sample was found to be comparable to nationally representative traditional American survey samples with respect to demographics of gender ratios, education levels, percent Caucasian, and attention check success rates (Berinsky, Huber, & Lenz 2012). MTurk participants have been demonstrated to be similar to in person participants on a variety of behavioral and cognitive tasks

(e.g., economic games, priming tasks; Paolacci & Chandler, 2014). Additionally, personality surveys completed by MTurk participants are comparable to personality distributions in the general population and show high alpha reliability (Buhrmester et al., 2011), suggesting high attention paid to the task and low rates of invalid responding. Overall, MTurk participants show similar rates of attention and consistency in responses as compared to samples recruited through other methods and are generally truthful in their responses (Paolacci & Chandler, 2014). The veracity of the MTurk participants' responses is demonstrated by the findings that the physical addresses that participants provided usually corresponded with their IP addresses and that the information participants provided on demographic measures as well as psychiatric self-report measures were consistent across time (Paolacci & Chandler, 2014).

Recruitment was limited to participants residing in the United States as research indicates that participants from other countries provide less reliable data (e.g., failing more attention checks, completing the same survey multiple times; Smith, Roster, Golden, & Albaum, 2016). Participants were excluded if they failed attention checks, attempted to complete the survey multiple times, or were from countries outside of the US. The following attention checks were utilized in the study to exclude participants. A question asking about exact date of birth and a question asking about current age were placed at the beginning and end of the study, respectively. Deviation by more than 1 year constituted failing this attention check. Additionally, one attention check question requiring the participant to select a particular answer was included in each of the following measures: CES-D11, SBQ-R, MDRS-22, Health Condition Checklist, and PHQ-9 questionnaires. Participants who successfully completed the majority of the attention checks (i.e., 4 out of the 6 attention checks) were included in the analyses. In instances when the participant failed an attention check embedded in a measure, the participant's data for said

measure was excluded from the analyses.

A study by Berinsky and colleagues (2012) found that recruitment was fast and consistent when participants were compensated \$0.25 for completing short two to four minute surveys. The present study was estimated to take approximately 15 to 30 minutes and thus MTurk participants recruited for this study were compensated \$2.50 for completing the study. This translates into an average hourly wage of between \$5 to \$10 dollars (for reference, federal minimum wage in 2019 = \$7.25 per hour). Some research suggest that MTurk participants may have more mental health symptoms than the general population (Paolacci & Chandler, 2014), however this is a strength with respect to the aims of this study (i.e., recruiting sufficient number of individuals with mental health symptoms to detect a relation between depression and suicide risk).

The goal of the study was to recruit at least 500 participants age 18 and older with 100 of the participants being at least age 50 or older and 100 of the participants being at least age 60 and older. The project aimed to recruit a minimum of 500 participants as power analyses indicated that small to moderate effect sizes would be detected in linear regressions with five or fewer predictors in a sample of 500 (Faul, Erdfelder, Lang, & Buchner, 2007). MTurk studies with fewer participants were able to detect significant effects using the same suicide risk outcome measure used in this study (e.g., Webb, Cui, Titus, Fiske, & Nadorff, 2018). The ideal recruitment goal was 1000 participants; the reason for over-recruiting beyond the needed N is because past MTurk studies have commonly had to exclude a substantial number of participants for failing attention checks (e.g., Webb et al., 2018). Consequently, 1009 participants ended up being successfully recruited to ensure that there would be a sufficient number of participants to be included in the final analyses who passed the exclusion criteria of the study.

Shapiro, Chandler, and Mueller's study (2013) found that MTurk participants with HIT

rates of 90% or higher reported depression symptoms at the same rate as the general population and demonstrated high rates of internal consistency and test-retest reliability on a depression inventory. As research indicates that quality of the data is higher when MTurk participants with high HIT rates are recruited (Peer, Vosgerau, & Acquisti, 2014), the present study set a 90% HIT criteria for participants under the age of 50. The HIT 90% requirement was not imposed when recruiting participants age 50 and older due to the difficulty in recruiting middle aged and older adults from MTurk. The MTurk work pool is comprised of predominately younger adults in their late 20s to mid-30s (Shapiro et al., 2013) and thus the addition of a HIT exclusion criterion would have made the already difficult task of recruiting middle aged and older adults unfeasible.

Measures

Demographics (Appendix A). Characteristics of the sample assessed included age, gender (male/female/other), race (Caucasian, African American, Hispanic, Asian/Pacific Islander, and other), level of education (less than high school, high school degree/GED, some college, four year college degree, and graduate degree), marital status (single, cohabitating, married, separated, divorced, widowed), number of children, employment status (employed full time, employed part time, unemployed, disabled, and retired), and income (0 - 9,999, 10,000 - 19,999, 20,000 - 39,999, 40,000 - 59,999, and 60,000+). Demographic questions were administered at the end of the MTurk survey. All other surveys were administered in the order that they appear below. The skew and kurtosis for the age variable were -.36 and -1.29.

Center for Epidemiological Studies Depression Scale 11 item version (CES-D11; Kohout, Berkman, Evans, & Cornoni-Huntley, 1993; Appendix B). Depression symptoms were measured using the CES-D11 item scale, a self-report measure of symptoms experienced during the past week. Items are rated on a scale of 0 (rarely or none of the time) to 3 (most or all of the

time) with higher scores indicating greater depression. A cut off score of 9 has demonstrated an 85% concordance with the CIDI-SF among participants in the SALT study (Suthers et al., 2004). The CES-D11 has the same four factor structure as the original CES-D (i.e., depressed affect, positive affect, somatic complaints, and interpersonal problems) and has a Cronbach's alpha of .76 (Kohout et al., 1993). The cognitive affective subscale used in the analyses consisted of the combination of the depressed affect factor items (2, 6, and 9) and positive affect factor items (5 and 8) with the positive affect items being reverse coded with higher values indicating less positive affect. The somatic subscale used in the analyses consisted of the somatic factor items (1, 3, 4, and 11). The Cronbach's alpha in the present study was .92 for the full scale, .90 for the cognitive affective subscale, and .82 for the somatic subscale. The skew and kurtosis were .62 and -.52 for the full scale, .65 and -.45 for the cognitive affective subscale, and .47 and -.71 for the somatic subscale. The CES-D11 has a range between 0 and 33. The CES-D11 cognitive affective subscale has a range between 0 and 15 and the somatic subscale has a range between 0 and 12.

Suicidal Behaviors Questionnaire-Revised (SBQ-R; Osman et al., 2001; Appendix C). Suicide risk was measured using the SBQ-R, a four item self-report questionnaire that assesses suicidal ideation and behaviors. Scores range from 3 to 18 with higher scores indicating greater suicide risk. Among inpatients, the intercorrelation among items ranged from .62 to .76 and the Cronbach's alpha was .87 (Osman et al., 2001). The Cronbach's alpha was .70 in a sample of older adults (Bamonti, Price, & Fiske, 2014). A cut-off score of 7 had a 93% sensitivity and 95% specificity in differentiating at risk community dwelling adults and a cut off score of 8 had an 80% sensitivity and 91% specificity in differentiating at risk adult inpatients (Osman et al., 2001). Bamonti and colleagues' (2014) study with community dwelling older adults utilized a

cut-off score of 8 to delineate at-risk individuals. The Cronbach's alpha for the SBQ-R in this study was .83. The SBQ-R had an elevated skew and kurtosis of 1.86 and 3.37, respectively, and thus a logarithmic transformation was conducted, which improved the skew to .93 and the kurtosis to -.21.

Male Depression Risk Scale (MDRS-22; Rice et al., 2013; Appendix D). Masculine depression symptoms were assessed using the MDRS-22, a self-report measure of symptoms theorized to be indicative of depression among males. The MDRS-22 consists of 22 items of masculine depression symptoms experienced over the past one-month period rated on a scale of 0 (not at all) to 6 (almost always). Factor analyses for the MDRS-22 has discerned six subscales: emotional suppression, alcohol use, drug use, anger and aggression, somatic symptoms, and risk taking (Rice et al., 2013). The scale has demonstrated a Cronbach's alpha between .90 and .92 for males and .86 and .87 for females as well as a test retest reliability of .78 for males and .67 for females over a three-month period in a sample of adults living in the community (Rice et al., 2015). The validity of the MDRS-22 is supported by the finding that males who have experienced a recent life stressor demonstrate greater increases in MDRS-22 scores as compared to females who have experienced a recent stressor (Rice et al., 2015). Several important limitations to note for this scale are that the psychometric properties of the scale have not been validated in older adult samples and the scale's ability to detect changes in symptoms as a result of treatment has not been evaluated. The Cronbach's alpha for the MDRS-22 in this study was .92. The skew and kurtosis were 1.13 and 1.05, respectively. The MDRS-22 total score has a range between 0 and 132.

The MDRS-22 was chosen over the other two male depression scales, the Gotland Male Depression Scale and the Masculine Depression Scale, for several reasons. The Gotland Male

Depression Scale demonstrated validity via its association with other depression measures and predictive association with initiating antidepressant medication usage (Zierau et al., 2002). The Gotland measure was not chosen, however, due to its poor psychometric properties. The scale had poorer Cronbach's alpha as compared to the MDRS-22 (Cronbach's alpha of .75 for the depression dimension and .78 for the distress dimension) and the scale's test-retest reliability has not been established (Zierau et al., 2002). Additionally, the Gotland measure demonstrated poor factor fit indices in both two-factor as well as three-factor models (Rice, Aucote, Möller-Leimkühler, & Amminger, 2015). The Masculine Depression Scale demonstrated a high internal consistency of .95 and was correlated with measures of depression as well as gender norm adherence. However, the scale was not chosen because its test-rest reliability has not been established and because the scale is fairly long with a total of 44 items (Magovcevic & Addis, 2008).

Health Conditions Checklist. The Swedish Twin Registry Screening Across the Lifespan Twin study (Lichtenstein et al., 2006; Appendix E) health conditions checklist was used to assess physical health. The yes/no checklist assesses 58 health problems and has been used in several past studies as an indicator of physical health (e.g., Ropponen, Narusyte, Alexanderson, & Svedberg, 2011; Svedberg, Bardage, Sandin, & Pedersen, 2006). The sum total of 57 items of the checklist was used as an indicator of physical health with higher scores indicating poorer physical health. Item 36 "mental problems/illness" was excluded as it was confounded with the independent and dependent variables assessing mental health. The health conditions variable had an abnormal skew and kurtosis due to outliers (2.87, 19.61, respectively) and thus the highest .5% of scores were deleted (i.e., 5 participants who endorsed 27 or more health conditions), which normalized the skew and kurtosis of the variable (.89, 1.03, respectively). The health

conditions checklist has a range between 0 and 57.

Patient Health Questionnaire-9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001; Appendix F). Depression symptoms were also assessed using the PHQ-9, which is a self-report measure of depression symptoms experienced over the past two-week period. The nine items in the PHQ-9 correspond to the nine diagnostic symptoms of MDD based on the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-V; American Psychiatric Association, 2013). Symptoms are rated on a scale of 0 (not at all) to 3 (nearly every day). Past research has identified a two-factor cognitive affective subscale and a somatic subscale in patients with spinal cord injuries and patients with heart disease (de Jonge et al., 2007; Richardson & Richards, 2008). The same coding was used to create the cognitive affective subscale (i.e., items 1, 2, 6, and 7) and somatic subscale (i.e., items 3, 4, 5, and 8) used in the present analyses. Scores of 5, 10, 15, and 20 indicate mild, moderate, moderately severe, and severe depression, respectively. The PHQ-9 has an 88% sensitivity and 88% specificity for MDD when using a cut off score of 10 or higher in adult samples (Kroenke et al., 2001) and a sensitivity of 88% and specificity of 80% when using a cut off score of 9 or higher in older adult samples (Phelan et al., 2010). The PHQ-9 has demonstrated a Cronbach's alpha of .89 in primary care samples as well as a test-retest reliability of .84 over a 48-hour period (Kroenke et al., 2001). Item 9, which assesses suicidal ideation, was excluded in all analyses relating to suicide risk due to the overlap between this item and items on the SBQ-R. The PHQ used in this study's analyses that has item 9 excluded is referred to as the PHQ-8. The Cronbach's alpha in the present study was .91 for the full scale, .91 for the PHQ-8 scale excluding item 9, .90 for the cognitive affective subscale, and .78 for the somatic subscale. The skew and kurtosis were 1.08 and .38 for the full scale, 1.01 and .14 with item 9 excluded, 1.18 and .42 for the cognitive affective subscale, and .88 and -.002 for

the somatic subscale. The PHQ-9 has a range between 0 and 27 and the PHQ-8 has a range between 0 and 24. Both the cognitive affective and somatic subscales have a range between 0 and 12.

Data Analytic Plan

Exploratory correlation analyses were conducted for all continuous variables of interest (i.e., CES-D11, PHQ-8, MDRS-22, health conditions checklist, and SBQ-R). A series of multiple linear regressions were conducted with SBQ-R as the dependent variable to investigate the predictive utility of cognitive affective and somatic symptoms of depression. Regression analyses were repeated using the logarithmic transformed SBQ-R variable to determine if there were any differences in findings. All multiple regression analyses were run using the PHQ-8 and CES-D11 scales separately, controlling for age and gender. All analyses predicting SBQ-R using the PHQ was done with item 9 excluded from the PHQ scale, i.e., using the PHQ-8. Primary Aim One was addressed with a multiple regression using cognitive/affective symptoms of depression to predict current suicide risk. Primary Aim Two was addressed with a multiple regression using somatic symptoms of depression to predict current suicide risk.

Exploratory Aim One was addressed using a multiple regression with both cognitive/affective and somatic symptoms of depression entered into the model simultaneously to predict current suicide risk. Exploratory Aim Two was addressed using a multiple regression with cognitive/affective symptoms and age (dichotomized) entered into step one and their interaction entered into step two of the model to predict suicide risk. Analyses were repeated with age as a continuous variable. Exploratory Aim Three was addressed using a multiple regression with somatic symptoms and age (dichotomized) entered into step one and their interaction entered into step two of the model to predict suicide risk. Analyses were repeated

with age as a continuous variable. Exploratory Aim Four was addressed using a multiple regression with cognitive/affective symptoms and gender entered into step one and their interaction entered into step two of the model to predict suicide risk. Exploratory Aim Five was addressed using a multiple regression with somatic symptoms and gender entered into step one and their interaction entered into step two of the model to predict suicide risk. Exploratory Aim Six was addressed using a multiple regression with cognitive/affective symptoms and health conditions checklist (continuous) entered into step one and their interaction entered into step two of the model to predict suicide risk. Exploratory Aim Seven was addressed using a multiple regression with somatic symptoms and health conditions checklist (continuous) entered into step one and their interaction entered into step two of the model to predict suicide risk. Exploratory Aim Eight was addressed using a multiple regression with conventional depression screener entered into step one and the MDRS-22 entered into step two of the model to predict suicide risk. Exploratory Aim Nine was addressed using all symptoms of depression entered into a multiple regression model simultaneously to predict suicide risk.

Results

A total of 1009 participants began the study survey and 944 participants were included in the final analyses. Participants were excluded as follows: 51 participants were excluded due to not completing the study, 6 participants/12 participant entrees were excluded due to having participated in the survey twice, and 2 of the remaining participants were excluded due to failing the majority of the attention checks. Additionally, of the 944 participants included in the final analyses, the following participants were excluded from analyses involving specific individual measures due to failing the attention checks embedded in said measures: five participants were excluded from all analyses involving the CES-D11 variables due to failing the CES-D11

attention check, four participants were excluded from all MDRS-22 analyses, 45 participants were excluded from all SBQ-R analyses, nine participants were excluded from all PHQ-9 analyses, and three participants were excluded from all health conditions analyses. Participants completed the study on average in 16.5 minutes ($SD = \text{plus minus } 41 \text{ minutes}$). Older adults did not significantly differ from younger adults in time spent completing the study, $F(1,942) = .04$, $p = .84$.

Participants included in the study were primarily middle aged ($M = 51.77$), Caucasian (86.4%), partnered (51.6%), females (53.3%). The majority of participants were college educated (51.5%), employed (68.9%), and had an annual income of 20,000 or greater (76.7%). Additional demographic information is presented in Table 1.

The sample had mild levels of mental health symptoms. The average PHQ-9 score of the sample was 5.8, which is in the mild range, with 55.6% of the sample scoring in the minimal range, 19.5% in the mild range, 13.9% in the moderate range, and 11.0% in the moderately severe to severe range (Kroenke & Spitzer, 2002). Over a quarter of the sample (25.3%) scored in the clinically significant risk range on the SBQ-R (i.e., score of 7 or higher; Osman et al., 2001). Descriptive statistics were conducted to compare differences on the depression scales and the suicide risk scale based on age, gender, and number of health conditions. Age was dichotomized at 60, i.e., 60 and older vs 59 and younger, and ANOVA indicated that younger adults had significantly higher depression symptoms on all scales as well as higher suicide risk ($p < .05$ for all; Table 2). Although the sample overall is a non-clinical community dwelling sample, when analyzed by age, over a third of the younger adults (age 59 and younger) had characteristics of a clinical sample. Thirty four percent of younger adults scored above the PHQ-9 clinical cut-off score of 10 and 33% scored above the SBQ-R clinical cut-off score of 7.

Males had demonstrated significantly higher scores on the MDRS-22 as compared to females ($p = .02$), and females had significantly higher somatic symptoms of depression than males, although the difference was less than half a point on both the CES-D11 and PHQ-8 somatic subscales ($p < .05$ for all; Table 2).

Individuals had on average 6.8 health conditions ($SD = 4.6$) with 5.8% of the sample endorsing 0 conditions, 29% endorsing between 1 - 4 conditions, 41.2% endorsing 5 - 9 conditions, 17.7% endorsing 10 - 14 conditions, and 6.3% endorsing 15 or more conditions. Younger adults had on average 6 conditions ($SD = 4.6$) whereas older adults had on average 7.7 conditions ($SD = 4.4$; $F(1,934) = 31.48$, $p < .01$). The five most common health conditions endorsed were chicken pox ($N = 608$), back pain ($N = 500$), allergy ($N = 479$), shoulder pain ($N = 341$) and dizziness ($N = 337$). The health conditions measure was dichotomized at the median of the sample, i.e., six or fewer health conditions vs seven or more health conditions for the descriptive analyses (Table 2). Individuals with seven or more health conditions had significantly higher depression symptoms on all scales as well as higher suicide risk scores ($p < .05$ for all; Table 2).

Correlations for continuous variables are presented in Table 3. Depression symptoms were positively associated with each other, health conditions, and suicide risk. Age was negatively associated with depression symptoms and suicide risk whereas number of health conditions was positively associated with depression symptoms and suicide risk.

Primary Aims One & Two

The cognitive affective symptoms of depression, as measured by the CES-D11 and the PHQ-8, were significant in predicting suicide risk in their respective models over and above age and gender, $B = .48$, $SE = .03$, $t = 16.81$, $p < .01$, $\Delta R^2 = .23$ and $B = .61$, $SE = .03$, $t = 18.70$, $p < .01$.

.01, $\Delta R^2 = .27$, respectively. The somatic symptoms of depression as measured by the CES-D11 and the PHQ-8 were also significant in predicting suicide risk in their respective models, $B = .58$, $SE = .04$, $t = 15.82$, $p < .01$, $\Delta R^2 = .21$; $B = .60$, $SE = .04$, $t = 15.69$, $p < .01$, $\Delta R^2 = .21$; respectively. All findings remained significant when the transformed SBQ-R scale was used as the dependent variable ($p < .05$ for all).

Exploratory Aim One

The cognitive affective subscale and the somatic subscale of the CES-D11 both separately predicted suicide risk as measured by the SBQ-R in a multiple linear regression model over and above age and gender, $B = .31$, $SE = .04$, $t = 7.42$, $p < .01$ and $B = .29$, $SE = .05$, $t = 5.39$, $p < .01$, respectively, $\Delta R^2 = .25$. Similarly, both the PHQ-8 cognitive affective subscale and somatic subscale also separately predicted suicide risk, $B = .49$, $SE = .05$, $t = 9.50$, $p < .01$ and $B = .17$, $SE = .06$, $t = 2.92$, $p < .01$ respectively, $\Delta R^2 = .27$. All findings remained significant when analyses were rerun with the transformed SBQ-R variable ($p < .05$ for all).

Exploratory Aim Two

Age, measured continuously, moderated the relation between cognitive affective symptoms of depression, as measured by the CES-D11, and suicide risk, $B = -.005$, $SE = .002$, $t = -2.91$, $p < .01$, $\Delta R^2 = .01$ (Table 4). Results were consistent when age as a dichotomous variable (59 and younger vs 60 and older) was used to moderate the relation, $B = -.154$, $SE = .047$, $t = -3.24$, $p < .01$, $\Delta R^2 = .01$.

Age, measured continuously, was also found to moderate the relation between the cognitive affective subscale of the PHQ-8 and suicide risk, $B = -.005$, $SE = .002$, $t = -2.36$, $p = .02$, $\Delta R^2 = .004$ (Table 5). Results were also consistent when age, measured dichotomously, was used to moderate the relation, $B = -.208$, $SE = .065$, $t = -3.22$, $p < .01$, $\Delta R^2 = .01$.

When the transformed SBQ-R scale was used as the dependent variable, all findings remained consistent except for the continuous age by PHQ-8 cognitive affective subscale interaction, which was no longer significant although trending in the same direction, $B = -.0002$, $SE = .0001$, $t = -1.53$, $p = .13$, $\Delta R^2 = .002$.

Follow-up graphical depictions indicated that at higher levels of cognitive affective depression symptom severity as measured by the CES-D11, younger adults had higher risk scores than older adults with comparable levels of depression (Figure 1). Findings were similar for the PHQ-8 cognitive affective symptoms of depression (Figure 2).

Exploratory Aim Three

Age, measured continuously, moderated the relation between the somatic symptoms of depression, as measured by the CES-D11, and suicide risk, $B = -.008$, $SE = .002$, $t = -3.53$, $p < .01$, $\Delta R^2 = .01$ (Table 4). Results were consistent when age as a dichotomous variable was used to moderate the relation, $B = -.263$, $SE = .062$, $t = -4.26$, $p < .01$, $\Delta R^2 = .01$.

Age, measured continuously, was also found to moderate the relation between the somatic subscale of the PHQ-8 and suicide risk, $B = -.008$, $SE = .002$, $t = -3.80$, $p < .01$, $\Delta R^2 = .01$ (Table 5). Results were also consistent when age, measured dichotomously, was used to moderate the relation, $B = -.293$, $SE = .068$, $t = -4.30$, $p < .01$, $\Delta R^2 = .02$.

When the transformed SBQ-R scale was used as the dependent variable, all interactions between age and the somatic subscales remained significant ($p < .05$ for all).

Follow-up graphical depictions indicated that at higher levels of somatic depression symptom severity as measured by the CES-D11, younger adults had higher risk scores than older adults with comparable levels of depression (Figure 3). Findings were similar for PHQ-8 somatic symptoms of depression (Figure 4).

Exploratory Aims Four & Five

Gender did not moderate the relation between the CES-D11 cognitive affective subscale and suicide risk, $B = .001$, $SE = .056$, $t = .01$, $p = .99$, $\Delta R^2 = 0$, nor did gender moderate the relation between the PHQ-8 cognitive affective subscale and suicide risk, $B = -.009$, $SE = .063$, $t = -.14$, $p = .89$, $\Delta R^2 = 0$.

As with the cognitive affective subscales, the relation between the somatic subscales of the CES-D11 and PHQ-8 and suicide risk were also not moderated by gender, $B = -.031$, $SE = .073$, $t = -.42$, $p = .67$, $\Delta R^2 = 0$ and $B = -.109$, $SE = .075$, $t = -1.45$, $p = .15$, $\Delta R^2 = .002$, respectively.

The interaction between depression subscales and gender remained nonsignificant when the transformed SBQ-R scale was used as the dependent variable ($p > .05$ for all).

Exploratory Aims Six & Seven

The CES-D11 cognitive affective symptom subscale predicted suicide risk over and above the health conditions checklist, $B = .424$, $SE = .029$, $t = 14.68$, $p < .01$, $\Delta R^2 = .17$. However, the relation between the cognitive affective symptom subscale of the CES-D11 and suicide risk was not significantly moderated by the number of health conditions endorsed, $B = .01$, $SE = .006$, $t = 1.60$, $p = .11$, $\Delta R^2 = .002$. The PHQ-8 cognitive affective symptom subscale also significantly predicted suicide risk over and above the health conditions checklist, $B = .549$, $SE = .034$, $t = 15.99$, $p < .01$, $\Delta R^2 = .19$. Similarly, the cognitive affective symptom subscale of the PHQ-8 was also not significantly moderated by the number of health conditions, $B = .002$, $SE = .006$, $t = .30$, $p = .77$, $\Delta R^2 = 0$.

Both the CES-D11 and PHQ-8 somatic subscales predicted suicide risk over and above the health conditions checklist in their respective models, $B = .510$, $SE = .039$, $t = 13.11$, $p < .01$,

$\Delta R^2 = .14$ and $B = .514$, $SE = .041$, $t = 12.50$, $p < .01$, $\Delta R^2 = .13$, respectively. Number of health conditions also did not significantly moderate the relation between suicide risk and the CES-D11 somatic subscale or the PHQ-8 somatic subscale $B = .008$, $SE = .008$, $t = 1.06$, $p = .29$, $\Delta R^2 = .001$ and $B = .011$, $SE = .007$, $t = 1.55$, $p = .122$, $\Delta R^2 = .002$, respectively.

When analyses were rerun with the transformed SBQ-R scale as the dependent variable, the interaction between number of health conditions and all depression subscales remained nonsignificant ($p > .05$ for all).

Exploratory Aim Eight

The MDRS-22 significantly predicted suicide risk over and above age, gender, and depression symptoms as measured by the PHQ-8, $B = .051$, $SE = .007$, $t = 7.29$, $p < .01$, $\Delta R^2 = .04$ (Table 6). Findings were consistent when controlling for age, gender, and depression symptoms measured by the CES-D11, $B = .054$, $SE = .007$, $t = 7.64$, $p < .01$, $\Delta R^2 = .04$ (Table 6). Follow-up post hoc analysis found that gender significantly moderated the relation between the MDRS-22 and suicide risk, $B = .021$, $SE = .01$, $t = 2.14$, $p = .03$, $\Delta R^2 = .004$ (Table 6). All analyses remained significant when rerun with the transformed SBQ-R scale as the dependent variable.

Graphical depictions indicated that at higher levels of male depression symptom severity, females had slightly higher risk scores than males with similar levels of depression (Figure 5).

Exploratory Aim Nine

When all 11 symptoms of the CES-D11 were entered into a multiple linear regression model simultaneously to predict suicide risk after controlling for age and gender, the overall model was significant, Model $R^2 = .32$, $F(1, 13) = 31.81$, $p < .01$, and item 2 depressed mood, $B = .924$, $SE = .219$, $t = 4.22$, $p < .01$, item 10 interpersonal difficulties, $B = .626$, $SE = .188$, $t =$

3.34, $p < .01$, and item 11 psychomotor retardation, $B = .556$, $SE = .181$, $t = 3.07$, $p < .01$, remained significant. Item 4 sleep was not significant though trending in the same direction, $B = .261$, $SE = .133$, $t = 1.96$, $p = .05$. When analyses were rerun with the transformed scale, item 4 sleep, was also significant, $B = .021$, $SE = .008$, $t = 2.49$, $p = .01$.

When the eight symptoms of the PHQ-8 were entered into a multiple linear regression model after age and gender were controlled, the overall model was significant $\text{Model } R^2 = .35$, $F(1, 10) = 47.46$, $p < .01$, and item 2 negative affect, $B = .708$, $SE = .19$, $t = 3.73$, $p < .01$, item 3 sleep problems, $B = .487$, $SE = .130$, $t = 3.73$, $p < .01$, item 6 self-esteem, $B = .976$, $SE = .158$, $t = 6.16$, $p < .01$, item 7 concentration, $B = .385$, $SE = .188$, $t = 2.05$, $p = .04$, and item 8 psychomotor retardation, $B = .805$, $SE = .202$, $t = 3.99$, $p < .01$, all remained significant in predicting suicide risk. When analyses were rerun with the transformed SBQ-R variable, item 7, trouble concentrating, was no longer significant though trending in the same direction, $B = .019$, $SE = .012$, $t = 1.58$, $p = .11$.

Discussion

The present study investigated the utility of depression symptoms from the CES-D11, PHQ-9, and MDRS-22 in predicting suicide risk as measured by the SBQ-R and whether the predictive utilities of these symptoms were moderated by age, gender, or number of health conditions. This study is unique in that it is the first study to investigate age, gender, and health status as moderators as well as being the first study to investigate the utility of the MDRS-22 in predicting suicide risk in a sample of mixed gender adults from the community. The sample consisted of 944 adults recruited from MTurk. The sample's scores on the clinical measures, e.g., PHQ-9, SBQ-R, were comparable to scores of non-clinical community samples (e.g., Kroenke et al., 2001, Osman et al., 2001).

Descriptive statistics indicated that younger adults scored higher than older adults on all depression symptom measures as well as on the suicide risk measure. Similar to younger adults, individuals with more health conditions also scored higher on all measures of depression and the suicide risk measure. Females demonstrated slightly but statistically significantly higher levels of somatic symptoms (less than .5 point difference) on the CES-D11 and PHQ-9 somatic subscales, whereas males scored higher on the MDRS-22. Importantly, suicide risk, as measured by the SBQ-R in this study, did not significantly differ by gender.

Both cognitive affective and somatic symptoms of depression were predictive of suicide risk, with each subscale independently adding predictive utility to the model even after controlling for age and gender. These findings are consistent with the limited studies on the relation between cognitive affective and somatic depression symptom subscales and suicide risk. Several studies have found the cognitive affective subscales of depression measures to be predictive of suicidal ideation (e.g., BDI-I, Keilp et al., 2012; BDI-II, Winer et al., 2014). The Keilp and colleagues (2012) study also found a weak relation between the BDI somatic complaints subscale and suicidal ideation, however the somatic complaints subscale failed to differentiate between individuals categorized into having any level of suicidal ideation vs. those with no suicidal ideation.

According to the interpersonal theory of suicide, suicidal ideation, the precursor to death by suicide, arises from a sense of thwarted belongingness as well as a sense of being a burden to others (Van Orden et al., 2010). The interpersonal theory of depression states that individuals with depression engage in various behaviors that damage their social relationships, thus leading to greater depression (Coyne, 1976a; Coyne, 1976b) as well as potentially to greater feelings of perceived burdensomeness and thwarted belongingness (Kleiman et al., 2014). Increases in

feelings of thwarted belongingness and perceived burdensomeness have been found to mediate the relation between depression and suicidal ideation (Kleiman, Liu, & Riskind, 2014). No studies to date have investigated how the different symptom clusters of depression (i.e., cognitive affective and somatic symptoms) relate to feelings of perceived burdensomeness and thwarted belongingness. It may be that cognitive affective symptoms negatively bias an individual's perception of the world, thus leading them to perceive themselves to be more a burden or be more socially isolated than they truly are. Somatic symptoms of depression may physically impair an individual's ability to engage in certain activities (e.g., too tired to clean the house, excessive sleeping leading to missing opportunities to socialize with friends), resulting in a greater sense of perceived burdensomeness and thwarted belongingness. Future studies may investigate how the different clusters of depression symptoms separately influence feelings of perceived burdensomeness and thwarted belongingness. Future studies may also investigate whether perceived burdensomeness or thwarted belongingness mediate the relation between cognitive affective and somatic symptoms of depression and suicide risk.

Older adults have been found to have lower rates of major depression as compared to other age groups (Kessler et al., 2010). There are multiple potential explanations for this finding. Older adults are less likely to present with cognitive affective symptoms such as depressed mood or anhedonia (Gallo, Anthony, & Muthén, 1994), which may contribute to less diagnosis of major depression in this age group, given that the DSM criteria for major depression requires one of the five endorsed depression symptoms to be either depressed mood or anhedonia. According to the socio-emotional selectivity theory, older adults put a higher priority on maximizing positive experiences and close social relationships as compared to younger adults, which may thus act as a protective barrier against depression (Blazer & Hybels, 2005; Carstensen, 1992). In

the present study, age was found to moderate the relation between both cognitive affective and somatic symptoms of depression and suicide risk. Findings indicate that at the lowest levels of cognitive affective or somatic symptoms, younger adults and older adults have comparable levels of suicide risk. However, at higher levels of symptom severity, younger adults have higher suicide risk as compared to older adults with comparable levels of depression symptom severity.

The selectivity in time and resource allocation toward fulfilling positive experiences and social relationships more commonly seen among older individuals (Carstensen, 1992) may be a protective factor against suicide risk even for older adults with high levels of depression. These decisions may help mitigate the negative influence of depression on social relationships and subsequent feelings of perceived burdensomeness and thwarted belongingness, leading to decreased suicide risk (Coyne, 1976a; Coyne, 1976b; Kleiman et al., 2014). Future studies may investigate whether perceived burdensomeness and thwarted belongingness interact with age to moderate the relation between cognitive affective and somatic symptoms of depression and suicide risk. Importantly, however, findings that older adults have a lower suicide risk as compared to younger adults even at high levels of depression symptom severity may also be reflective of the fact that middle aged adults, which in this study were included in the younger adult group, have a higher overall risk for suicide as compared to older adults (Curtin et al., 2016). Younger adults also tend to have higher 12 month prevalence rates of suicidal ideation (Borges et al., 2010) which is captured by one of the four suicide risk questionnaire items and may thus also be driving the finding of overall higher suicide risk scores among younger adults as compared to older adults.

Each age group presents with different challenges to suicide risk assessment and risk for suicide. Among the United States population, younger adults ages 18 to 29 have higher rates of

suicidal ideation, planning, and attempts (Crosby et al., 2011), middle aged adults have the highest rates of death by suicide (Curtin et al., 2016), and older adults have a low ratio of suicide attempts to death by suicide, with deaths due to suicide being especially difficult to prevent in this age group (Conwell et al., 2011). These differences support the need for evaluations of suicide risk to be age specific. The present findings suggest that when assessing suicide risk, the severity of the depression symptoms endorsed should be given more weight for younger adults as compared to older adults. It is important to note, however, that depression, including diagnosis and symptom severity, should never be the only factor evaluated when determining suicide risk.

Researchers have posited that males and females may differ in their presentation of depressive symptomology (Berger et al., 2012; Oliffe & Phillips, 2008; Rochlen et al., 2010). Researchers have hypothesized that males may be socialized to be more avoidant of expressing negative affect as compared to females (Addis, 2008; Genuchi & Valdez, 2015) and have a greater stigma against depression (Oliffe et al., 2016), thus resulting in a more somatic presentation of depression (Padesky & Hammen, 1981; Vredenburg, Krames, & Flett, 1986). Differences in depressive phenotype may affect accurate diagnosis and treatment of depression which then affects suicide risk (Rutz et al., 1997). Based on the present findings, it did not appear that males were more hesitant in reporting cognitive affective symptoms or more willing to report somatic symptoms of depression on self-report depression screeners as evidenced by the comparable rates of depression symptom severity endorsed by males and females in this study. There were no gender differences in cognitive affective depression symptom severity and females actually had slightly higher somatic symptoms of depression than males. This is consistent with other studies that have also found slightly higher somatic symptomology among females (e.g., Delisle, Beck, Dobson, Dozois, & Thombs, 2012). Population studies have found

that almost twice as many women are diagnosed with major depression as compared to men (Eaton et al., 2012; Marcus et al., 2005). The present findings that males have comparable levels of depression symptoms as females does not contradict findings in past literature on prevalence rates of depression diagnoses as the present study was with a non-clinical sample. Past studies with non-clinical samples have also found similar levels of depression symptoms in males as compared to females (e.g., Delisle et al., 2012). A recent meta-analysis of depression studies across the lifespan has found that gender differences in depression symptoms are prevalent in adolescence and early adulthood but mostly disappear by an individual's 30s and onwards (Salk, Hyde, & Abramson, 2017).

Males consistently have the highest rates of death by suicide across all age groups (Curtin et al., 2016) which may be due in part to their reluctance to seek help for mental health concerns (Doherty & Kartalova-O'Doherty, 2010; Husky et al., 2016) and use of more lethal methods (Curtin et al., 2016). It is thus essential that suicide risk is accurately assessed in males. Although females reported slightly higher somatic symptoms of depression, moderation analyses did not find gender to moderate the relation between cognitive affect or somatic symptoms of depression and suicide risk. Both cognitive affective and somatic symptoms of depression significantly predicted suicide risk in their respective models after controlling for gender. This suggests that both cognitive affective and somatic symptoms of depression are significant suicide risk factors for both males and females. Suicide risk assessments should thus be conducted with both males and females who present with elevated cognitive affective or somatic symptoms of depression. Researchers have argued that males present with gender specific symptoms of depression not adequately captured by conventional depression measures and have thus designed scales to tap into other symptoms theorized to be part of a male's experience of depression (e.g., Zierau et al.,

2002, Rice et al., 2013, Magovcevic & Addis, 2008). Regardless of what additional symptoms comprise the male presentation of depression, the present findings indicate that conventional symptoms of depression, i.e., cognitive affective and somatic symptoms, are valid and useful indicators of depression severity in both males and females given their association with suicide risk in both sexes.

However, male depression measures designed to capture hypothesized atypical symptoms of depression that comprise the male depression experience may improve the accuracy of measuring depression symptom severity in males. As depression symptom severity is a key risk factor for suicide (Brådvik et al., 2008), more accurate evaluation of symptom severity through use of male depression measures would thus improve the accuracy of evaluating risk for suicide. Males were found to have scored higher on the MDRS-22 as compared to females however there were no gender differences in overall CES-D11 or PHQ-9 scales. These findings are consistent with the non-significant trend found in the Rice and colleagues' (2013) validation study of the MDRS-22 and supports the arguments some researchers have made that conventional depression scales do not fully capture the experience of depression among males (Olfiffe & Phillips 2008).

Although conventional depression measures are useful in predicting suicide risk, the present findings indicate that a male depression measure adds additional predictive utility over and above conventional scales. The MDRS-22 predicted suicide risk over and above both the CES-D11 and PHQ-8. To date, this is the first study to investigate the utility of the MDRS-22 in predicting suicide risk over and above other measures of depression in a sample of mixed gender community dwelling adults. Future studies may investigate whether incorporating a measure of male depression into the battery of commonly used suicide risk assessment measures (e.g.,

measures assessing conventional depression symptoms, hopelessness, reasons for living) improves the accuracy of suicide risk evaluations. Gender also moderated the relation between the MDRS-22 and suicide risk. Interestingly, however, higher scores on the MDRS-22 did not convey greater suicide risk for males as compared to females with comparable scores. Instead, the exact opposite phenomenon was found, with females with high MDRS-22 scores having higher risk scores on the SBQ-R as compared to males with comparably high MDRS-22 scores.

There is limited literature investigating gender as a moderator of the relation between male depression symptoms and suicide risk. Innamorati and colleagues (2011) found that the Gotland Scale for Depression predicted suicide risk in psychiatric inpatients however this relation was not moderated by gender. The present findings indicate that male depression symptoms are suicide risk factors for both males and females, however females with high levels of male depression may be at even greater risk than their male counterparts. This finding may reflect the fact that females are at overall higher risk for suicide attempts as compared to males (Tsirigotis, et al., 2011), however additional research on gender differences in the risk that male depression symptoms pose for suicidal behaviors is warranted. The MDRS-22 may be especially useful in predicting suicide risk among females who endorse high levels of masculine characteristic traits. Women who endorse higher masculine traits tend to report lower levels of depression symptoms on conventional depression measures (Price, Gregg, Smith, & Fiske, 2018). These measures may not be fully capturing their depression severity and thus may be less useful in predicting suicide risk as compared to using the MDRS-22 or other masculine depression measures.

Chronic health conditions are risk factors for both depression and suicide (Gunn et al., 2012; Scott et al., 2010). Additionally, medical illnesses may confound the somatic symptoms of

depression (Ayotte et al., 2010; Matcham, Rayner, Steer, & Hotopf, 2013), thus potentially also confounding the utility of somatic depression symptoms in predicting suicide risk among those with health problems. Consequently, researchers have discussed potential advantages and disadvantages of using an exclusive approach to evaluating depression severity where all somatic symptoms of depression would be excluded vs using an inclusive approach which does not exclude any symptoms of depression when assessing depression among the medically ill (Koenig et al., 1997). Individuals with more health conditions in the present study scored higher on both cognitive affective and somatic symptoms of depression as well as suicide risk when compared to those with fewer health conditions. These findings are consistent with the literature on the relation between depression and physical health (Goldberg, 2010) and indicate that, in general, physical health conditions contribute to worsening depression overall and are not merely conflated with the somatic symptoms of depression or only contribute to worsening somatic symptoms.

Health conditions were associated with higher cognitive affective and somatic symptoms as well as greater suicide risk, however, health conditions did not moderate the relation between cognitive affective or somatic symptoms of depression and suicide risk. Both cognitive affective and somatic symptoms of depression significantly predicted suicide risk after controlling for number of health conditions in their respective models. These findings indicate that both cognitive affective as well as somatic symptoms of depression are useful indicators of depression severity and predictors of suicide risk regardless of physical health status, thus lending support for using the inclusive approach of assessing depression severity as an indicator of suicide risk among the physically ill. Certain medical disorders may inflate/confound the somatic symptoms of depression (e.g., arthritis, Matcham et al., 2013). However, the present findings are consistent

with the clinical consensus that in general when assessing depression in the medically ill population, the somatic symptoms of depression should not be weighted any differently than if working with physically healthy individuals (Kapfhammer et al., 2006).

Cognitive affective and somatic subscales of depression are both useful in predicting suicide risk, however not all individual cognitive affective or somatic symptoms are equally predictive. When all CES-D11 symptoms were entered into a model simultaneously to predict suicide risk, only depressed mood, interpersonal difficulties, psychomotor retardation, and sleep problems were significant. The PHQ-8 symptoms that remained significant in a multiple regression model were negative affect, self-esteem issues, concentration difficulties, psychomotor problems, and sleep problems. Negative affect, psychomotor problems, and sleep problems were found to predict suicide risk across two separate depression measures assessing depression symptoms across different timeframes (i.e., over past week for the CES-D11 and over past two weeks for the PHQ-9). Consistent with past literature, these findings provide support for the importance and robustness of negative affect, psychomotor retardation, and sleep problems as predictors of suicide risk. A recent case-controlled study of suicide found that in addition to depressed mood, lack of energy and psychomotor retardation were the only other symptoms predictive of suicide risk (Lin et al., 2014). Sleep problems have been well established as an independent predictor of suicide risk over and above depression symptoms (Bernert, Kim, Iwata, & Perlis, 2015). Similar to depression, sleep problems can consist of a wide array of different symptoms including difficulties falling asleep or staying asleep, waking up too early, frequent awakenings, poor sleep efficiency, low total sleep time, and unrestful sleep. Individuals presenting with depressed mood, psychomotor retardation, or sleep concerns should be evaluated

for suicide risk. Future studies may investigate what types of sleep problems pose the greatest risk for suicide.

Limitations

The results of this study need to be interpreted in the context of several limitations. Although some studies support the reliability of data collected from MTurk samples (e.g., Paolacci & Chandler, 2014), other studies have found that MTurk participants are less reliable in their responses as compared to in person participants (Rouse, 2015). The findings of this study may benefit from replication using an in-person sample. The present sample was a non-clinical sample and thus most participants had low levels of depression symptoms and suicide risk. The frequency of low scores on the suicide risk measure resulted in problematic skew and kurtosis which had to be corrected with logarithmic transformation. The use of a non-clinical sample supports the overall generalizability of findings but hinders generalizability to clinically severe samples such as inpatients. One limitation of the study was that mental health disorders and treatments were not assessed or controlled for however individuals were also not excluded due to the presence or absence of any mental health disorders or treatments thus supporting the generalizability of the findings. The sample was primarily Caucasian and thus findings may not generalize to more heterogeneous samples. Replication in other racial samples is warranted given the fact that suicide rates for males and females differ significantly by race and ethnicity (Curtin & Hedegaard, 2019). Some important strengths of the present sample include a relatively equal distribution of males vs females and younger vs older adults as well as being large enough to detect small to moderate effect sizes. Of note however, most of the older adults were between the ages of 60 and 70 with very few older adults in the sample over the age of 75. Another limitation of the study was that all depression variables were assessed via self-report, which is not as

accurate as structured clinical interviews (e.g., SCID, Stuart et al., 2014) and prevents the determination of depression diagnoses. Research indicates that the most accurate assessments should include both self-report and clinician ratings of symptoms (Uher et al., 2012). It is important to note however that the self-report measures used in this study had good psychometric properties, acceptable internal consistency in the present sample, and included attention checks. The present study's operationalization of health as a checklist sum of health conditions both supports the overall generalizability to individuals with physical health problems but also hinders the generalizability to individuals diagnosed with any specific health conditions. Research has found several health conditions (e.g., kidney disease and arthritis) to confound the somatic symptoms of depression (Drayer et al., 2006; Matcham et al., 2013). The investigation of the relation between somatic subscales of depression screeners and suicide risk in samples with these specific health conditions may be an area for future study. The severity and disability associated with different health conditions was also not factored into consideration in the analyses and thus represents another limitation of the study. The last major limitation is that a cross-sectional correlation design was used for the study and thus temporal precedence and causality between variables cannot be determined. Future studies should investigate the utility of cognitive affective, somatic, and male depression symptoms in predicting suicide risk using a longitudinal design.

Conclusions

The present study investigated the utility of different symptoms of depression in predicting suicide risk and whether the predictive utility of these symptoms differs depending on age, gender, or number of health conditions. This study was the first to investigate age, gender, and health conditions as moderators of the relation between cognitive affective or somatic

symptoms of depression and suicide risk. It was also the first study to investigate the predictive utility of the MDRS-22 as well as moderators of the relation between the MDRS-22 and suicide risk in a mixed gender community sample. Both cognitive affective and somatic symptoms of depression add predictive utility when evaluating suicide risk. Gender and health conditions did not moderate the relation between cognitive affective or somatic symptoms and suicide risk. Age moderated the relation between both cognitive affective and somatic symptoms of depression and suicide. Younger age amplifies the association between these types of depression symptoms and suicide risk. Male depression symptoms added predictive utility over and above conventional depression scales (i.e., CES-D11, PHQ-9). The relation between male depression and suicide risk was significantly moderated by gender. At higher levels of male depression symptomology, females had greater suicide risk as compared to male counterparts with similar levels of male depression. With respect to individual depression symptoms, negative affect, psychomotor retardation, and sleep problems predicted suicide risk across both the PHQ-8 and CES-D11 depression scales. These findings significantly add to the literature on the relation between depression and suicide risk. Although research has investigated the relation between depression diagnoses or overall depression symptom severity and suicide risk, the literature on the relation between specific symptoms of depression and suicide risk as well as moderators of this relation is limited. The findings on the relation between cognitive affective, somatic, and male symptoms of depression and suicide risk and whether these relations differ for different at-risk populations such as males, older adults, and those with numerous health problems thus fills an important gap in suicide literature.

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Table 1. Demographic Characteristics

	M	SD	N	%
Age	51.77	16.20	944	
Gender				
Male			441	46.7
Female			503	53.3
Race				
Caucasian			816	86.4
African American			49	5.2
Hispanic			33	3.5
Asian/Pacific Islander			31	3.3
Other			15	1.6
Education				
Less than high school			3	0.3
High School/GED			122	12.9
Some college			333	35.3
Four year college			353	37.4
Graduate degree			133	14.1
Marital Status				
Single			252	26.7
Cohabiting			83	8.8
Married/Civil union			404	42.8
Separated			16	1.7
Divorced			142	15.0
Widowed			47	5.0
Number of Children	1.35	1.51	944	
Employment Status				
Employed full time			485	51.4
Employed part time			165	17.5
Unemployed			60	6.4
Disabled			25	2.6
Retired			209	22.1
Income				
0 - 9,999			61	6.5
10,000 - 19,999			159	16.8
20,000 - 39,999			315	33.4
40,000 - 59,999			177	18.8
60,000+			232	24.6

Table 2. Clinical Characteristics

	Full Sample	Age				Gender				Health Conditions			
	M(SD)	59 and Younger	60 and Older	F	p	Male	Female	F	p	Six or Fewer	Seven or More	F	p
CES-D11	9.4(7.0)	10.6(7.3)	8.1(6.3)	30.9	<.01	9.1(7.2)	9.7(6.7)	2.0	.16	7.9(6.5)	11.0(7.1)	47.4	<.01
CES-D11 CA	4.6(3.6)	5.1(3.8)	4.0(3.3)	19.9	<.01	4.4(3.7)	4.8(3.5)	2.9	.09	3.9(3.4)	5.3(3.7)	36.8	<.01
CES-D11 S	3.7(2.9)	4.1(2.9)	3.3(2.7)	23.1	<.01	3.5(2.9)	3.9(2.8)	3.9	.049	3.1(2.7)	4.4(2.9)	58.5	<.01
PHQ-9	5.8(6.0)	7.1(6.3)	4.3(5.1)	56.2	<.01	5.5(6.0)	6.0(5.9)	1.8	.18	4.5(5.2)	7.1(6.3)	48.4	<.01
PHQ-9 CA	2.6(3.2)	3.3(3.4)	1.8(2.6)	57.9	<.01	2.5(3.2)	2.6(3.1)	.40	.55	1.9(2.8)	3.2(3.3)	38.5	<.01
PHQ-9 S	3.0(2.8)	3.5(2.8)	2.4(2.6)	34.3	<.01	2.7(2.7)	3.2(2.8)	7.2	.01	2.3(2.4)	3.6(2.9)	58.0	<.01
MDRS-22	24.9(20.6)	29.5(22.5)	19.5(16.6)	58.4	<.01	26.6(23.4)	23.4(17.6)	5.7	.02	21.3(19.6)	28.1(20.1)	26.9	<.01
SBQ-R	5.5(3.5)	6.1(4.1)	4.7(2.5)	39.3	<.01	5.4(3.4)	5.5(3.6)	.01	.94	4.9(3.1)	6.0(3.8)	22.4	<.01

Notes: CES-D11 = Center for Epidemiological Studies Depression Scale 11 item, PHQ-9 = Patient Health Questionnaire 9 item, CA = Cognitive Affective Subscale, S = Somatic Subscale, MDRS-22 = Male Depression Risk Scale 22 item, SBQ-R = Suicidal Behaviors Questionnaire-Revised

Table 3. Clinical Correlations

	Age	CES-D11	PHQ-8	MDRS-22	Health Conditions	SBQ-R
Age	1					
CES-D11	-.17**	1				
PHQ-8	-.24**	.87**	1			
MDRS-22	-.27**	.73**	.73**	1		
Health Conditions	.28**	.27**	.30**	.22**	1	
SBQ-R	-.20**	.53**	.55**	.54**	.23**	1

Notes: * = $p < .05$, ** = $p < .01$

CES-D11 = Center for Epidemiological Studies Depression Scale 11 item, PHQ-8 = Patient Health Questionnaire 8 item, MDRS-22 = Male Depression Risk Scale 22 item, SBQ-R = Suicidal Behaviors Questionnaire-Revised

Table 4. CES-D11 Age by Depression Moderation Predicting Suicide Risk

	B	SE	Beta	t	p
Cognitive Affective Subscale					
Step 1					
Age	-.03	.01	-.14	-4.97	< .01
Gender	-.04	.20	-.01	-.21	.83
Cognitive Affective Subscale	.48	.03	.48	16.81	< .01
Step 2					
Age	-.01	.01	-.04	-.76	.45
Gender	-.04	.20	-.01	-.21	.84
Cognitive Affective Subscale	.73	.09	.74	7.93	< .01
Age by Cognitive Affective	-.01	.002	-.28	-2.91	< .01
Somatic Subscale					
Step 1					
Age	-.03	.01	-.13	-4.29	< .01
Gender	-.08	.21	-.01	-.39	.70
Somatic Subscale	.58	.04	.47	15.82	< .01
Step 2					
Age	.002	.01	.01	.23	.82
Gender	-.07	.21	-.01	-.31	.75
Somatic Subscale	.96	.11	.77	8.44	< .01
Age by Somatic	-.01	.002	-.33	-3.53	< .01

Table 5. PHQ-8 Age by Depression Moderation Predicting Suicide Risk

	B	SE	Beta	t	p
Cognitive Affective Subscale					
Step 1					
Age	-.01	.01	-.06	-2.23	.03
Gender	.05	.20	.01	.26	.80
Cognitive Affective Subscale	.61	.03	.54	18.70	< .01
Step 2					
Age	-.002	.01	-.01	-.20	.84
Gender	.06	.20	.01	.31	.76
Cognitive Affective Subscale	.83	.10	.73	8.36	< .01
Age by Cognitive Affective	-.01	.002	-.20	-2.36	.02
Somatic Subscale					
Step 1					
Age	-.02	.01	-.10	-3.38	< .01
Gender	-.16	.21	-.02	-.74	.46
Somatic Subscale	.60	.04	.47	15.69	< .01
Step 2					
Age	.01	.01	.02	.49	.62
Gender	-.12	.21	-.02	-.57	.57
Somatic Subscale	1.02	.12	.80	8.64	< .01
Age by Somatic	-.01	.002	-.35	-3.80	< .01

Table 6. MDRS-22 Predicting Suicide Risk

	B	SE	Beta	t	p
MDRS-22 and CES-D11					
Step 1					
Age	-.03	.01	-.12	-4.01	< .01
Gender	-.02	.20	-.003	-.10	.92
CES-D11	.26	.02	.52	18.09	< .01
Step 2					
Age	-.02	.01	-.07	-2.42	.02
Gender	.20	.20	.03	1.02	.31
CES-D11	.15	.02	.29	7.33	< .01
MDRS-22	.05	.01	.31	7.64	< .01
MDRS-22 and PHQ-8					
Step 1					
Age	-.02	.01	-.07	-2.43	.02
Gender	-.08	.20	-.01	-.38	.70
PHQ-8	.34	.02	.54	18.69	< .01
Step 2					
Age	-.01	.01	-.04	-1.52	.13
Gender	.14	.20	.02	.73	.47
PHQ-8	.21	.03	.33	8.33	< .01
MDRS-22	.05	.01	.29	7.29	< .01
MDRS-22 and Gender					
Step 1					
Age	-.01	.01	-.06	-2.10	.04
Gender	.42	.20	.06	2.09	.04
MDRS-22	.09	.01	.53	18.30	< .01
Step 2					
Age	-.01	.01	-.06	-2.08	.04
Gender	-.10	.31	-.01	-.32	.75
MDRS-22	.06	.02	.36	4.26	< .01
Gender by MDRS	.02	.01	.19	2.14	.03

Notes: CES-D11 = Center for Epidemiological Studies Depression Scale 11 item, PHQ-9 = Patient Health Questionnaire 9 item, MDRS-22 = Male Depression Risk Scale 22 item

Figure 1. CES-D11 Cognitive Affective Subscale by Age Moderation Predicting Suicide Risk

Figure 2. PHQ-8 Cognitive Affective Subscale by Age Moderation Predicting Suicide Risk

Figure 3. CES-D11 Somatic Subscale by Age Moderation Predicting Suicide Risk

Figure 4. PHQ-8 Somatic Subscale by Age Moderation Predicting Suicide Risk

Figure 5. MDRS-22 by Gender Moderation Predicting Suicide Risk

Appendix A

Demographic Questionnaire

State of Residence ____

Age ____

Gender☐ Male☐ Female☐ Other _____**Race**☐ Caucasian☐ African American☐ Hispanic☐ Asian/Pacific Islander☐ Other _____**Education**☐ Less than high school☐ High school degree/GED☐ Some college☐ Four year college degree☐ Graduate Degree**Marital Status**☐ Single☐ Cohabiting☐ Married/Civil Union☐ Separated☐ Divorced☐ Widowed

Number of Children ____

Employment Status☐ Employed full time☐ Employed part time☐ Unemployed☐ Disabled☐ Retired**Income**☐ 0 – 9,999☐ 10,000 – 19,999☐ 20,000 – 39,999☐ 40,000 – 59,999☐ 60,000+

Appendix B

Center for Epidemiological Studies Depression Scale 11 item				
For each of the following statements, please tell me if you experienced the feeling during the past week, and if so, how often?				
	Never or almost never	Seldom	Often	Always or almost always
1. You did not feel like eating. Your appetite was poor.				
2. You felt depressed.				
3. You felt that everything you did was an effort.				
4. Your sleep was restless.				
5. You were happy.				
6. You felt lonely.				
7. People were unfriendly.				
8. You enjoyed life.				
9. You felt sad.				
10. You felt that people disliked you.				
11. You could not “get going”.				

Appendix C

Suicidal Behaviors Questionnaire-Revised

Instructions: Please Check the number beside the statement or phrase that best applies to you.

1. Have you ever thought about or attempted to kill yourself? (check one only)

- ☐ 1. Never
- ☐ 2. It was just a brief passing thought
- ☐ 3a. I have had a plan at least once to kill myself but did not try to do it
- ☐ 3b. I have had a plan at least once to kill myself and really wanted to die
- ☐ 4a. I have attempted to kill myself, but did not want to die
- ☐ 4b. I have attempted to kill myself, and really hoped to die

2. How often have you thought about killing yourself in the past year? (check one only)

- ☐ 1. Never
- ☐ 2. Rarely (1 time)
- ☐ 3. Sometimes (2 times)
- ☐ 4. Often (3-4 times)
- ☐ 5. Very Often (5 or more times)

3. Have you ever told someone that you were going to commit suicide, or that you might do it? (check one only)

- ☐ 1. No
- ☐ 2a. Yes, at one time, but did not really want to die
- ☐ 2b. Yes, at one time, and really wanted to die
- ☐ 3a. Yes, more than once, but did not want to do it
- ☐ 3b. Yes, more than once, and really wanted to do it

4. How likely is it that you will attempt suicide someday? (check one only)

☐ 0. Never	☐ 4. Likely
☐ 1. No chance at all	☐ 5. Rather likely
☐ 2. Rather unlikely	☐ 6. Very likely
☐ 3. Unlikely	

Appendix D

Male Depression Risk Scale

Please think back over the last month and respond to each item considering how often it applied to you.
Please respond where 0 = not at all; 6 = almost always.

	Not at all						Almost always	
	0	1	2	3	4	5	6	
I bottled up my negative feelings	0	1	2	3	4	5	6	
I tried to ignore feeling down	0	1	2	3	4	5	6	
I covered up my difficulties	0	1	2	3	4	5	6	
I had to work things out by myself	0	1	2	3	4	5	6	
I used drugs to cope	0	1	2	3	4	5	6	
Using drugs provided temporary relief	0	1	2	3	4	5	6	
I sought out drugs	0	1	2	3	4	5	6	
I needed alcohol to help me unwind	0	1	2	3	4	5	6	
I needed to have easy access to alcohol	0	1	2	3	4	5	6	
I drank more alcohol than usual	0	1	2	3	4	5	6	
I stopped feeling so bad while drinking	0	1	2	3	4	5	6	
I was verbally aggressive to others	0	1	2	3	4	5	6	
I verbally lashed out at others without being provoked	0	1	2	3	4	5	6	
It was difficult to manage my anger	0	1	2	3	4	5	6	
I overreacted to situations with aggressive behaviour	0	1	2	3	4	5	6	
I had unexplained aches and pains	0	1	2	3	4	5	6	
I had stomach pains	0	1	2	3	4	5	6	
I had regular headaches	0	1	2	3	4	5	6	
I had more heartburn than usual	0	1	2	3	4	5	6	
I drove dangerously or aggressively	0	1	2	3	4	5	6	
I stopped caring about the consequence of my actions	0	1	2	3	4	5	6	
I took unnecessary risks	0	1	2	3	4	5	6	

Appendix E

Health Conditions Checklist

Do you have or have you had:

angina pectoris

Yes

No

heart attack

Yes

No

heart failure

Yes

No

high blood pressure

Yes

No

lipid disorder

Yes

No

vascular spasm in the legs

Yes

No

clot in the leg

Yes

No

cerebral hemorrhage or clot in the brain

Yes

No

Transient Ischemic Attack (TIA) attacks

Yes

No

murmurs in the carotid arteries or narrowing of the neck arteries

Yes

No

irregular cardiac rhythm/atrial fibrillation

Yes

No

chronic bronchitis

Yes

No

emphysema

Yes

No

Do you have or have you had:

dizziness

Yes

No

Parkinson's disease

Yes

No

multiple sclerosis

Yes

No

polio

Yes

No

mental problems/illness

Yes

No

Do you have or have you had:

rheumatoid arthritis

Yes

No

sciatica

Yes

No

hip joint problem

Yes

No

psoriasis

Yes

No

back rheumatism

Yes

No

neck pain

Yes

No

scoliosis

Yes

No

knee joint problem

Yes

No

osteoporosis

Yes

No

any physical handicap

Yes

No

SLE (lupus)

Yes

No

back pain

Yes

No

shoulder pain

Yes

No

Do you have or have you had:

diabetes

Yes

No

goiter

Yes

No

glandular disease

Yes

No

gall bladder problem

Yes

No

liver disease

Yes

No

gout

Yes

No

kidney disease

Yes

No

Have you had:

glandular fever/infectious mononucleosis

yes

no

chicken pox

yes

no

tuberculosis

yes

no

Do you sometimes get cold sore (herpes) around the mouth?

yes

no

Were you born with lip fissure, jaw fissure or cleft palate?

yes

no

Do you have or have you had:
stomach or intestinal problems

yes

no

ulcerative colitis

yes

no

prostate problem

yes

no

Crohn's disease

yes

no

recurring urinary tract problems

yes

no

cancer, tumor disease or leukemia

Yes

No

Epilepsy?

Yes

No

Do you have or have you had: seizures, e.g., in connection with fever, minor epileptic seizures,
so called absence epilepsy, or "petit mal"

yes

no

Do you have or have you had:

migraine

yes

no

asthma

yes

no

allergy

yes

no

Do you have or have you had:

hay fever

yes

no

eczema

yes

no

hives/urticaria

yes

no

gluten allergy/celiac disease

yes

no

Do you have any other physical problems which seriously affect your health?

yes (text box)

no

Appendix F

Patient Health Questionnaire-9

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3