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An Examination of Risk and Protective Factors for Suicidal Behavior in a Low-Income,
Underserved Primary Care Sample

A dissertation
presented to
the faculty of the Department of Psychology
East Tennessee State University

In partial fulfillment
of the requirements for the degree
Doctor of Philosophy in Psychology

by
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August 2014

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Keywords: Suicidal Behavior, Social problem-solving ability, Health-Related Quality of Life,
Belongingness, Burdensomeness, Neuroticism, Hopelessness

ABSTRACT

An Examination of Risk and Protective Factors for Suicidal Behavior in a Low-Income, Underserved Primary Care Sample

by

Kristin Leigh Walker

Suicidal behavior, including ideation and attempts, is a significant public health problem. Due to the complexity of suicidal behavior, it is necessary to consider an array of factors that could serve as risk and protective factors. Previous research has shown that deficits in social problem-solving ability are associated with increased risk for suicidal ideation and attempts; conversely, problem solving strengths are associated with reduced risk. This dissertation project, consisting of 3 individual manuscripts, was designed to explore the relationship between social problem-solving ability and suicidal behavior in low-income primary care patients. Furthermore, additional constructs including health related quality of life, interpersonal needs, neuroticism, and hopelessness were also explored as they related to social problem solving and suicidal behavior. In a sample of 220 primary care patients ages 19-79 ($M = 44.08$; $SD = 12.11$), we examined the following: 1) health related quality of life as a mediator of the relationship between social problem solving and suicidal behavior, 2) interpersonal needs as a mediator of the relationship between social problem solving and suicidal behavior, and 3) the potential mediating role of hopelessness on the relation between neuroticism and suicidal behavior and the moderating role of social problem-solving ability on these associations. Participants completed self-report questionnaires including the Social Problem Solving Inventory-Revised-Short Form, Suicidal Behaviors Questionnaire-Revised, Short-Form 36, Interpersonal Needs Questionnaire, NEO-Five Factor Inventory, and the Beck Hopelessness Scale. Scores were analyzed using

bootstrapped mediation and moderated mediation techniques. In Manuscript 1 mediating effects were found for mental health related quality of life. In Manuscript 2 thwarted belongingness and perceived burdensomeness mediated the relationship between social problem solving and suicidal behavior. Finally, in Manuscript 3 there was a significant indirect effect of neuroticism on suicidal behavior through hopelessness, and this indirect effect was moderated by social problem-solving ability. Our findings indicate that social problem-solving ability serves as both a risk and protective factor for suicidal behavior and impacts other variables that influence suicide risk among primary care patients. Interventions that bolster social problem-solving ability may reduce suicide risk in primary care.

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CHAPTER 1

INTRODUCTION

Suicide is a significant public health problem in the United States (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). The complex nature of suicidal behavior, which includes ideation, attempts, and death by suicide, necessitates the consideration of an array of biological, social, and psychological variables as potential risk and protective factors. As examples, poor physical health (Druss & Pincus, 2000; Goodwin & Olfson, 2002; Mackenzie & Popkin, 1990); personality characteristics such as neuroticism (Statham et al., 1998); frustrated interpersonal and psychological needs such as the need for belonging and feelings of burdensomeness (Joiner, 2005); and, cognitive dysfunction such as hopelessness (Beck, Steer, Kovacs, & Garrison, 1985), confer risk for suicidal behavior.

Suicide risk is also greater for vulnerable populations including medically-compromised individuals; as such, medical settings, particularly primary care clinics, are a critical location for detecting and preventing suicidal behavior (Bryan & Rudd, 2011). Indeed, many individuals who die by suicide visit their primary care provider within the week or month prior to their death (Bryan & Rudd, 2011; Luoma, Martin, & Pearson, 2002). This may be of particular relevance for rural individuals for whom mental health treatment may be geographically inconvenient or culturally disdained, and who are more likely to seek treatment from a primary care provider than a mental health provider (Bailey, 2009; Roberts, Battaglia, & Epstein, 1999). Yet, research on suicidal behavior and its prevention is lacking in rural primary care settings.

Even in the context of such demographic, psychosocial, and interpersonal risk factors, many individuals do not engage in suicidal behavior, perhaps due to the presence of adaptive coping characteristics such as social problem-solving ability (Becker-Weidman, Jacobs,

Reinecke, Silva, & March, 2010; Chang, Watkins, & Banks, 2004; Hirsch, Chang, & Jeglic, 2012). As a result, this study involves an examination of data from a sample of low-income primary care patients to determine how health-related quality of life, neuroticism, thwarted belongingness and perceived burdensomeness, and hopelessness interact to predict suicidal behavior and how problem-solving might influence these inter-relationships.

Epidemiology and Terminology of Suicidal Behavior

Approximately one million people die by suicide worldwide each year, a rate of one death every 40 seconds (World Health Organization [WHO], 2006). In the United States suicide is the 10th leading cause of death, with 38,364 people dying by suicide in 2010 (American Association of Suicidology [AAS], 2012). Averaged among all age groups, it is estimated that for each death by suicide, there are 25 nonfatal suicide attempts, with over 666,000 documented emergency room visits for self-inflicted injury occurring in the U.S. in 2008 (Centers for Disease Control and Prevention [CDC], 2011). There were 8.3 million adults (approximately 3.7% of the U.S. population) thought about suicide within the past year, 2.2 million made a suicide plan within the past year, and 1 million adults attempted suicide within the past year (CDC, 2011).

Given its global prevalence, it is important to use accurate and consistent terminology when discussing suicide and suicidal behavior to reduce the potential for confusion and error among researchers and clinicians. In a recently released set of uniform definitions, suicide is defined as “death caused by self-directed injurious behavior with any intent to die as a result of the behavior” (Crosby, Ortega, & Melanson, 2011, p. 23). A suicide attempt is described as “a non-fatal self-directed potentially injurious behavior with any intent to die as a result of the behavior,” and should not be confused with nonsuicidal self-directed violence, which is described as “behavior that is self-directed and deliberately results in injury or the potential for

injury to oneself...with no evidence, whether implicit or explicit, of suicidal intent” (Crosby et al., 2011, p. 21). Finally, suicidal ideation is defined as “thinking about, considering, or planning for suicide” (Crosby et al., 2011, p. 21). This project is an examination of suicidal ideation and suicide attempts, as defined above.

Suicidal Behavior in Primary Care Settings

Research suggests that the primary care setting may be an important catchment area for the assessment and treatment of suicidal behaviors (Hirsch, Duberstein, & Unutzer, 2009; Schulberg, Bruce, Lee, Williams, & Dietrich, 2004). Approximately 62% of people who die by suicide made contact with a primary care provider within 1 year of their death, 45% of individuals within 1 month prior to their death, and approximately 20% made contact within 1 day (Bryan & Rudd, 2011; Luoma et al., 2002). Age and sex differences do exist. A greater proportion of older adults (greater than 55 years) make contact with a primary care provider prior to death by suicide compared to those aged 35 and younger; 100% of women made contact with a primary care provider within 1 year of suicide compared to 78% of men (Luoma et al., 2002).

The percentage of individuals who make contact with a primary care provider is significantly larger than that of those who contacted a mental health provider; approximately 32% of individuals made contact with a mental health professional in the year prior to their death and 15%-19% within the past month (Bryan & Rudd, 2011; Luoma et al., 2002). Studies have estimated that major depression, a common risk factor for suicide, occurs in 5%-10% of primary care patients (Katon & Schulberg, 1992; Nimalasuriya, Compton, & Guillory, 2009); between 1%-10% of primary care patients endorse suicidal ideation (Schulberg et al., 2004).

Demographic Factors Related to Suicidal Behavior

There are several demographic risk factors for suicidal behavior including geographical location; for decades, individuals living in rural areas (17.9/100,000) have had significantly higher rates of suicide compared to their urban counterparts (14.9/100,000) (Beeson, 2000; NCHS, 2001; Stack, 1982). Unique socio-cultural characteristics of rural communities including an emphasis on “rugged independence,” geographic and interpersonal isolation, economic distress, limited access to health care resources, perceived stigma surrounding mental health and help-seeking, and acceptance of firearms may increase risk for suicidal behavior in rural individuals (Buckwalter, Smith, & Castor, 1994; Crawford & Brown, 2002; Hirsch, 2006; Hoyt, Conger, Valde, & Weihs, 1997).

Of particular concern are individuals experiencing economic hardship, who are frequently found in rural areas and may be at increased risk for precursors to suicide including depression, anxiety, and substance abuse (Catalano, 2009; Dhingra, Strine, Holt, Berry, & Mokdad, 2009; Kessler, Borges, & Walters, 1999; Kposowa, 2001). Individuals with low educational achievement, or who are unemployed or homeless, may also be at increased risk for suicide (Beautrais, 1998, 2003; Denney, Rogers, Kreuger, & Wadsworth, 2009; Holtman, Shelmerdine, London, & Flisher, 2011; Kaslow et al., 2004). Those who are economically disadvantaged encounter many barriers to treatment and have limited access to health care resources including health insurance, health education, and knowledge about available services (Adler, Boyce, Chesney, Folkman, & Syme, 1993; Adler et al., 1994; Shavers, 2007; Sudano & Baker, 2006).

Other demographic factors related to risk for suicide and suicidal behavior include race and ethnicity, sex, and age. For example, with regard to race and ethnicity, White and American

Indian / Native American males have higher risk for death by suicide compared to other ethnic groups (Mosicki, 1997; Sorensen & Golding, 1988), whereas African American females have the lowest relative risk for suicide (Joe, Baser, Breeden, Neighbors, & Jackson, 2006). Sex differences are evident when suicide rates are considered; males die by suicide at four times the rate of females and account for 78.2% of all suicides, yet females attempt suicide more than males and account for over 50% of suicide attempts (CDC, 2011; Mosicki, 1994).

Suicide is the third leading cause of death among adolescents ages 15-24, and the second leading cause of death among adults ages 25-39 (CDC, 2011), suggesting age differences in suicide rates. Among adolescents it is estimated that there are 100-200 suicide attempts for each death by suicide (CDC, 2011); among adults over 75, there are approximately 4 suicide attempts for each suicide death (CDC, 2011). Adults ages 75-84 have the highest suicide rate (23.5/100,000) of any age group, followed by adults ages 65-74. White males over the age of 65 have the highest rate of all age groups (42.7/100,000) (CDC, 2011).

In the state of Tennessee in 2011 suicide was the fourth leading cause of death among adults aged 35-44 (Tennessee Suicide Prevention Network [TSPN], 2012). The rates of suicide among this 35-44 age group have increased compared to rates in 2006 and are more than four times the rate of adolescents. Additionally, the highest rate of suicide deaths (per 100,000) between 2006-2010 was among adults aged 55-64 at approximately 22.4/100,000 (TSPN, 2012). In Tennessee the “baby boom” generation (ages 55-64) and middle-aged adults ages 45-54 are significant risk groups for suicidal behavior; these findings “suggest that the Network’s primary suicide prevention effort should be outreach and education among middle-aged adults” (TSPN, 2012, p. 21).

Social Problem Solving and Suicidal Behavior

In addition to demographic and geographic or socio-cultural risk factors, there are multiple social and interpersonal mechanisms that may contribute to suicidal behavior, including social problem solving. The construct of “social problem solving” is conceptualized as a purposeful coping strategy focused on overcoming “everyday” challenges occurring across home, school, and work environments (D’Zurilla & Nezu, 1982, 1990). Social problem solving includes cognitive, emotional, and interpersonal processes and occurs via a conscious effort to solve real-world problems including interpersonal conflicts, occupational difficulty, and subjective personal challenges (D’Zurilla & Nezu, 1982, 1990). Problem resolution may occur as a result of the implementation of strategies such as problem definition, generation of alternative responses, and decision making (D’Zurilla, Nezu, & Maydeu-Olivares, 2002). Corresponding to this construct, a measure of social problem solving, the Social Problem Solving Inventory – Revised (SPSI-R) developed by D’Zurilla et al. (2002), assesses overall problem solving as well as five subdomains, including two orientations: positive and negative, and three styles: rational, impulsive and careless, and avoidant.

The positive problem orientation subscale is described as a problem solving-set that involves seeing problems as challenges, rather than threats, and believing that problems are solvable. In contrast, a negative problem orientation involves negative cognitions that include viewing problems as threats and feelings of frustration when trying to solve problems (D’Zurilla et al., 2002).

A rational problem-solving style is described as taking a rational, deliberate, and systematic approach to problem solving by applying adaptive problem solving techniques. The impulsive and careless style characterizes individuals who do make attempts to solve problems

but do so in a hurried and incomplete manner. The avoidant style is characterized by passivity and inaction, including a desire for another person to solve the problem (D’Zurilla et al., 2002).

Poor problem-solving skills have been consistently identified as a risk factor for suicidal behavior across age groups (McAuliffe et al., 2006; McLaughlin, Miller, & Warwick, 1996), and problem-solving deficits differentiate between suicide attempters and nonattempters (Roskar, Bucik, & Valentin, 2007). Pollock and Williams (2004) found that, compared to nonsuicidal psychiatric inpatients, suicide attempters demonstrated increased passivity in their approach to problem solving, consistent with an avoidant style of problem solving. In samples of suicidal and nonsuicidal psychiatric inpatients, Linehan, Camper, Chiles, Strosahl, and Sherin (1987) found that suicide attempters had significantly impaired problem-solving ability, characterized by passivity, compared to nonattempters.

Among adolescents there has been a focus on deficiencies in problem solving as a risk factor for suicidal behavior (Speckens & Hawton, 2005). Across 22 studies of social problem solving and suicidal behavior comparing suicide attempters with suicide ideators and nonsuicidal controls, deficits in social problem solving were consistently found in attempters (Speckens & Hawton, 2005). In another study of adolescents impulsive and avoidant styles of problem solving were predictors of suicidal behavior; problem orientation predicted severity of depression and moderated treatment outcome (Becker-Weidman et al., 2010). Deficits in problem solving also have a significant impact on late-life suicide; older adult suicide attempters tend to view their problems more negatively and may attempt to cope with their problems in a more impulsive manner compared to controls (Gibbs et al., 2009; Szanto et al., 2012)

Although most research has focused on the role of problem solving as a risk factor for suicidal behavior, several studies have found that enhanced problem-solving abilities are

associated with decreased risk for depression, hopelessness, and suicidal behavior (Becker-Weidman et al., 2010; Chang et al., 2004; Hirsch et al., 2012). Further, treatment focused on improving social problem-solving ability may reduce suicidal behavior (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Stewart, Quinn, Plevier, & Brett, 2009). For example, in a sample of recent suicide attempters Cognitive Therapy emphasizing problem-solving appraisal resulted in self-reported improvements in the ways the individuals appraised and approached their problems (Ghahramanlou-Holloway et al., 2012); Problem-Solving Therapy compared to treatment as usual in a sample of suicide attempters resulted in decreased suicidal ideation (Stewart et al., 2009).

Research on the association between social problem-solving ability and suicidal behavior (McAuliffe et al., 2006; McLaughlin, Miller, & Warwick, 1996) has focused primarily on adolescents and college student samples, psychiatric samples, and older adults (Becker-Weidman et al., 2010; Linehan et al., 1987; Pollock & Williams, 2004; Speckens & Hawton, 2005; Szanto et al., 2012). There has been little research examining middle-aged adults, members of identified rural communities, and patients in primary care. Additionally, the majority of studies have used the total score of the Social Problem Solving Inventory-Revised (SPSI-R) as opposed to examining the individual subscales. This study is a direct address to a significant gap in the literature by assessing the relationship between social problem solving total score, and subscale scores, and suicidal behavior in a low-income primary care sample of middle-aged adults.

Health and Suicidal Behavior

In addition to psychological and social correlates of suicidal behavior, a growing body of literature has noted the association between physical health and functional impairment and suicidal behavior. Suicide is related to poor physical health, most often a chronic or terminal

illness, as well as chronic pain (Conwell et al., 2010; Fishbain, 1999; Kleepsies, Hughes, & Gallacher, 2000; Mackenzie & Popkin, 1990). Marzuk (1994) suggests that suicide among people with terminal illnesses has become more common because of the advent of medical advancements that have rendered many terminal illnesses not only terminal but also chronic. Among individuals with terminal illnesses those with cancer, AIDS, and Huntington's chorea have been the most studied and endorse higher rates of suicidal behavior including ideation, attempts, and death by suicide compared to healthy counterparts (Fox, Stanek, Boyd, & Flannery, 1982; Storm, Christensen, & Jensen, 1992).

In addition to terminal illnesses, general medical illness is associated with increased suicidal behavior (Mackenzie & Popkin, 1990). In a study of 7,589 young adults ages 17-39, Druss and Pincus (2000) assessed lifetime suicidal ideation, suicide attempts, and prevalence of common general medical conditions. The authors found that compared to 16.3% of respondents with no medical conditions who endorsed lifetime suicidal ideation, 25.2% of those with one general medical condition endorsed suicidal ideation; 35% of individuals with two or more medical conditions endorsed lifetime suicidal ideation (Druss & Pincus, 2000). Similar rates were seen among suicide attempts; 5.5% of respondents without a medical condition had made a suicide attempt compared to 8.9% with one medical condition and 16.2% with more than one medical condition (Druss & Pincus, 2000). In a series of studies of suicide deaths among adults living in the U.S., Great Britain, Sweden, and South Africa, frequency of medical illness was examined; an average of 43% of individuals dying by suicide were judged to be suffering from medical illness at the time of death (Mackenzie & Popkin, 1990).

Perception of health, or health-related quality of life (HRQL), involves a subjective approach to assessing health related functioning and well-being stemming from the belief that a

patient is the best judge of his or her own experience (Ware & Sherbourne, 1992). Self-reported health, which is highly correlated with objective illness and impairment ratings, has a strong association with suicidal behaviors among medical patients (Goodwin & Olfson, 2002); for example, in a sample of 4,007 patients from general internal medicine practices, those with perceptions of poor health, compared to those with a more favorable view of their health, were significantly more likely to endorse suicidal ideation (Goodwin & Olfson, 2002).

Further, poor HRQL is a risk factor for predictors of suicidal behavior, such as depression, substance abuse, and hopelessness (Chen et al., 2010; Norlev, Sundaram, & Mette, 2005; Pagura, Bolton, Cox, Grant, & Jitender, 2010; Resch, Parzer, & Brunner, 2008; Winter et al., 2012). In a sample of hemodialysis patients with chronic renal failure, HRQL was predictive of increased depression, which, in turn, was predictive of suicidal behavior (Chen et al., 2010). Reduced HRQL was predictive of depression and suicide attempts in a sample of Russian outpatients (Winter et al., 2012) and, among German and Danish adolescents poor HRQL was predictive of suicidal ideation and attempts (Norlev et al., 2005; Resch et al., 2008). Finally, in a study of U.S. patients with borderline personality disorder, which compared patients with and without posttraumatic disorder, HRQL was associated with increased risk of a lifetime suicide attempt (Pagura et al., 2010). Although research on the relationship between HRQL and suicidal behavior has been conducted in specialized populations at high risk for suicide, such as patients with AIDS, cancer, and Huntington's chorea, this association has not been extensively examined in general medical patients, particularly those in the middle-age group (Fox, Stanek, Boyd, & Flannery, 1982; Storm, Christensen, & Jensen, 1992).

Neuroticism and Suicidal Behavior

Extensive personality research has established a strong linkage between neuroticism and suicidal behavior (Statham et al., 1998); indeed, neuroticism accounts for a significant proportion (32%) of variance in suicide rates among Americans (McCann, 2010). An examination of cross-national studies on the relationship of personality factors and suicide rates found an association between neuroticism and historical as well as contemporary suicide rates (Voracek, 2009). Neuroticism also predicts suicidal behavior across a variety of age groups including adolescents and middle aged and older adults (Dixit & Khokar, 2007; Pickles, Collishaw, Messer, Rutter, & Maughan, 2010; Segal, Marty, Meyer, & Coolidge, 2012).

Individuals high in neuroticism have an increased propensity for experiencing negative affect including feelings such as anxiety, anger, envy, and guilt (Costa & McCrae, 1992; McCrae & Costa, 2004). Such individuals also often respond poorly to stress, are at an increased likelihood of interpreting problems or challenges as threatening, and have low frustration tolerance (Bowen, Leuschen, & Kalynchuk, 2011; Costa & McCrae, 1992; Hettema, Neale, Myers, Prescott, & Kendler, 2006; McCrae & Costa, 2004). Perhaps as a result neuroticism is associated with depressed mood, mood instability, and suicidal behavior including ideation and attempts as well as death by suicide (Beautrais, Joyce, & Mulder, 1999; Bowen et al., 2011; Brezo, Paris, & Turecki, 2006; Chioqueta & Stiles, 2005; Quilty, Sellborn, Tackett, & Bagby, 2009; Statham et al., 1998).

Further, research on the association between neuroticism and problem solving indicates that individuals high in neuroticism tend to have poorer coping skills including reduced problem solving capabilities (Carver & Connor-Smith, 2010). In a college student study involving the Social Problem Solving Inventory-Revised neuroticism was the strongest predictor of a negative

problem orientation and overall lower social problem-solving ability (D’Zurilla, Maydeu-Olivares, & Gallardo-Pujol, 2011). Other studies of college students have shown similar results (Chang & D’Zurilla, 1996; Huband, McMurrin, Evans, & Duggan, 2007; McMurrin, Egan, Blair, & Richardson, 2001).

Hopelessness and Suicidal Behavior

Another negatively-valenced, intra-personal risk factor that, arguably, plays a central role in suicidal behavior is hopelessness (Beck & Lester, 1973; Britton et al., 2008; Chang, Sanna, Hirsch, & Jeglic, 2010; Minkoff, Bergman, Beck, & Beck, 1973; Wetzell, Margulies, Davis, & Karam, 1980). Hopeless individuals often believe that “nothing will turn out right for them; they will never succeed at what they attempt to do; their important goals can never be obtained, and that their worst problems will never be solved” (Beck & Steer, 1988, p.1). Beck (1967) investigated hopelessness as it related to his cognitive model of depression, which highlighted the role of negative beliefs about the self, others, and the future. Beck et al. (1985) argue that hopelessness serves as the link between depression and suicide; when individuals are depressed and believe there is no way out of an intolerable situation, suicide may be considered a viable alternative (Beck et al., 1985). Indeed, in a study examining the role of hopelessness and eventual death by suicide, only hopelessness and the pessimism item of the Beck Depression Inventory were predictive; in fact, scores of 10 or more on the BHS yielded a specificity of .91 for predicting eventual suicides (Beck et al., 1985).

In a longitudinal study of individuals with psychosis, hopelessness predicted suicidal attempts at multiple time points including 4 to 6 years after first hospitalization; those individuals who died by suicide during the study period scored significantly higher at baseline on the Beck Hopelessness Scale (BHS) compared to those who did not die by suicide (Klonsky, Kotov,

Bakst, Rabinowitz, & Bromet, 2012). In a sample of older adults hopelessness and impulsivity were associated with suicidal ideation and attempts (Neufield & O'Rourke, 2009). Among college students hopelessness has been consistently demonstrated as a predictor of suicidal risk (Heisel, Flett, & Hewitt, 2003; Hess, Becker, Pituch, & Saathoff, 2011; Hirsch & Conner, 2006), and similar relationships between hopelessness and suicidal behavior have been found among adolescents and psychiatric outpatients (Arie, Apter, Orbach, Yefet, & Zalzman, 2008; Bhar, Ghahramanlou-Holloway, Brown, & Beck, 2008).

Thwarted Belongingness, Perceived Burdensomeness, and Suicidal Behavior

In addition to intrapersonal risk factors, interpersonal and social functioning are associated with suicidal behavior, including the need to relate to others. Baumeister and Leary (1995) proposed that human beings have a fundamental need to belong and that our self-esteem is based, at least partially, on the perceived value of our interpersonal relationships. They also argued that when this need to belong is thwarted, individuals can experience significant declines in health and well-being (Baumeister & Leary, 1995). Similarly, Deci and Ryan (2000) proposed a theory of human psychological needs, Self Determination Theory (SDT), which posits the existence of three primary psychological needs: relatedness, autonomy, and competence. Research on SDT indicates that satisfaction of the need for relatedness predicts higher levels of psychological well-being, whereas lower levels of relatedness predict poor psychological health (Deci & Ryan, 2009, 2012; Rowe, Walker, Britton, & Hirsch, 2013).

Building on these early theories, Thomas Joiner (2005) developed the Interpersonal-Psychological Theory of Suicide, which proposes that interpersonal distress, specifically, when people feel a lack of connectedness to others, combined with a sense of being a burden to those around them, increases suicide risk (Joiner, 2005).

Perceived burdensomeness occurs when individuals believe that their life places a burden on family, friends, and/or society (Joiner, 2005). When people perceives that they have become a burden, they may feel as though others will benefit more from their death than their life (Joiner, 2005; Joiner et al., 2009). *Thwarted belongingness* is described as feeling separate or apart from others, not integrated into the family, and feeling a lack of connectedness with friends or other valued groups (Joiner, 2005). Some researchers argue that the experience of feeling isolated and distanced from loved ones is the most robust risk factor for predicting suicidal behavior (Boardman, Grimbaldeston, Handley, Jones, & Willmott, 1999; Van Orden et al., 2010).

Several research studies have documented a relationship between perceived burdensomeness and thwarted belongingness and suicidal behavior, across a variety of populations including college students, military personnel, and older adults (Anestis, Bagge, Tull, & Joiner, 2011; Bryan, 2011; Conner, Britton, Sworts, & Joiner, 2007; Gunn, Lester, Haines, & Williams, 2012; Jahn & Cukrowicz, 2011; Jahn, Cukrowicz, Linton, & Prabhu, 2011; Joiner et al., 2002; Van Orden, Lynam, Hollar, & Joiner, 2006; Van Orden, Witte, Gordon, Bender, & Joiner, 2008; Van Orden et al., 2008); yet, there has been little published research to date examining this theory in primary care patients. In a mechanistic explanation, in a sample of college students thwarted belongingness was associated with social anxiety and depression, suggesting a pathway by which anxiety and depression may lead to increase suicide risk (Davidson, Wingate, Grant, Judah, & Mills, 2011).

In a study examining 261 suicide notes from 1,091 consecutive completed suicides in Tasmania, researchers found that notes from women more often contained messages with the theme of perceived burdensomeness compared to men; suicide notes from younger adults contained greater themes of thwarted belongingness compared to older adults (Gunn et al.,

2012). In other studies with older adults, for whom death by suicide occurs at a higher rate compared to other age groups (CDC, 2011), perceived burdensomeness accounted for a significant portion of the variance in suicidal ideation after controlling for depression, hopelessness, and functioning impairment, and these effects were the same among men and women (Cukrowicz, Cheavens, Van Orden, Ragain, & Cook, 2011). Perceived burdensomeness was also a mediator of the relationship between depression and suicidal ideation, and perceptions of burden on younger family members were related to increases in suicidal behavior (Jahn et al., 2011; Jahn & Cukrowicz, 2011).

Statement of the Problem

To my knowledge, no other published study has examined the mechanisms of association between social problem-solving ability and suicidal behavior within the context of physical and mental health, personality, and interpersonal functioning. Another gap in the literature pertains to how these constructs operate in a low-income primary care sample and among middle-aged adults. The goal of this study, therefore, was to address these gaps by examining the role of such factors as potential moderators and mediators of the association between social problem solving and suicidal behavior in an understudied and vulnerable sample. Further, previous research suggests that adaptive problem solving may be of benefit, whereas maladaptive problem solving may be a detriment, to mental health outcomes, suggesting that social problem-solving ability may serve as both a protective and risk factor against suicidal behavior. Both perspectives were examined in the study.

This dissertation project is comprised of three individual manuscripts, fulfilling the requirements for an alternate dissertation format as described by the School of Graduate Studies at ETSU (<http://www.etsu.edu/gradstud/pdf/REVISED%20ETD%20guide.pdf>). In the first manuscript, I examined the mediating effect of social problem-solving ability on the association between physical and mental health and suicidal behavior. In the second manuscript, I examined the mediating effects of thwarted belongingness and perceived burdensomeness on the relationship between social problem solving and suicidal behavior. Finally, in the third manuscript, I examined conditional indirect effects of social problem-solving ability and hopelessness on the relationship between neuroticism and suicidal behavior.

Hypotheses

Manuscript 1 – Health related quality of life mediates the relationship between social problem solving and suicidal behavior

1. At the bivariate level, I hypothesized that higher levels of social problem-solving ability would be significantly negatively associated with suicidal behavior. I hypothesized that higher scores on both the physical and mental component summary scores would be significantly negatively associated with suicidal behavior and significantly positively associated with total social problem-solving ability. I hypothesized that higher scores on the following subscales of social problem-solving ability, negative problem orientation, avoidant style, and impulsive and careless style, would be significantly positively associated with suicidal behavior and significantly negatively associated with physical and mental component summary scores. I hypothesized that higher scores on the positive problem orientation and rational problem solving subscales would be significantly negatively associated with suicidal behavior and significantly positively associated with physical and mental component summary scores.
2. In mediation analyses, I hypothesized that physical and mental component summary scores would mediate the relationship between total social problem-solving ability and suicidal behavior, such that higher levels of social problem solving would be associated with better physical and mental health, which in turn, would be associated with lower levels of suicidal behavior.
3. I hypothesized that physical and mental component summary scores would mediate the relationship between positive problem orientation, rational problem-solving style, and suicidal behavior such that individuals with higher levels of positive problem orientation

and rational problem solving style would report higher levels of physical and mental health, which in turn, would be associated with lower levels of suicidal behavior. I also hypothesized that physical and mental component summary scores would mediate the relationship between negative problem orientation, impulsive and careless style, avoidant style, and suicidal behavior, such that individuals with higher levels of negative problem orientation, impulsive and careless style, and avoidant style would report lower levels of physical and mental health, which in turn, would be associated with higher levels of suicidal behavior.

Manuscript 2 – Perceived burdensomeness and thwarted belongingness mediate the relationship between social problem-solving ability and suicidal behavior

1. At the bivariate level, I hypothesized that overall higher scores on a measure of social problem-solving ability would be significantly negatively associated with thwarted belongingness, perceived burdensomeness, and suicidal behavior. I hypothesized that higher scores on the following subscales of social problem-solving ability, negative problem orientation, avoidant style, and impulsive and careless style, would be significantly positively associated with thwarted belongingness, perceived burdensomeness, and suicidal behavior. I hypothesized that higher scores on the positive problem orientation and rational problem solving subscales would be significantly negatively associated with thwarted belongingness, perceived burdensomeness, and suicidal behavior.
2. I hypothesized that thwarted belongingness and perceived burdensomeness would mediate the relationship between overall social problem-solving ability and suicidal behavior such that higher levels of overall social problem-solving ability would be

associated with lower levels of thwarted belongingness and perceived burdensomeness which, in turn, would be related to fewer suicidal behaviors.

3. I hypothesized that thwarted belongingness and perceived burdensomeness would mediate the relationship between negative problem orientation, avoidant style, and impulsive and careless style and suicidal behavior such that higher levels of each of these subscales would be associated with greater levels of thwarted belongingness and perceived burdensomeness which, in turn, would be related to greater suicidal behavior.
4. I hypothesized that thwarted belongingness and perceived burdensomeness would mediate the relationship between positive problem orientation and rational problem style and suicidal behavior such that higher levels of each of these subscales would be associated with lower levels of thwarted belongingness and perceived burdensomeness which, in turn, would be related to lower levels of self-reported suicidal behaviors.

Manuscript 3 – Conditional indirect effects of social problem solving and hopelessness on the relationship between neuroticism and suicidal behavior

1. At the bivariate level, I hypothesized that neuroticism and hopelessness would be significantly positively associated with suicidal behavior; overall social problem-solving ability would be significantly negatively associated with suicidal behavior.
2. I hypothesized that hopelessness would mediate the relationship between neuroticism and suicidal behavior such that higher levels of neuroticism would be associated with higher levels of hopelessness, which, in turn, would be associated with greater levels of suicidal behavior. Further, I hypothesized that this relationship would be moderated by social problem-solving ability. I expected a moderation effect to occur in the relationship between neuroticism and hopelessness as well as in the relationship between

hopelessness and suicidal behavior. Specifically, I hypothesized that the relationships between neuroticism and hopelessness and between hopelessness and suicidal behavior would be strengthened at lower levels of problem solving so that for individuals lower in social problem-solving ability the mediating effects of hopelessness on the relationships between neuroticism and suicidal behavior would be stronger than for those higher in social problem-solving ability.

CHAPTER 2
MANUSCRIPT 1

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Health Related Quality of Life Mediates the Relationship between Social problem-solving ability
and Suicidal Behavior in Low-income Primary Care Patients

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Abstract

Purpose: Suicidal behavior, including ideation and attempts, is a significant public health problem, and previous research suggests that deficits in problem solving ability and poor health-related quality of life are associated with greater risk. Yet, little is known about the interrelationships between these variables, particularly the underlying factors explaining the linkage between social problem solving and suicidal behavior; health-related quality of life may be one such factor. *Method:* In a sample of 220 low-income, underserved, primary care patients ages 19-79 ($M = 44.08$; $SD = 12.11$), we examined the potential mediating role of physical and mental health-related quality of life on the relation between social problem-solving ability and suicidal behavior. Participants completed self-report questionnaires including: Suicidal Behaviors Questionnaire-Revised, Social Problem Solving Inventory-Revised, and Short-Form 36 Health Survey. Scores were analyzed using bootstrapped mediation techniques. *Results:* Our hypotheses were partially supported; mediating effects were found for mental health related quality of life on the relationship between social problem solving total and subscale scores, and suicidal behavior. Physical health-related quality of life was not a significant mediator. *Conclusions:* Higher levels of social problem-solving ability are associated with better mental health related quality of life which, in turn, is related to lower reported levels of suicidal behavior. Interventions promoting the skill set of social problem solving may help to increase quality of life and reduce risk of suicidal behavior among primary care patients.

Health Related Quality of Life and Suicidal Behavior in Primary Care Patients: The Role of Social problem-solving ability

In the United States, suicide is a significant public health problem, with 38,364 people dying by suicide in 2010, making suicide the 10th leading cause of death [1]. Rates of suicidal behavior, including thoughts about suicide, planning for suicide, and suicide attempts are thought to be much higher. In 2011, 8.3 million adults, approximately 3.7% of the U.S. population, thought about suicide, 2.2 million made a suicide plan, and 1 million adults attempted suicide, within the past year [2].

Previous research suggests that suicide risk is greater for vulnerable populations, including medically compromised individuals; as such, medical settings, particularly primary care clinics, are a critical location for detecting and preventing suicidal behavior [3-5]. For example, major depression, a common risk factor for suicide, is estimated to occur in 5-10% of primary care patients [6-7], and between 1-10% of primary care patients endorse suicidal ideation [5]. Importantly, approximately 62% of people who die by suicide made contact with a primary care provider within one year of their death, 45% of individuals within one month prior to their death, and approximately 20% made contact within 1 day [3, 8]. Of note, the percentage of individuals who make contact with a primary care provider is significantly larger than that of those who contacted a mental health provider, approximately 32% in the year prior to their death and 15-19% within the past month [3, 8]. Yet, research on suicidal behavior and its prevention is lacking in primary care settings, particularly among middle-aged patients, among whom the rates of suicide have been increasing significantly [9].

The complex nature of suicidal behavior necessitates the consideration of an array of biological, social, and psychological variables as potential risk and protective factors, including

social problem-solving ability and health related quality of life. The construct of “social problem solving” is conceptualized as a purposeful coping strategy focused on overcoming “everyday” challenges occurring across home, school, and work environments [10-11]. Social problem solving includes cognitive, emotional, and interpersonal processes, and occurs via a conscious effort to solve real-world problems, including interpersonal conflicts, occupational difficulty, and subjective personal challenges [10-11]; problem resolution may occur as a result of the implementation of strategies such as problem definition, generation of alternative responses, and decision making [12]. Corresponding to this construct, a measure of social problem solving, the Social Problem Solving Inventory – Revised (SPSI-R) was developed, which assesses overall problem solving as well as five sub-domains, including two orientations: positive and negative, and three styles: rational, impulsive and careless, and avoidant [12].

Positive problem orientation is conceptualized as a problem solving-set that involves seeing problems as challenges, rather than threats, and believing that problems are solvable. In contrast, a negative problem orientation involves negative cognitions that include viewing problems as threats and feelings of frustration when trying to solve problems [12]. A rational problem solving style is described as taking a rational, deliberate, and systematic approach to problem solving by applying adaptive problem solving techniques. The impulsive and careless style characterizes individuals who do make attempts to solve problems, but do so in a hurried and incomplete manner. Finally, an avoidant style is characterized by passivity and inaction, including a desire for another person to solve the problem [12].

Poor problem solving skills have been consistently identified as a risk factor for suicidal behavior, across age groups [13-14], and problem solving deficits differentiate between suicide attempters and non-attempters [15]. Compared to non-suicidal psychiatric inpatients, suicide

attempters demonstrated increased passivity in their approach to problem solving, consistent with an avoidant style of problem solving [16]. In samples of suicidal and non-suicidal psychiatric inpatients, suicide attempters had significantly impaired problem solving ability, characterized by passivity, compared to non-attempters [17]. Across twenty-two studies of social problem solving and suicidal behavior, comparing suicide attempters with suicide ideators and non-suicidal controls, deficits in social problem solving were consistently found in attempters [18].

Although most research has focused on the role of problem-solving deficits as a risk factor for suicidal behavior, several studies have found that enhanced problem solving abilities are associated with decreased risk for depression, hopelessness, and suicidal behavior [19-21]. Further, treatment focused on improving social problem-solving ability may reduce suicidal behavior [22-23]. For example, in a sample of recent suicide attempters, Cognitive Therapy emphasizing problem-solving appraisal resulted in self-reported improvements in appraisal of, and approach toward, problems [22], and Problem-Solving Therapy, compared to treatment as usual in a sample of suicide attempters, resulted in decreased suicidal ideation [23].

Research on the association between social problem-solving ability and suicidal behavior has focused primarily on adolescents and college student samples, psychiatric samples, and older adults [13-14, 16-18, 20, 24]. There has been little research examining middle-aged adults and patients in primary care. Additionally, the majority of studies have utilized the total score of the Social Problem Solving Inventory-Revised (SPSI-R), as opposed to examining the individual subscales. This study directly addresses a significant gap in the literature by assessing the relationship between social problem solving total score, and subscale scores, and suicidal behavior, in a primary care sample of middle-aged adults.

In addition to psychological and social correlates of suicidal behavior, a growing body of literature has noted the association between poor physical health suicidal behavior and death by suicide [25-28]. General medical illness is associated with increased suicidal behavior [28]. Among young adults, higher lifetime reports of suicidal ideation and suicide attempts were reported among those who also endorsed one or more general medical conditions, compared to those without a medical condition [29].

Perception of health, or health-related quality of life (HRQL), involves a subjective approach to assessing health related functioning and well-being, stemming from the belief that a patient is the best judge of his or her own experience [30]. Self-reported health, which is highly correlated with objective illness and impairment ratings, has a strong association with suicidal behaviors among medical patients [31]. Further, poor HRQL is a risk factor for predictors of suicidal behavior, such as depression, substance abuse, and hopelessness [32-36]. Although research on the relationship between HRQL and suicidal behavior has been conducted in specialized populations at high risk for suicide, such as patients with AIDS, cancer, and Huntington's chorea, this association has not been extensively examined in general medical patients, particularly those in the middle-age group [37-38].

Although HRQL and problem solving have both been independently linked to suicidal behavior, there is a dearth of information on the interrelationships between these constructs, and little is known about potential mechanisms that may underlie this association, such as mental and physical health. We hypothesized that physical and mental component summary scores would mediate the relation between total social problem-solving ability and suicidal behavior, such that higher levels of social problem solving would be associated with better physical and mental health which, in turn, would be related to less suicidal behavior. Furthermore, physical and

mental component summary scores will mediate the relationship between positive and negative problem solving and suicidal behavior, such that individuals with greater positive problem solving will report better physical and mental health which will, in turn, be associated with lower levels of suicidal behavior and individuals with higher levels of negative problem solving will report poorer physical and mental health and, in turn, more suicidal behavior.

Method

Participants

Two hundred and twenty adult participants (137 females, 61.2%, 82 males, 36.6%, 1 transgendered, 0.4%) from a primary care clinic serving primarily low-income, uninsured patients participated in this institutional review board-approved, cross-sectional study.

Participants were required to be at least 18 years of age, be able to read English, and have the cognitive ability to provide consent and complete the self-report questionnaires. Our sample had a mean age of 44.08 years (standard deviation [SD] = 12.11), and 86.2% were Caucasian (n=193), 7.1% African American (n=16), 3.1% were Hispanic (n=7), 0.9% were American Indian (n=2) and 0.4% Asian American (n=1).

Measures

The *Suicidal Behaviors Questionnaire-Revised* (SBQ-R), a 4-item measure, was used to assess suicidal behaviors including lifetime history of ideation and attempts, suicide ideation in past year, communication, and likelihood of future attempts [39]. Each question on the SBQ-R is scored on a 5-point to 7-point Likert-type scale from 1 (no/never) to 7 (very likely), where higher numbers indicate increased frequency or severity. The items are summed for a total score, and higher total scores are indicative of greater levels of suicidal behavior. The items can also be examined and analyzed individually, as each item asks a different question about suicidal behavior [39].

When the SBQ-R was administered to adolescent psychiatric inpatients (N=120), high school students (N=138), adult psychiatric inpatients (N=120), and college undergraduates (N=135), the measure demonstrated good internal consistency across samples (.76-.88) [39]. The SBQ-R exhibited adequate discriminant validity, as it differentiates suicidal versus non-suicidal inpatients (standardized estimate = .79). Further, cutoff scores of 7 for non-clinical samples (sensitivity rate of .83 and specificity rate of .96) and 8 for clinical samples (sensitivity rate of 0.87 and specificity rate of 0.93) were identified. The first item of the SBQ-R can also be used as a screener, with a cut-off score of 2; use of the screener resulted in sensitivity of 0.80 and specificity of 0.97 for at-risk inpatients [39]. In this study, internal consistency is good ($\alpha = .85$).

Social problem-solving ability was assessed via the *Social Problem Solving Inventory-Revised Short Form* (SPSI-R-SF), a 25-item self-report questionnaire that is scored using a 5-point Likert-type scale ranging from 0 (*not at all true of me*) to 4 (*very true of me*) [12]. The items in the SPSI-R-SF are designed to reflect cognitive, behavioral, and emotional responses to real-life problems and challenges. The SPSI-R-SF yields a total score and five subscales scores: positive problem orientation (PPO), rational problem solving (RPS), negative problem orientation (NPO), impulsive and careless style (ICS), and avoidant style (AS) [12].

The PPO subscale is described as a constructive, problem solving-set that involves viewing problems as challenges, rather than threats, holding a belief that problems are solvable, having a sense of self-efficacy, believing that successful problem solving takes time and effort, and making a commitment to solving problems as opposed to avoiding them [12]. Internal consistency for the PPO subscale in this study was good ($\alpha = .84$). In contrast, the NPO subscale involves a negative and/or dysfunctional cognitive set that involves viewing problems as threats, doubting personal ability to solve problems, and feeling frustrated when confronted with daily

problems [12]. The NPO subscale also demonstrated good internal consistency in this study ($\alpha = .83$).

In addition to the orientations assessed by the SPSI-R-SF, there are also three problem solving style subscales. The first, RPS, encompasses a rational, deliberate, skillful, and systematic approach to problem solving that involves the application of adaptive problem solving techniques. This style involves four specific tasks: problem definition and problem formulation, generating alternative solutions, making decisions, and implementing and verifying solutions. In this study, internal consistency for the RPS was good ($\alpha = .85$). The ICS characterizes individuals who make active attempts to solve problems, but do so in an impulsive, hurried, careless, and incomplete fashion. People with high ratings on this subscale consider one or a limited number of alternative solutions, often going with the first solution that comes to mind. The ICS subscale also demonstrated good internal consistency in this study ($\alpha = .77$). Finally, avoidant style (AS) is characterized by passivity, inaction or avoidance, procrastination, and dependency on others to make decisions. Individuals with this style will avoid problems as long as they can, wait for problems to solve themselves or put the responsibility or solving the problem onto someone else [12]. Internal consistency for the AS subscale was also good in this study ($\alpha = .87$).

When calculating a total score, the negative subscales are reverse-scored, so that higher total scores are indicative of increased social problem-solving ability. The psychometric properties of the SPSI-R-SF have been evaluated across multiple studies utilizing collegiate, clinical, and community samples [12, 40-43], in which the SPSI-R-SF has demonstrated good internal consistency ($\alpha = .79$), test-retest reliability over a three-week time period ($r = .91$) and adequate convergent validity with depression ($r = .57$) and anxiety ($r = .61$). Additionally,

confirmatory factor analysis has validated the five-factor structure of the SPSI-R-SF [12, 44]. The overall internal consistency of this measure in our study was good ($\alpha = .80$).

The *Short-Form 36 Health Survey (SF-36v2)* consists of 36-items assessing eight domains of perceived health status and quality of life, including four physical domains: 1) Physical Functioning (PF), 2) Role-Physical (RP), 3) Bodily Pain (BP), 4) General Health (GH), and four mental health domains: 1) Vitality (VT), 2) Social Functioning (SF), 3) Role-Emotional (RE), and 4) Mental Health (MH) [45]. The questions are measured on a Likert scale (with different scales according to the specific question) that ranges from higher levels to lower levels of health functioning. The measure is not intended to provide an objective or comprehensive evaluation of health functioning [45].

The SF-36v2 can be scored into two component summary scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). The PCS and MCS were created to reduce the 8-scale profile to two domains that are more readily usable for researchers and statistical analyses. The eight domains of functioning are aggregated across the two summary scores to create the physical and mental components [46]. Orthogonal rotation of factors determined that the PCS and MCS accounted for over 80% of the variance across the eight domains of the SF-36v2 in both general and patient populations [47]. The PF, RP, BP, and GH subscales, load on the PCS component, and the MH, RE, SF, and VT subscales load on the MCS component. For this study the PCS and MCS will be used in statistical analyses.

Internal consistency for the SF-36v2 has been consistently demonstrated to be good ($\alpha = .80-.95$) across the eight domains, in multiple studies [48-52]. Internal consistency scores for all of the subscales in this study were also good, ranging from .84-.94. The SF-36v2 PCS and MCS composite scores have good internal consistency, with alpha levels exceeding .90 [48-52]. Test-

retest reliability during a 3-week time period, and the values were acceptable across the eight domains ($r = .71-.89$) [48]. In this study, internal consistency was good for the MCS ($\alpha = .87$) and PCS ($\alpha = .81$).

Factor analytic studies among adults in the United States and worldwide, have shown the SF-36v2 to have construct validity; items consistently load on the eight domain and two summary component scores [47, 53-55]. In a study of predictive validity, using the Mental Component Summary score, individuals with low MCS scores (below 20) were more likely to receive care from a psychiatrist or psychologist; lower scores on the Physical Component Summary score predicted greater likelihood of dying within 2 years [52].

Statistical Analyses

Pearson correlation coefficients (r) were calculated to examine independence of, and associations between, study variables. Simple mediation, otherwise known as an indirect effect, occurs when the relationship between an independent variable (X) and a dependent variable (Y) is explained, or partially explained, by a third variable (M) [56]. A process called bootstrapping, a procedure for surmounting limitations of statistical methods that assume a normal distribution of data, was used in all analyses. Bootstrapping is becoming a preferred method for analyzing data and involves repeated random samples of observations and computation of the test statistic (F-statistic in this instance) in each resample [57]. Across many re-samplings, an approximation of the sampling distribution is calculated and utilized to test the hypothesis. These statistical techniques estimate path coefficients in a mediator model and generate bootstrap confidence intervals (percentile, bias-corrected, and bias-corrected and accelerated) for total and specific indirect effects of X on Y through the mediator variable M . This process adjusts all paths for the potential influence of covariates not proposed to be mediators in the model. If a true zero falls

between the upper and lower confidence intervals, there is not a significant indirect effect via the mediator. Covariates in all models included age, sex, and race.

In this manuscript, simple mediation models (those including only one mediator and one independent variable) were analyzed. The first set of models examined the mediating relationship of physical HRQL on the relationship between 1) social problem solving total score and suicidal behavior, and 2) social problem solving subscale scores and suicidal behavior. The second set analyzed the mediating role of mental HRQL on the relationship between 1) social problem solving total score and suicidal behavior, and 2) social problem solving subscale scores and suicidal behavior.

Results

In our primary care sample, 66.1% (n=148) of participants reported an annual income between \$0 and \$9,999.00, and 20.5% (n=46) had an annual income between \$10,000 and \$19,999.00. Sixty-eight percent (n=152) did not have any form of health insurance. An examination of suicidal behavior revealed that 55.2% (n=123) reported lifetime suicidal ideation, and 38.1% (n=85) reported having thought about suicide in the past year. Ten percent (n=22) had communicated their suicidal intent to another person, and 8.1% (n=18) reported that it was likely or very likely that they would attempt suicide someday in the future. Furthermore, 35.9% (n=80) scored above the clinical cut-off on the SBQ-R indicating significant suicide risk, and 55.4% (n=123) endorsed suicidal ideation within the past 12 months.

In bivariate analyses, total social problem-solving ability was significantly negatively associated with suicidal behavior ($r = -.40, p < .001$) and positively associated with physical ($r = .18, p = .008$) and mental ($r = .50, p < .001$) health related quality of life. Suicidal behavior was also negatively associated with mental health related quality of life ($r = -.50, p < .001$). Complete

descriptive results, including variable means and standard deviations, and bivariate results, can be found in Table 1.

Table 1. Sample descriptives and bivariate correlations of study variables

	Mean	SD	SPSI-Total	SPSI-PPO	SPSI-NPO	SPSI-RPS	SPSI-ICS	SPSI-AS	SF36-MCS	SF36-PCS	SBQ-R
Age	44.08	12.15	-.06	-.06	.06	-.07	.01	.03	-.14*	-.37**	.03
Social problem-solving ability (SPSI)-Total Score	12.01	3.67	-	.70**	-.78**	.70**	-.67**	-.83**	.50***	.18**	-.40***
SPSI – Positive Problem Orientation (PPO)	11.59	5.02	-	-	-.35**	.78**	-.08	-.35**	.36***	.20**	-.28***
SPSI – Negative Problem Orientation (NPO)	8.95	4.99	-	-	-	-.27**	.54**	.70**	-.52***	-.14*	.42***
SPSI – Rational Problem Solving Style (RPS)	10.96	4.83	-	-	-	-	-.21*	-.31**	.35***	.15*	-.26***
SPSI – Impulsive/Careless Style (ICS)	6.54	4.55	-	-	-	-	-	.66**	-.24***	-.08	.23**
SPSI – Avoidant Style (AS)	7.02	5.48	-	-	-	-	-	-	-.37***	-.10	.30***
Mental Component Summary Scale (MCS)	-1.52	1.42	-	-	-	-	-	-	-	.18*	-.50***
Physical Component Summary Scale (PCS)	-1.02	1.05	-	-	-	-	-	-	-	-	-.11
Suicidal Behavior (SBQ-R)	6.16	3.70	-	-	-	-	-	-	-	-	-

Note: Mental and Physical Component Summary Scales = Short Form 36v2; Suicidal Behavior = Suicidal Behaviors Questionnaire-Revised Total Score; Social problem-solving ability = Social Problem Solving Inventory-Revised-Short Form (Total and Subscale Scores); * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Supporting our hypotheses, mental HRQL was a significant mediator of the relationship between total social problem-solving ability and suicidal behavior (IE lower 95% CI= -.170, upper 95% CI= -.058). See Figure 1.

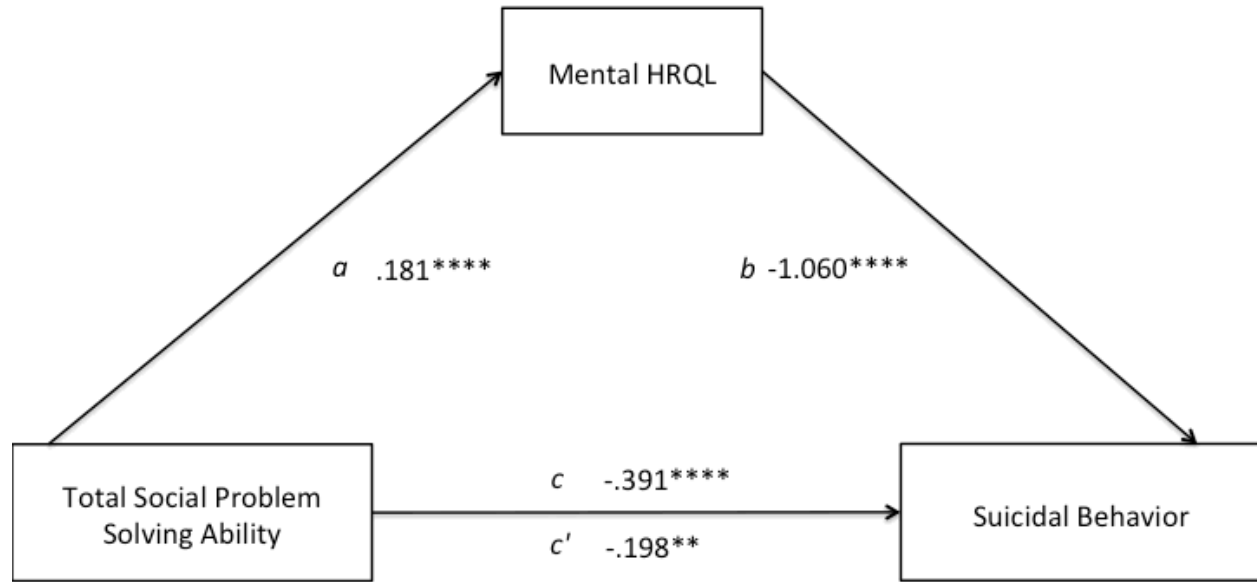


Figure 1: Effect of Social Problem Solving on Suicidal Behavior Mediated by Mental HRQL
 ** $p \leq .01$; **** $p \leq .0001$

Illustration of an indirect effect model. Note: A *total effect* (c) occurs if there is a relationship between the IV and DV without accounting for the MV. That is, social problem solving affects suicidal behavior without accounting for mental health related quality of life. A *direct effect* (c') occurs if there is a relationship between IV and DV after accounting for the MV. An *indirect effect* (ab) occurs if the MV plays a role in the relationship between the IV and DV. That is, social problem-solving ability affects suicidal behavior through mental health related quality of life.

Mental HRQL was also a significant mediator of the relationship between all subscales of the SPSI-R-SF including PPO and suicidal behavior (IE lower 95% CI = -.169, upper 95% CI = -.058), NPO and suicidal behavior (IE lower 95% CI = .089, upper 95% CI = .212), RPS and suicidal behavior (IE lower 95% CI = -.179, upper 95% CI = -.055), ICS and suicidal behavior (IE lower 95% CI = .041, upper 95% CI = .155), and AS and suicidal behavior (IE lower 95% CI = .071, upper 95% CI = .170). In models examining the potential mediating effect of physical HRQL on the relationship between total social problem-solving ability and suicidal behavior, as

well as on the relations between the five subscales of the SPSI-R-SF and suicidal behavior, physical HRQL was not a significant mediator.

Discussion

We examined the relationships between social problem-solving ability, health related quality of life, and suicidal behavior, among low-income primary care patients. At the bivariate level, and consistent with previous research, higher levels of positive social problem solving were associated with less self-reported suicidal behavior, whereas negative styles of problem solving were related to more suicidal behavior. Additionally, better perceived mental HRQL was associated with less negative problem solving ability, greater positive problem solving ability and less suicidal behavior.

We found that mental HRQL significantly mediated the relationship between problem solving and suicidal behavior. Specifically, mental HRQL was a mediator of total social problem solving and suicidal behavior, where higher levels of overall social problem-solving ability were associated with higher levels of mental quality of life which, in turn, was associated with lower levels of suicidal behavior. Mental HRQL mediated the positive subscales of problem solving (PPO, RPS) where PPO and RPS were associated with higher levels of mental HRQL, which, in turn, was associated with lower reported levels of suicidal behavior. Finally, mental HRQL also mediated the negative subscales of problem solving (NPO, ICS, and AS) where NPO, ICS, and AS were associated with lower levels of mental HRQL which, in turn, was associated with higher levels of suicidal behavior. Physical HRQL was not a significant mediator for overall social problem-solving ability or any of the subscales.

Our results are consistent with prior research demonstrating a relationship between problem-solving deficits and increased suicidal behavior and also between problem-solving

strengths and decreased risk for suicidal behavior [19-21]. Furthermore, our results extend the literature by highlighting potential mechanisms underlying the relationship between problem solving and suicidal behavior, that being the fundamental role of mental HRQL.

Previous research suggests that patients with a positive problem orientation may have the ability to see their problems as challenges, believe their problems can be solved and commit to solving their problems [12]. Having such a positive outlook on problems is associated with higher reported quality of life (QOL) in the mental domain which, in the current study, is related to lower levels of suicidal behavior, but likely impacts risk factors for suicide as well, such as depression and hopelessness [19-21]. Similarly, patients with a rational problem solving style, who take a purposeful, deliberate, and skillful approach to handling real-world problems, also reported higher levels of mental QOL and lower risk for suicidal behavior; as well, in past research, a rational problem solving style is associated with lower levels of suicidal behavior and better psychological outcomes, such as reduced depression [43, 58]. The ability to cope with daily stressors across multiple domains, such as work, home life and relationships, in a reasoned and positive manner, appears to be directly linked to a person's perception of their mental and emotional health and, when this perception is more positive, patients are less likely to consider suicide as an option for managing their problems [59-60].

Conversely, patients who have problem solving deficits, such as those who view problems as threats or do not feel able to solve their problems, those who have an impulsive or careless approach to problem solving, or those who avoid problems until they become unmanageable, appear to be at increased risk for negative outcomes, including suicidal ideation or suicide attempts [13-16]. These deficits in coping with the everyday pressures and challenges in daily life may lead people to feel distressed, anxious, depressed, or even hopeless, all risk

factors for suicidal behavior [61-62]. It should also be noted that a negative and ineffective problem solving style, in the context of stressors, may contribute to a sense of mental exhaustion, or low vitality, and perceived inability to complete the demands of daily life, with consequent risk for suicidal behavior [63-65]. Conversely, a positive and adaptive problem solving style may promote mental energization and a goal-oriented approach toward completion of daily routines, thereby reducing suicide risk [61, 66-67].

Contrary to our hypotheses, we did not find that physical HRQL was a significant mediator of the relation between problem solving and suicidal behavior, suggesting that problem solving ability may exert the largest effect on mental health outcomes. It may be that the inability, or ability, to cope with problems is more likely to influence a person's perception of their emotional health than their physical health. Because problem solving deficits are most often associated with psychological outcomes, such as symptoms of depression and hopelessness [13-14, 63], it seems reasonable that a person's perceptions of their own bodily pain, physical health and physical impairment, may not reflect the risk and protective nature of social problem solving as it relates to suicidal behavior outcomes. Importantly, it may be that social problem solving, with its well-established effects on psychosocial functioning [13-14, 19-21, 62], may have less of an impact on perceived physiological symptoms; that is, no amount of problem solving may alleviate feelings of pain or functional impairment due to physical difficulties. Future studies may consider employing a measure of medical coping to determine how a specific and non-social coping focus might influence the utility of social problem solving and the manifestation of suicidal behavior.

Limitations

Our novel results should be interpreted in the context of minor limitations, including the use of self-report questionnaires, which may be subject to the influence of demand characteristics, such as social desirability; therefore, underreporting of suicidal behavior may be a possibility. The cross-sectional aspect of our study precludes the examination of causality, and replicated research utilizing prospective assessments is needed. Additionally, our sample was predominantly middle-aged, female, and White, which may limit generalizability to other important groups. Future research utilizing diverse samples is needed to confirm that our findings apply to other age and ethnic/racial groups.

Implications

Our results may have clinical implications for suicide prevention efforts targeting primary care patients. Although some studies suggest that universal screening has only a negligible impact on detecting or reducing suicidal behavior [68], screening for suicidal ideation may be beneficial [69]. The number of patients in our primary care sample (55.4% n=123) that endorsed suicidal ideation is significantly higher compared to other studies with adolescents, middle-aged, and older adults, whose prevalence rates ranged from 1.0%-14.3% [5, 70-72]. Given the limited time primary care providers often have with each individual patient, one potential screening option could be that, during triage, nurses utilize Item 1 of the SBQ-R, a one-item screener, to assess for the presence of suicidal ideation within the past twelve months, followed by a more detailed assessment utilizing the entire SBQ-R if the patient screens positive for that item. An additional tool for primary care providers is the 9-item Patient Health Questionnaire (PHQ-9), which has also been used to assess suicidal ideation in primary care settings [73].

Second, a multidimensional approach to treatment of such patients may be in order, targeting both social problem solving and HRQL. Evidenced-based therapeutic interventions such as Cognitive-Behavioral Therapy or Problem Solving Therapy, may allow patients to improve their ability to identify a salient medical or emotional issue, generate alternative solutions, and assess whether the solution they chose was effective in addressing the problem [22-23]. This ability to manage problems associated with physical and mental health, such as stress, may increase a patient's self-efficacy and increase their perceived health related quality of life, thereby reducing suicide risk [74-76].

Conclusions

To our knowledge, this is the first study to examine the role of HRQL as it impacts the relationship between social problem solving and suicidal behavior among primary care patients. Our results indicate that social problem solving deficits are associated with reduced HRQL and increased suicidal behavior. Furthermore, mental HRQL mediated the relationship between both positive and negative problem solving styles and suicidal behavior. Primary care physicians, behavioral health consultants, and staff may be better able to assess, manage, and treat suicidal behavior among their patients by: 1) screening for suicide risk, 2) assessing for problem solving strengths and deficits as well as HRQL, and 3) utilizing brief, evidence-based treatments to improve social problem solving skills and HRQL.

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CHAPTER 3
MANUSCRIPT 2

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Social Problem Solving and Suicidal Behavior in Low-income Primary Care Patients: The
Mediating Role of Interpersonal Needs

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Abbreviated Title: Social Problem Solving and Suicidal Behavior

Keywords: suicidal behavior, social problem solving, thwarted belongingness, perceived burdensomeness, primary care

Abstract

Objective: Deficits in problem solving ability, as well as interpersonal dysfunction, are well-established risk factors for suicidal behavior; however, little is known about the interrelationships between these characteristics. *Method:* In a sample of 220 primary care patients, we examined the mediating role of perceived burdensomeness and thwarted belongingness on the relationship between social problem-solving ability and suicidal behavior. Participants completed self-report questionnaires including the Social Problem Solving Inventory-Revised, Interpersonal Needs Questionnaire, and Suicidal Behaviors Questionnaire-Revised; scores were analyzed using bootstrapped mediation techniques. *Results:* Thwarted belongingness and perceived burdensomeness mediated the relationship between social problem solving and suicidal behavior. *Conclusions:* Patients with greater social problem-solving ability reported lower levels of thwarted belongingness and perceived burdensomeness which, in turn, were related to fewer suicidal behaviors. Interventions that promote social problem solving and social connectedness, and reduce perceived burdensomeness, may help ameliorate suicide risk among primary care patients.

Social Problem Solving and Suicidal Behavior in Low-income Primary Care Patients: The Mediating Role of Interpersonal Needs

In the United States, suicide is the 10th leading cause of death, with 38,364 people dying by suicide in 2010 (American Association of Suicidology [AAS], 2012). Rates of suicidal behavior, including thoughts about suicide, planning for suicide, and suicide attempts are estimated to occur at even greater rates. For instance, data from 2011 show that within the past twelve months, 8.3 million adults (approximately 3.7% of the U.S. population) thought about suicide, 2.2 million made a suicide plan, and 1 million adults attempted suicide (Center for Disease Control and Prevention [CDC], 2011).

Suicide risk may be greater for vulnerable populations, including medically compromised individuals; as such, medical settings, particularly primary care clinics, are an important catchment area and critical milieu for assessing and managing suicidal behavior (Bryan & Rudd, 2011; Hirsch, Duberstein, & Unutzer, 2009; Schulberg, Bruce, Lee, Williams, & Dietrich, 2004). Data on contacts made by suicidal individuals receiving primary care support the importance of suicide prevention efforts in this setting. For example, approximately 62% of people who die by suicide made contact with a primary care provider within one year of their death, 45% of individuals within one month prior to their death, and approximately 20% made contact within 1 day (Bryan & Rudd, 2011; Luoma, Martin, & Pearson, 2002).

The percentage of individuals who make contact with a primary care provider is significantly larger than that of those who contacted a mental health provider; approximately 32% of individuals made contact with a mental health professional in the year prior to their death and 15-19% within the past month (Bryan & Rudd, 2011; Luoma et al., 2002). Studies have estimated that major depression, a common risk factor for suicide, occurs in 5-10% of primary

care patients (Katon & Schulberg, 1992; Nimalasuriya, Compton, & Guillory, 2009); between 1-10% of primary care patients endorse suicidal ideation (Schulber et al., 2004). Yet, there is a paucity of research on suicidal behavior in primary care settings, especially among middle-aged adults, for whom the rates of suicidal ideation, attempts, and death by suicide have been increasing significantly over the past decade (CDC, 2013).

The complexity of suicidal behavior requires the examination of a variety of biological, social, and psychological constructs as potential risk and protective factors, including social problem-solving ability and interpersonal needs. “Social problem solving” is conceptualized as a purposeful coping strategy focused on overcoming “everyday” challenges occurring across home, school, and work environments (D’Zurilla & Nezu, 1982, 1990). Social problem solving includes cognitive, emotional, and interpersonal processes, and occurs via a conscious effort to solve real-world problems, including interpersonal conflicts, occupational difficulty, and subjective personal challenges (D’Zurilla & Nezu, 1982, 1990); problem resolution may occur as a result of the implementation of tactics such as problem definition, generation of alternative responses, and decision making (D’Zurilla, Nezu, & Maydeu-Olivares, 2002).

Problem solving deficits have been consistently identified as a risk factor for suicidal behavior, across age groups (D’Zurilla, Chang, Nottingham, & Faccini, 1998; McAuliffe et al., 2006; McLaughlin, Miller, & Warwick, 1996). Poor problem solving skills also differentiate suicide attempters from non-attempters (Roskar, Zorko, Bucik, & Marusic, 2007). Pollock and Williams (2004) found that suicide attempters demonstrated increased passivity in their approach to problem solving, in comparison to non-suicidal psychiatric inpatients, and that this approach was consistent with an avoidant style of problem solving. In samples of suicidal and non-suicidal psychiatric inpatients, Linehan, Camper, Chiles, Strosahl, and Sherin (1987) found that suicide

attempters had significantly impaired problem solving ability, also characterized by passivity, compared to non-attempters. In another sample of suicide attempters, higher rates of impulsivity/carelessness, as well as having a negative outlook on problems, were found in participants' approach to problem solving (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012). Across twenty-two studies of social problem solving and suicidal behavior, comparing suicide attempters with those who endorsed only having thoughts of suicide, and non-suicidal controls, deficits in social problem solving were consistently found in attempters, including the inability to generate multiple solutions to problems and viewing problems as threats to well-being (Speckens & Hawton, 2005).

Although the majority of research has focused on the role of poor problem-solving as a risk factor for suicidal behavior, several studies have found that enhanced problem solving abilities serve as a protective factor and are associated with decreased risk for depression, hopelessness, and suicidal behavior (Chang, Watkins, & Banks, 2004; Becker-Weidman, Jacobs, Reinecke, Silva, & March, 2010; Hirsch, Chang, & Jeglic, 2012). Further, treatment focused on improving social problem-solving ability may reduce suicidal behavior (Ghahramanlou-Holloway et al., 2012; Stewart, Quinn, Plever, & Emmerson, 2009). For example, in a sample of recent suicide attempters, a cognitive-therapeutic approach emphasizing problem-solving appraisal resulted in self-reported improvements in the appraisal of, and approach to, problems (Ghahramanlou-Holloway et al., 2012) and, in a sample of suicide attempters, Problem-Solving Therapy, compared to treatment as usual, resulted in decreased suicidal ideation (Stewart et al., 2009).

Research on the relationship between social problem-solving ability and suicidal behavior (McAuliffe et al., 2006; McLaughlin et al., 1996) has focused primarily on adolescents and

college student samples, psychiatric samples, and older adults (Becker-Weidman et al., 2010; Linehan et al., 1987; Pollock & Williams, 2004; Speckens & Hawton, 2005; Szanto et al., 2012), with very few studies examining middle-aged adults or patients in primary care. Additionally, most studies have utilized the total score of the Social Problem Solving Inventory-Revised (SPSI-R), as opposed to examining individual problem-solving styles. This study addresses a significant gap in the literature by assessing the relationship between social problem solving total score, and subscale scores, and suicidal behavior, in sample of low-income, middle-aged primary care patients.

Like social problem-solving ability, interpersonal needs, including the need to relate to others, are associated with suicidal behavior. Baumeister and Leary (1995) proposed that human beings have a fundamental need to belong, and that our self-esteem is based, at least partially, on the perceived value of our interpersonal relationships. The perceived quality of these relationships is based not only connectedness, but also on feelings of competence and autonomy; conversely, the experience of feeling like a burden in relationships may decrease the perception of quality (Baumeister & Leary, 1995; Deci & Ryan, 2000; Jahn & Cukrowicz, 2011). They also argued that when this need to belong is thwarted, individuals can experience significant declines in health and well-being (Baumeister & Leary, 1995). Similarly, Deci and Ryan (2009) proposed a theory of human psychological needs, Self Determination Theory (SDT), which posits the existence of three primary psychological needs: relatedness, autonomy, and competence. Research on SDT indicates that satisfaction of the need for relatedness predicts greater psychological well-being, and that basic psychological needs play a role in the progression from suicidal ideation to attempts in young adults (Britton, Van Orden, Hirsch, & Williams, *In Press*; Deci & Ryan, 2012; Deci & Ryan 2009; Rowe, Walker, Britton, & Hirsch, 2013).

Building on these early theories, Joiner (2005) developed the Interpersonal-Psychological Theory of Suicide, which proposes that interpersonal distress, in the form of inability to sufficiently form connections with others, combined with a sense of being a burden to those around them, increases suicide risk (Joiner, 2005). *Perceived burdensomeness* occurs when an individual believes that their life places a burden on their family, friends, and/or society (Joiner, 2005). When a person perceives that they have become a burden, they may feel as though others will benefit more from their death than their life (Joiner, 2005; Joiner et al., 2009). *Thwarted belongingness* is described as feeling separate or apart from others, not integrated into the family, and feeling a lack of connectedness with friends or other valued groups (Joiner, 2005). The experience of feeling isolated and distanced from loved ones is a robust risk factor for predicting suicidal behavior (Boardman, Grimbaldeston, Handley, Jones, & Willmott, 1999; Van Orden, Witte, Cukrowicz, Braithwaite, Selby, & Joiner, 2010).

Numerous studies have documented a relationship between perceived burdensomeness and thwarted belongingness and suicidal behavior, across a variety of populations including college students, military personnel, and older adults (Anestis, Bagge, Tull, & Joiner, 2011; Bryan, 2011; Conner, Britton, Sworts, & Joiner, 2007; Jahn & Cukrowicz, 2011; Van Orden, Lynam, Hollar, & Joiner, 2006; Van Orden, Witte, Gordon, Bender, & Joiner, 2008; Van Orden et al., 2008), although very few have done so in a primary care sample. For example, in a sample of college students, social anxiety and depression were associated with thwarted belongingness and perceived burdensomeness, which was, in turn, associated with increased suicide risk (Davidson, Wingate, Grant, Judah, & Mills, 2011). Among primary care patients, thwarted belongingness mediated the relationship between pain interference and suicidal behavior (Walker, Cukrowicz, & Hirsch, *In Press*) and, in a study examining suicide notes, notes from

women more often contained messages with the theme of perceived burdensomeness, compared to men, and suicide notes from younger adults contained greater themes of thwarted belongingness compared to older adults (Gunn, Lester, Haines, & Williams, 2012). Finally, among older adults, perceived burdensomeness accounted for a significant portion of the variance in suicidal ideation, after controlling for depression, hopelessness, and functional impairment (Cukrowicz, Cheavens, Van Orden, Ragain, & Cook, 2011), and was also a predictor of greater suicidal behavior as well as a mediator of the relationship between depression and suicidal ideation (Jahn, Cukrowicz, Linton, & Prabhu, 2011; Jahn & Cukrowicz, 2011).

Although deficits in social problem-solving ability and thwarted interpersonal needs have both been linked to suicidal behavior, there is a paucity of information on how social problem-solving ability may influence interpersonal needs. At the bivariate level, we hypothesized that positive social problem solving styles would be significantly negatively associated with thwarted belongingness, perceived burdensomeness, and suicidal behavior; conversely, we predicted that negative problem solving styles would be positively associated with thwarted belongingness, perceived burdensomeness, and suicidal behavior. In multivariate analyses, we hypothesized that thwarted interpersonal needs would mediate the relationship between overall social problem-solving ability and suicidal behavior, such that higher levels of social problem-solving ability would be associated with lower levels of thwarted interpersonal needs and, in turn, to fewer suicidal behaviors. We also examined the mediating influence of thwarted interpersonal needs on the relationships between the subscales of the social problem solving measure and suicidal behavior.

Method

Participants

Two hundred and twenty adult participants (137 females, 61.2%, 82 males, 36.6%, 1 transgendered, 0.4%) from a primary care clinic serving low-income, uninsured patients participated in this Institutional Review Board-approved study. Previous research suggests that primary care settings are an important catchment area for the assessment and treatment of suicidal behaviors (Hirsch et al., 2009; Schulberg et al., 2004). Participants were required to be at least 18 years of age, be able to read English, and have the cognitive ability to provide consent and complete the self-report questionnaires. Our primary care sample had a mean age of 44.08 years (standard deviation [SD] = 12.11), and 86.2% were Caucasian (n=193), 7.1% African American (n=16), 3.1% were Hispanic (n=7), 0.9% were American Indian (n=2) and 0.4% Asian American (n=1).

Measures

Suicidal behavior was assessed using the *Suicidal Behaviors Questionnaire-Revised* (SBQ-R) (Osman, Bagge, Gutierrez, Konick, Kopper, & Barrios, 2001). This 4-item measure is used to assess suicidal behaviors including lifetime history of ideation and attempts, suicide ideation in past year, communication, and likelihood of future attempts. Each question on the SBQ-R is scored on a 5-point to 7-point Likert-type scale from 1 (no/never) to 7 (very likely), and higher scores indicate increased frequency or severity. The items are summed for a total score, and higher total scores are indicative of greater levels of suicidal behavior. The items can also be examined and analyzed individually, as each item asks a different question about suicidal behavior (Osman et al., 2001).

Osman et al. (2001) administered the SBQ-R to adolescent psychiatric inpatients, high school students, adult psychiatric inpatients, and college undergraduates and the measure demonstrated good internal consistency across samples (.76-.88). The SBQ-R exhibited adequate

discriminant validity, as it differentiates suicidal versus non-suicidal inpatients (standardized estimate = .79). Further, a cutoff score of 7 for non-clinical samples (sensitivity rate of .83 and specificity rate of .96) and 8 for clinical samples (sensitivity rate of 0.87 and specificity rate of 0.93) was identified. The first item of the SBQ-R can also be used as a screener, with a cut-off score of 2; use of the screener resulted in sensitivity of 0.80 and specificity of 0.97 for at-risk inpatients (Osman et al., 2001). In this study, internal consistency for the SBQ-R was good ($\alpha = .85$).

The *Social Problem Solving Inventory-Revised Short Form* (SPSI-R-SF) was used to assess social problem-solving ability (D’Zurilla et al., 2002). This 25-item self-report questionnaire is scored using a 5-point Likert-type scale ranging from 0 (*not at all true of me*) to 4 (*very true of me*). The items in the SPSI-R-SF are designed to reflect cognitive, behavioral, and emotional responses to real-life problems and challenges. The SPSI-R-SF yields a total score and five subscales scores: positive problem orientation (PPO), rational problem solving (RPS), negative problem orientation (NPO), impulsive and careless style (ICS), and avoidant style (AS) (D’Zurilla et al., 2002).

The PPO subscale is described as a constructive, problem solving-set that involves viewing problems as challenges, rather than threats, holding the belief that problems can be solved, having a sense of self-efficacy, believing that successful problem solving often takes time and energy, and making a commitment to solving problems instead of avoiding them (D’Zurilla et al., 2002). In contrast, the NPO subscale involves a negative and/or dysfunctional cognitive set that involves viewing problems as threats, doubting the ability to solve problems, and having feelings of frustration when challenged with daily problems (D’Zurilla et al., 2002).

In addition to the orientations assessed by the SPSI-R-SF, there are also three problem solving style subscales. The first, RPS, encompasses a rational, deliberate, skillful, and systematic approach to problem solving that involves applying adaptive problem solving techniques. This style involves four specific tasks: problem definition and problem formulation, generating alternative solutions, decision-making, and implementing solutions and gathering feedback. The ICS characterizes individuals who do make active attempts to solve problems, but engage in those attempts in an impulsive, hurried, careless, and incomplete fashion. People with high ratings on this subscale consider only one or a small number of alternative solutions, often going with the first choice that comes to mind. Finally, avoidant style is characterized by passivity, inaction or avoidance, procrastination, and dependency on others to make decisions. Individuals with this style will avoid problems as long as they can, wait for problems to solve themselves or put the responsibility or solving the problem onto someone else (D’Zurilla et al., 2002).

When calculating a total score, the negative subscales are reverse-scored, so that higher total scores are indicative of better social problem-solving ability. The psychometric properties of the SPSI-R-SF have been assessed across multiple studies including in collegiate, clinical, and community samples (D’Zurilla et al., 2002; Hawkins, Sofronoff, & Sheffield, 2009; Morera, Maydeu-Olivares, Nygren, White, Fernandez, & Skewes, 2006; Nezu, Nezu, & Perri, 1989; Spence, Sheffield, & Donovan, 2002); in these studies the SPSI-R-SF has demonstrated good internal consistency ($\alpha = .73-.79$), test-retest reliability over a three-week time period ($r = .91$) and adequate convergent validity with depression ($r = .57$) and anxiety ($r = .61$). Additionally, confirmatory factor analysis has validated the five-factor structure of the SPSI-R-SF (Maydeu-Olivares & D’Zurilla, 1996), and D’Zurilla et al. (2002), with a comparative fit

index (CFI) of .91 and an adjusted goodness of fit index (AGFI) of .89. In this study, internal consistency was good for the total score and each subscale score, ranging from .77-.85.

The *Interpersonal Needs Questionnaire-Revised* (INQ-R) was used to assess thwarted belongingness (9 items) and perceived burdensomeness (6 items) (Van Orden, Cukrowicz, Witte, & Joiner, 2012), using a 7-point Likert scale, ranging from 1 “Not at all true for me” to 7 “Very true for me” (Van Orden et al., 2012). The INQ-R is comprised of two subscales: thwarted belongingness, which assesses the extent to which the individual feels connected to other people, and perceived burdensomeness, which measures an individual’s perception of feeling like a burden to others. The perceived burdensomeness subscale of the INQ-R has a range of scores from 6 (no perceived burdensomeness) to 42 (extreme perceived burdensomeness). The thwarted belongingness subscale of the INQ-R has potential scores ranging from 9 (no thwarted belongingness) to 63 (extreme thwarted belongingness). When necessary, items were reverse scored so that higher scores indicate a greater sense of thwarted belongingness and perceived burdensomeness.

Although the INQ is a relatively new measure (Van Orden et al., 2008), it is being used increasingly in suicide research (Davidson et al., 2011; Rasmussen & Wingate, 2011; Van Orden, et al., 2012; Wong, Koo, Tran, Chiu, & Mok, 2011), with strong psychometric support for the INQ total and subscale scores. Among samples including college students and older adult community members, the perceived burdensomeness subscale has good internal consistency ($\alpha = .74-.92$) and convergent validity with suicidal ideation ($r = .35-.38$) and depressive symptoms ($r = .52-.57$). Similarly, the thwarted belongingness subscale has good internal consistency ($\alpha = .74-.90$) and adequate convergent validity with suicidal ideation ($r = .31$) and depressive symptoms ($r = .52-.56$) (Davidson et al., 2011; Rasmussen & Wingate, 2011; Wong et al., 2011). In our

sample, internal consistency was good for both the thwarted belongingness subscale ($\alpha = .86$) and perceived burdensomeness subscale ($\alpha = .83$).

Statistical Analyses

Pearson correlation coefficients (r) were calculated to examine independence of, and associations between, study variables. Mediation, otherwise known as an indirect effect, occurs when the relationship between an independent variable (X) and a dependent variable (Y) is explained, or partially explained, by a third variable (M) (Hayes, 2013; Preacher, Rucker, & Hayes, 2007). A process called bootstrapping, a procedure for surmounting limitations of statistical methods that assume a normal distribution of data, was used in all analyses.

Bootstrapping (Shrout & Bolger, 2002) is becoming a preferred method for analyzing data and involves repeated random samples of observations and computation of the test statistic (F-statistic in this instance) in each resample. Across many re-samplings, an approximation of the sampling distribution is calculated and utilized to test the hypothesis.

Often, multiple mediators may be thought to affect the relationship between X and Y , an assumption which can be tested utilizing a series of linear regression analyses to determine the impact of more than one mediator in a direct relationship (Hayes, 2013; Preacher & Hayes, 2008). In the current study, we analyzed thwarted belongingness and perceived burdensomeness as simultaneous, or parallel, mediators of the relationship between total social problem solving score, as well as the five social problem solving subscale scores, and suicidal behavior. This statistical technique estimates path coefficients and generates bootstrap confidence intervals for total and specific indirect effects of X on Y through one or more mediator variable(s) M , while adjusting all paths for the potential influence of covariates not proposed to be mediators in the model. If a true zero falls between the upper and lower confidence intervals, there is not a

significant indirect effect via the mediator. Because group differences exist, including age, sex and ethnicity, with regard to rates of suicidal behavior, primary health care utilization, as well as contact with a primary care provider prior to death by suicide (CDC, 2011; Joe, Baser, Breeden, Neighbors, & Jackson, 2006; Mosicki, 1994; Mosicki, 1997; Sudano & Baker, 2006), we covaried these demographic characteristics in all models.

Results

In our primary care sample, 66.1% (n=148) of participants reported an annual income between \$0 and \$9,999.00, and 20.5% (n=46) had an annual income between \$10,000 and \$19,999.00. Sixty-eight percent (n=152) did not have any form of health insurance. An examination of suicidal behavior revealed that 55.2% (n=123) reported lifetime suicidal ideation, and 38.1% (N=85) reported having thought about suicide in the past year. Ten percent (N=22) had communicated their suicidal intent to another person, and 8.1% (N=18) reported that it was likely or very likely that they would attempt suicide someday in the future. Furthermore, 35.9% (n=80) scored above the clinical cut-off on the SBQ-R indicating significant suicide risk, and 55.4% (n=123) endorsed suicidal ideation within the past 12 months. Descriptive results including variable means and standard deviations can be found in Table 1.

In bivariate analyses, and supporting our hypotheses, total social problem-solving ability was significantly negatively associated with thwarted belongingness ($r = -.48, p < .001$), perceived burdensomeness ($r = -.50, p < .001$), and suicidal behavior ($r = -.40, p < .001$). Perceived burdensomeness (PB) and thwarted belongingness (TB) were significantly positively associated with suicidal behavior (PB: $r = .61, p < .001$; TB: $r = .52, p < .001$). For complete bivariate results, including social problem solving subscales, see Table 1.

Table 1. Sample descriptives and bivariate correlations of study variables

	Mean	SD	SPSI- Total	SPSI- PPO	SPSI- NPO	SPSI- RPS	SPSI- ICS	SPSI- AS	INQ- PB	INQ- TB	SBQ-R
Age	44.08	12.15	-.06	-.06	.06	-.07	.01	.03	.04	.03	.03
Social problem-solving ability (SPSI)-Total Score	12.01	3.67	-	.70**	-.78**	.70**	-.67**	-.83**	-.51**	-.48*	-.40**
SPSI – Positive Problem Orientation (PPO)	11.59	5.02	-	-	-.35**	.78**	-.08	-.35**	-.34**	-.37*	-.28**
SPSI – Negative Problem Orientation (NPO)	8.95	4.99	-	-	-	-.27**	.54**	.70**	.44**	.43**	.42**
SPSI – Rational Problem Solving Style (RPS)	10.96	4.83	-	-	-	-	-.21*	-.31**	-.30**	-.33**	-.26**
SPSI – Impulsive and careless Style (ICS)	6.54	4.55	-	-	-	-	-	.66**	.34**	.26**	.23*
SPSI – Avoidant Style (AS)	7.02	5.48	-	-	-	-	-	-	.43**	.36**	.30**
INQ – Perceived Burdensomeness (PB)	15.98	10.79	-	-	-	-	-	-	-	.64**	.61**
INQ – Thwarted Belongingness (TB)	31.39	14.13	-	-	-	-	-	-	-	-	.52**
Suicidal Behavior (SBQ-R)	6.16	3.70	-	-	-	-	-	-	-	-	-

Note: INQ = Interpersonal Needs Questionnaire; Suicidal Behavior = Suicidal Behaviors Questionnaire-Revised Total Score; Social problem-solving ability = Social Problem Solving Inventory-Revised-Short Form (Total and Subscale Scores); * = $p < .01$; ** = $p < .001$

Also in support of our hypotheses, thwarted belongingness (TB) and perceived burdensomeness (PB) were significant mediators of the relationship between total social problem-solving ability and suicidal behavior (TB: IE lower 95% CI = -.171, upper 95% CI = -.026; PB: IE lower 95% CI = -.343, upper 95% CI = -.138) (See Figure 1). As well, thwarted

belongingness and perceived burdensomeness were significant mediators of the relationship between PPO and suicidal behavior (TB: IE lower 95% CI = -.106, upper 95% CI = -.019; PB: IE lower 95% CI = -.191, upper 95% CI = -.059), NPO and suicidal behavior (TB: IE lower 95% CI = .014, upper 95% CI = .111; PB: IE lower 95% CI = .080, upper 95% CI = .223), RPS and suicidal behavior (TB: IE lower 95% CI = -.097, upper 95% CI = -.015; PB: IE lower 95% CI = -.173, upper 95% CI = -.055), ICS and suicidal behavior (TB: IE lower 95% CI = .017, upper 95% CI = .089; PB: IE lower 95% CI = .072, upper 95% CI = .211), and AS and suicidal behavior (TB: IE lower 95% CI = .018, upper 95% CI = .094; PB: IE lower 95% CI = .081, upper 95% CI = .203).

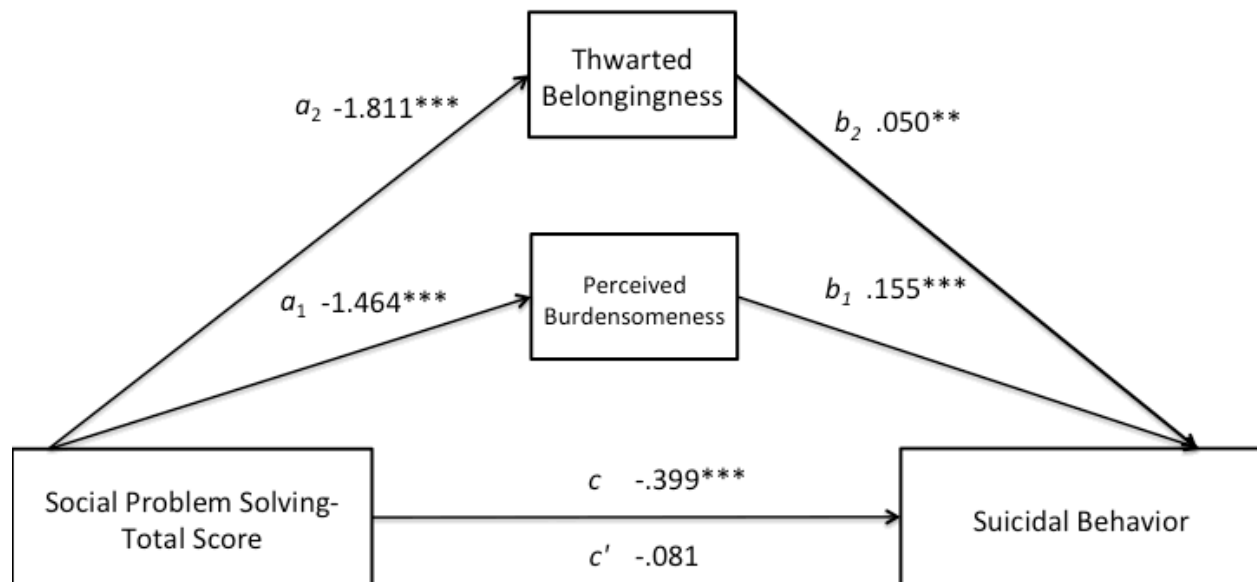


Figure 1: Effect of Social Problem Solving on Suicidal Behavior as Mediated by Interpersonal Needs

** $p \leq .01$; *** $p \leq .001$

Illustration of an indirect effect model. Note: A *total effect* (c) occurs if there is a relationship between the IV and DV without accounting for the mediating variable (MV). That is, social problem solving affects suicidal behavior without accounting for interpersonal needs. A *direct effect* (c') occurs if there is a relationship between IV and DV after accounting for the MV. An *indirect effect* (ab) occurs if the MV plays a role in the relationship between the IV and DV. That is, social problem-solving ability affects suicidal behavior through thwarted belongingness and perceived burdensomeness. Adapted from Preacher and Hayes (Preacher & Hayes, 2008a).

Discussion

In a sample of low-income primary care patients, we examined the relationships between social problem-solving ability, interpersonal needs, and suicidal behavior. Supporting our hypotheses at the bivariate level, and consistent with previous research, higher levels of positive social problem solving were associated with less self-reported suicidal behavior and lower levels of thwarted interpersonal needs, whereas negative styles of problem solving were related to more suicidal behavior and higher levels of thwarted interpersonal needs. Additionally, higher levels of thwarted belongingness and perceived burdensomeness were associated with greater suicidal behavior.

In further support of hypotheses, thwarted belongingness and perceived burdensomeness mediated the relationship between total score and subscales of social problem-solving ability and suicidal behavior; specifically, greater social problem-solving ability was associated with lower levels of thwarted interpersonal needs which were, in turn, related to lower levels of suicidal behavior. Furthermore, thwarted belongingness and perceived burdensomeness mediated the positive subscales of problem solving (PPO, RPS), where PPO and RPS were associated with fewer thwarted interpersonal needs and, in turn, to less suicidal behavior, and also mediated the negative subscales of problem solving (NPO, ICS, and AS), where NPO, ICS, and AS were related to greater thwarted interpersonal needs and in turn, to higher levels of suicidal behavior.

Our results are consistent with prior research demonstrating a relationship between problem solving deficits and increased suicidal behavior (Chang et al., 2004; Becker-Weidman et al., 2010; Hirsch et al., 2012). Patients who view problems as threats or do not feel able to solve their problems, who have an impulsive or careless approach to problem solving, or who avoid problems until they become unmanageable, are at increased risk for negative outcomes,

including suicidal ideation or suicide attempts (McAuliffe et al., 2006; McLaughlin et al., 1996; Pollock & Williams, 2004; Roskar et al., 2007). Conversely, problem solving strengths are associated with reduced risk for suicide and other negative psychological outcomes, such as depression and hopelessness (D’Zurilla & Nezu, 2010; Townsend et al., 2001). Moreover, our results extend the literature by highlighting the relationship between social problem solving and interpersonal needs, as well the mechanistic role of interpersonal needs in the relationship between problem solving and suicidal behavior.

Our findings demonstrate that there is a relationship between problem solving deficits and greater levels of thwarted belongingness and perceived burdensomeness. Prior research among older adult suicide attempters revealed that attempters had limited social networks, were less likely to confide in family members, and reported fewer close friends, compared to non-suicidal older adults with depression and older adults with no psychiatric history (Szanto et al., 2012). These attempters also reported hostility in relationships, and a lack of social support; they perceived social problems as impossible to resolve, and took a careless and impulsive approach to solving problems (Szanto et al., 2012). Further, individuals high in impulsivity often experience interpersonal conflict and perceive reduced social support (Kleiman, Riskind, Schaefer, & Weingarden, 2012); as a result, individuals with impulsive or careless problem-solving styles may eventually be ostracized by their support network, perhaps increasing feelings of burdensomeness or isolation from social networks. In a similar fashion, those who are avoidant of problems and do not actively pursue solutions may not engage social support networks appropriately or may fear being rebuffed (Chao, 2011; Friedman, 2006; Jakupcak et al., 2014), perhaps increasing sense of burdensomeness and isolation from others. Inability to generate effective solutions to interpersonal problems is also associated with increased feelings

of shame and guilt, which contribute to suicide risk (Covert, Tangney, Maddux, & Heleno, 2003). Our results suggest that problem solving deficits may contribute to thwarting of interpersonal needs, including a greater sense of burdensomeness to, and disconnectedness from, others, which are risk factors for suicidal behavior (Joiner, 2005; Szanto et al., 2012; Van Orden & Conwell, 2011).

On the other hand, we found that adaptive problem-solving ability was related to fewer thwarted interpersonal needs. Patients with greater levels of social problem-solving ability, who are able to face challenges directly, develop and maintain a stronger social support network, as well as utilize the network in times of distress (Daniels, Beesley, Wimalasiri & Cheyne, 2013; D’Zurilla et al., 2002; D’Zurilla & Nezu, 2010; Lui, Lee, Greenwood, & Ross, 2012), are likely to feel more connected to people in their lives, and may be at reduced risk for suicide. For instance, previous research with children and youth suggests that promoting problem solving skills enhances relationships (Cappadocia & Weiss, 2011) and, similarly, adults who seek advice or assistance from others to solve their problems endorse greater feelings of interpersonal connectedness. In our sample, social problem solving strengths were also associated with lower levels of perceived burdensomeness. The ability to solve problems and manage daily stressors, whether interpersonal, home-related or vocational in nature, may result in increased feelings of self-efficacy and a reduced perception of being a burden on others, thereby ameliorating risk for suicidal behavior (Marks, Allegrante, & Lorig, 2005; McAuley, Konopack, Motl, Morris, Doerksen & Rosengren, 2006; Robinson-Smith, Johnston, & Allen, 2000).

Our results also extend the growing body of research demonstrating a relationship between thwarted interpersonal needs and suicidal behavior. Increased feelings of thwarted belongingness, or a sense of isolation and disconnectedness from others, as well as feeling like a

burden to others, or that others' lives would benefit from their absence, is associated with a greater risk for suicide (Joiner, 2005; Van Orden et al., 2008; Jahn & Cukrowicz, 2011). In a previous study of older adults, perceived burdensomeness was related to greater suicidal ideation, after controlling for depression, hopelessness, and functioning impairment (Cukrowicz, et al., 2011). Perceived burdensomeness also functions as a mediator of the relationship between depression and suicidal ideation (Jahn et al., 2011; Jahn & Cukrowicz, 2011), and there is a growing body of research associating thwarted interpersonal needs to suicidal behavior in primary care (Cukrowicz, Jahn, Graham, Poindexter, & Williams, 2013; Nsamenang, Webb, Cukrowicz, & Hirsch, 2013).

Furthermore, our unique finding that interpersonal needs mediate the relationship between social problem solving and suicidal behaviors contributes to a better understanding of the Interpersonal Psychological Theory of Suicide, calling attention to an important mechanism of action for the problem solving-suicidal behavior linkage and highlighting two important areas for assessment and intervention: social problem solving and interpersonal needs. Individuals with a positive problem orientation and/or a rational problem solving style appear to be at lower risk for feeling disconnected from others or feeling like a burden in their relationships and consequently, less risk for suicidal behavior. Conversely, persons with problem solving deficits including having a negative problem orientation and/or an impulsive or avoidant style seem to have greater incidence of thwarted interpersonal needs and related suicidal behavior. Our findings also suggest that there may be a developmental or learning-based aspect to the Interpersonal Psychological Theory of Suicide, in that social problem-solving ability develops across the lifespan and, perhaps, as a result of exposure to social modeling (Blanchard-Fields, 2007; D'Zurilla & Nezu, 2010;); thus, our results imply that long-term deficits in social problem

solving may contribute to the vulnerability of perceiving thwarted interpersonal needs. Having knowledge of potential precursors to thwarted interpersonal needs, as well as understanding of the downstream risk-inducing or buffering effects of specific social problem solving abilities is important in prioritizing the development and implementation of successful interventions, and provides primary care providers and behavioral health consultants with therapeutic targets to effect change in risk for suicidal behavior for their patients.

Limitations

Our novel results should be interpreted in the context of minor limitations, including the use of self-report questionnaires, which, although necessary, may be subject to the influence of demand characteristics, such as social desirability; therefore, underreporting of suicidal behavior may be a possibility. However, 35.9% (n=80) of our sample had scores above the clinical cut-off on the SBQ-R, and 55.4% (n=123) endorsed suicidal ideation within the past 12 months, rates that are higher than those reported in most primary care samples and evidence that underreporting is less likely (Heisel, Duberstein, Lyness, & Feldman, 2010; Schulberg et al., 2004; Unützer et al., 2006; Wintersteen, 2010). The cross-sectional aspect of our study precludes the examination of causality and bi-directionality is a possibility; replication of our models utilizing prospective and objective assessments is needed. Additionally, a significant strength of our study is the focus on two vulnerable groups for suicidal behavior – Whites and middle-aged adults. However, this homogeneity may limit generalizability, and future research is needed utilizing diverse demographic, community and clinical samples, to confirm that our findings apply to other sociocultural groups.

Implications

Our results may have clinical implications for suicide prevention efforts in primary care settings. Although some studies suggest that universal screening has a minimal impact on detecting or reducing suicidal behavior (O'Connor, Gaynes, Burda, Soh, & Whitlock, 2013), our own results suggest that screening for suicidal ideation may be beneficial (Bostwick & Rackley, 2012), particularly for vulnerable medical samples. The number of patients in our low-income, under-insured primary care sample (55.4% n=123) that endorsed suicidal ideation is significantly higher compared to other studies with middle-aged and older adults, and adolescent samples, whose prevalence rates ranged from 1.0%-14.3% (Heisel et al., 2010; Schulberg et al., 2004; Unützer et al., 2006; Wintersteen, 2010). Given that there is often limited time with each individual patient in the primary care setting, one potential screening option could be that health personnel, whether physician, nurse or office staff, utilize Item 1 of the SBQ-R, a one-item screener, to assess for the presence of suicidal ideation within the past twelve months, followed by a more detailed assessment utilizing the complete SBQ-R if the patient screens positive for that item. An additional tool for providers is the widely used and oft-cited 9-item Patient Health Questionnaire (PHQ-9), which has also been used to assess suicidal ideation in primary care settings (Bauer, Chang, Huang, Vannoy, & Unützer, 2013).

Second, a multidimensional, perhaps multi-orientation, approach to treatment of such patients may be in order, targeting both social problem solving and interpersonal needs. As an example, Problem Solving Therapy may allow patients to improve their ability to identify a salient problem, generate alternative solutions, and assess whether the solution they chose was effective in addressing the problem (Ghahramanlou-Holloway et al., 2012; Stewart et al., 2009). When successfully applied, the ability to manage everyday problems, such as financial stress or relationship strain, may increase a patient's self-efficacy, thereby reducing feelings of

burdensomeness and decreasing suicide risk (Marks et al., 2005; McAuley et al., 2006; Robinson-Smith et al., 2000). Cognitive Behavioral Therapy may be simultaneously employed to help patients identify maladaptive or distorted cognitions that underlie feelings of isolation or burden-laden perceptions, and to bolster the social support networks of patients by utilizing homework assignments or behavioral activation to increase engagement with others (Beckner, Howard, Vella, & Mohr, 2010; Newman et al., 2011; Stangier, Schramm, Heidenreich, Berger, & Clark, 2011). Furthermore, Interpersonal Therapy, which focuses on strengthening a sense of social connectedness and improving the quality of interpersonal relationships, may serve to decrease feelings of thwarted belongingness, as well as suicide risk (Beckner et al., 2010; de Mello, de Jesus Mari, Bacaltchuk, Verdeli, & Neugebauer, 2005; Stellrecht et al., 2006; Weissman & Klerman, 1990).

Conclusions

This is the first published study examining the impact of interpersonal needs on the relationship between social problem-solving ability and suicidal behavior in primary care patients. Our results indicate that social problem-solving ability serves as both a risk and protective factor for suicidal behavior and thwarted interpersonal needs. Problem solving deficits are associated with greater thwarted belongingness and perceived burdensomeness and, in turn, to greater suicidal behavior. Conversely, better social problem-solving ability is associated with lower levels of thwarted belongingness and perceived burdensomeness as well as consequent lower levels of suicidal behavior. The fact that interpersonal needs mediate the relationship between positive and negative problem solving styles and suicidal behavior highlights a potential mechanism by which the social problem solving and suicide linkage may occur and offers targets for intervention. Health care providers in primary care settings, including physicians, behavioral

health consultants, and nursing and other staff, may be better able to assess and manage suicidal behavior among their patients by screening for suicidal ideation, assessing for problem solving strengths and deficits as well as thwarted interpersonal needs, and utilizing brief-evidence based treatments to enhance problem solving ability and bolster feelings of competence and connectedness.

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CHAPTER 4
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Neuroticism and Suicidal Behavior: A Moderated Mediation Model of Social Problem Solving
and Hopelessness

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Abstract

Purpose: Suicide is a significant public health problem. Individuals with problem solving deficits, higher levels of neuroticism, and/or hopelessness, may be at increased risk. However, little is known about how these constructs may influence each other and impact vulnerability for suicidal behavior. *Methods:* In a sample of 220 low-income, primary care patients ages 19-79 ($M = 44.08$; $SD = 12.11$), we examined the potential mediating role of hopelessness on the relation between neuroticism and suicidal behavior, as well as the potential moderating role of social problem-solving ability on this association. Participants completed self-report questionnaires: Suicidal Behaviors Questionnaire-Revised, Social Problem Solving Inventory-Revised, Beck Hopelessness Scale, and NEO Five Factor Inventory. Models were tested using bootstrapped moderated mediation techniques. *Results:* There was a significant indirect effect of neuroticism on suicidal behavior through hopelessness, and this indirect effect was moderated by social problem-solving ability. *Conclusion:* Patients with higher levels of neuroticism also manifest greater levels of hopelessness and, in turn, more suicidal behavior, and these relationships are strengthened at lower levels of social problem solving. Although neuroticism is a relatively stable personality trait, interventions that increase social problem-solving ability and reduce feelings of hopelessness may reduce risk for suicidal behavior.

Neuroticism and Suicidal Behavior: A Moderated Mediation Model of Social problem-solving ability and Hopelessness

Suicide and suicidal behavior are significant public health problems. In the United States, suicide is the 10th leading cause of death, and 38,364 people died by suicide in 2010 (American Association of Suicidology [AAS], 2012), and many more individuals engaged in suicidal behavior, such as having thoughts about suicide or having made a suicide attempt. For example, in 2011, 8.3 million adults (approximately 3.7% of the U.S. population) endorsed having thoughts about suicide, 2.2 million made a plan for suicide, and 1 million adults had a suicide attempt (Center for Disease Control and Prevention [CDC], 2011).

Development of effective intervention and prevention efforts for suicide are predicated on the ability of researchers to understand the multifaceted nature of suicidal behavior, and requires attention to a variety of social and psychological variables as potential risk and protective factors. At the intrapersonal level, a well-established risk factor for suicide, neuroticism, is conceptualized as a stable, and often pervasive, personality trait that contrasts adjustment and emotional stability (i.e., low levels of neuroticism) with maladjustment and emotional instability (i.e., high levels of neuroticism). Individuals high in neuroticism have an increased propensity for experiencing negative affect, including feelings such as anxiety, anger, envy, and guilt (Costa & McCrae, 1992; McCrae & Costa, 2004). Perhaps, as a result, neuroticism is associated with unstable and depressed mood and suicidal behavior, including ideation and attempts, as well as death by suicide (Beautrais, Joyce, & Mulder, 1999; Bowen, Baetz, Leuschen, & Kalynchuk, 2011; Brezo, Paris, & Turecki, 2006; Chioqueta & Stiles, 2005; Statham et al., 1998; Quilty, Sellborn, Tackett, & Bagby, 2009; Roy, 2002). Indeed, neuroticism accounts for a significant proportion (32%) of variance in suicide rates among Americans

(McCann, 2010) and, in an examination of cross-national relations between personality factors and suicide rates, neuroticism was linked to historical as well as contemporary suicide rates (Voracek, 2009). Neuroticism also predicts suicidal behavior across a variety of age groups including adolescents, and middle-aged and older adults (Dixit & Khokar, 2007; Pickles, Collishaw, Messer, Rutter, & Maughan, 2010; Segal, Marty, Meyer, & Coolidge, 2012).

Another negatively-valenced, intrapersonal risk factor that, arguably, plays a central role in suicidal behavior, and which may evolve from neurotic personality tendencies, is hopelessness (Britton, Duberstein, Conner, Heisel, Hirsch, & Conwell, 2008; Chang, Sanna, Hirsch, & Jeglic, 2010; Wetzel, Margulies, Davis, & Karam, 1980). Hopeless individuals often believe that “nothing will turn out right for them; they will never succeed at what they attempt to do; their important goals can never be obtained; and, that their worst problems will never be solved” (Beck & Steer, 1988, p.1). Beck, Steer, Kovacs, & Garrison (1985) argue that hopelessness serves as the link between depression and suicide; when individuals are depressed and also believe there is no way out of an intolerable situation, suicide may be considered a viable alternative (Beck et al., 1985). In a study of hopelessness and eventual death by suicide, only hopelessness and the pessimism item of the Beck Depression Inventory were predictive; in fact, scores of 10 or greater on the BHS yielded a specificity of .91 for predicting eventual death by suicide (Beck et al., 1985).

Among psychotic patients, hopelessness predicted suicidal attempts at multiple time points, including 4 to 6 years after first hospitalization (Klonsky, Kotov, Bakst, Rabinowitz, & Bromet, 2012). For older adults, hopelessness is associated with suicidal ideation and attempts (Neufield & O’Rourke, 2009) and, among college students, hopelessness is a consistent predictor of suicidal risk (Heisel, Flett, & Hewitt, 2003; Hess, Becker, Pituch, & Saathoff, 2011; Hirsch &

Conner, 2006). Similar relationships between hopelessness and suicidal behavior have been found among adolescents and psychiatric outpatients (Arie, Apter, Orbach, Yefet, & Zalzman, 2008; Bhar, Ghahramanlou-Holloway, Brown, & Beck, 2008).

At the interpersonal level, deficits in social problem-solving ability contribute to suicide risk while, at the same time, adaptive problem solving may serve as a protective factor. Social problem solving is conceptualized as a purposeful coping strategy focused on overcoming “everyday” challenges that occur in home, school, and/or work environments (D’Zurilla & Nezu, 1982, 1990). Social problem solving includes cognitive, emotional, and interpersonal processes, and takes place utilizing a conscious effort to solve real-world problems, including interpersonal conflicts, occupational difficulty, and subjective personal challenges (D’Zurilla & Nezu, 1982, 1990); resolving problems may occur as a result of the implementation of strategies such as: 1) problem definition, 2) generation of alternative responses, 3) decision making, and 4) evaluating the effectiveness of the chosen solution (D’Zurilla, Nezu, & Maydeu-Olivares, 2002).

Across age groups, problem solving deficits have been consistently identified as a risk factor for suicidal behavior and have been shown to differentiate between suicide attempters and non-attempters (McAuliffe et al., 2006; McLaughlin, Miller, & Warwick, 1996; Roskar, Zorko, Bucik, & Marusic, 2007). Compared to non-suicidal psychiatric inpatients, suicide attempters demonstrated significantly impaired problem solving ability and increased passivity in their approach to problem solving, consistent with an avoidant style of problem solving (Linehan, Camper, Strosahl, & Sherin, 1987; Pollock & Williams, 2004). In a meta-analysis comparing suicide attempters with suicide ideators and non-suicidal controls, deficits in social problem solving were consistently found in attempters, suggesting that these deficits may play a role in the progression from suicidal ideation to suicide attempts (Speckens & Hawton, 2005).

Although most research on problem solving and psychopathology focuses on problem solving deficits as risk factors, several studies have found that enhanced problem solving abilities are associated with lower risk for negative outcomes including depression, hopelessness, and suicidal behavior (Chang, Watkins, & Banks, 2004; Becker-Weidman, Jacobs, Reinecke, Silva, & March, 2010; Hirsch, Chang, & Jeglic, 2012). Further, interventions that strive to improve social problem-solving ability appear to reduce suicidal behavior (Ghahramanlou-Holloway, Bhar, Brown, Olsen, & Beck, 2012; Stewart, Quinn, Plevier, & Brett, 2009).

Although the relations between neuroticism, hopelessness, social problem solving and suicidal behavior have never been examined in a single study, previous research implies that our premise may be accurate. For instance, individuals high in neuroticism tend to have poorer coping skills, including reduced problem solving capabilities (Carver & Connor-Smith, 2010) and, across several samples of college students, neuroticism was the strongest predictor of a negative problem orientation and overall lower social problem-solving ability (Chang & D’Zurilla, 1996; D’Zurilla, Maydeu-Olivares, & Gallardo-Pujol, 2011; Huband, McMurrin, Evans, & Duggan, 2007; McMurrin, Egan, Blair, & Richardson, 2001). Furthermore, social problem solving deficits have been associated with increased depression, hopelessness and suicidal behavior across multiple samples, including college students, non-suicidal psychiatric inpatients, and suicidal inpatients (Bonner & Rich, 1988; Dixon, Heppner, & Rudd, 1994; D’Zurilla, Chang, Nottingham, & Faccini, 1998; Reinecke, DuBois, & Schultz, 2001; Yang & Clum, 1994).

In the current study, we examined the relations between these characteristics in a sample of low-income, underserved, primary care patients. At the bivariate level, we hypothesized that neuroticism and hopelessness would be significantly positively associated with suicidal behavior,

and that overall social problem-solving ability would be significantly negatively associated with suicidal behavior, hopelessness, and neuroticism. We hypothesized that hopelessness would mediate the relationship between neuroticism and suicidal behavior, such that higher levels of neuroticism would be associated with increased hopelessness, and, in turn, to greater levels of suicidal behavior. Further, we hypothesized that the relationships between 1) neuroticism and hopelessness, 2) hopelessness and suicidal behavior, and 3) neuroticism and suicidal behavior would be moderated by social problem solving.

Method

Participants

Two hundred and twenty adults were (137 females, 61.2%; 82 males, 36.6%; 1 transgendered, 0.4%) recruited from a primary care clinic serving low-income, uninsured patients, to participate in this institutional review board-approved. Participants were required to be at least 18 years of age, be able to read English, and have the capacity to provide consent and complete self-report questionnaires. Participants had a mean age of 44.08 years (standard deviation [SD] = 12.11), and 86.2% were Caucasian (n=193), 7.1% African American (n=16), 3.1% Hispanic (n=7), 0.9% American Indian (n=2) and 0.4% Asian American (n=1).

Of importance, our use of a primary care sample acknowledges an increasingly recognized fact, that primary care clinics are important locations for detecting and preventing suicidal behavior (Bryan & Rudd, 2011; Hirsch, Duberstein, & Unutzer, 2009; Schulberg, Bruce, Lee, Williams, & Dietrich, 2004). Approximately 62% of people who die by suicide made contact with a primary care provider within one year of their death, 45% of individuals within one month prior to their death, and approximately 20% made contact within 1 day (Bryan & Rudd, 2011; Luoma, Martin, & Pearson, 2002). Of note, major depression, a concomitant of

neuroticism and a common risk factor for suicide, occurs in 5-10% of primary care patients (Katon & Schulberg, 1992; Nimalasuriya, Compton, & Guillory, 2009), and between 1 and 10% of primary care patients endorse suicidal ideation (Schulber et al., 2004). Despite this information, suicide prevention research is lacking in primary care settings, especially for middle-aged adults, for whom rates of suicidal behavior have increased significantly over the past decade (CDC, 2013).

Measures

Suicidal behaviors were evaluated using the *Suicidal Behaviors Questionnaire-Revised* (SBQ-R) (Osman, Bagge, Gutierrez, Konick, & Kopper, 2001). This measure is comprised of 4 questions designed to assess suicidal behavior including: 1) lifetime history of ideation and attempts, 2) suicide ideation in past year, 3) communication of suicidal intent, and 4) likelihood of future attempts. Each question is scored on a 5-point to 7-point Likert-type scale from 1 (no/never) to 7 (very likely); items are summed for a total score, although they can also be examined independently, with higher numbers indicating increased frequency or severity (Osman et al., 2001).

Across multiple samples including, adolescent psychiatric inpatients (N=120), high school students (N=138), adult psychiatric inpatients (N=120), and college undergraduates (N=135), the SBQ-R demonstrated good internal consistency ($\alpha = .76-.88$) (Osman et al., 2001). This measure has also shown adequate discriminant validity, as it differentiates suicidal versus non-suicidal inpatients (standardized estimate = .79). Further, a cutoff score of 7 for non-clinical samples (sensitivity rate of .83 and specificity rate of .96) and 8 for clinical samples (sensitivity rate of 0.87 and specificity rate of 0.93) have been determined. The first item of the SBQ-R can also be used as a screener, with a cut-off score of 2; use of the screener resulted in sensitivity of

0.80 and specificity of 0.97 for at-risk inpatients (Osman et al., 2001). In this study, internal consistency is good at $\alpha = .85$.

Social problem-solving ability is assessed via the *Social Problem Solving Inventory-Revised Short Form* (SPSI-R-SF) (D'Zurilla et al., 2002), a 25-item self-report questionnaire that is scored using a 5-point Likert-type scale ranging from 0 (*not at all true of me*) to 4 (*very true of me*). The items in the SPSI-R-SF are designed to reflect cognitive, behavioral, and emotional responses to real-life problems and challenges. The SPSI-R-SF yields a total score that is comprised of five subscales scores: positive problem orientation (PPO), rational problem solving (RPS), negative problem orientation (NPO), impulsive and careless style (ICS), and avoidant style (AS) (D'Zurilla et al., 2002).

The PPO subscale is described as a constructive, problem solving-set that involves viewing problems as challenges and holding a belief that problems are solvable. In contrast, the NPO subscale involves a negative and/or dysfunctional cognitive set that involves viewing problems as threats and doubting personal ability to solve problems (D'Zurilla et al., 2002). In addition to the orientations assessed by the SPSI-R-SF, there are also three problem solving style subscales. The first, RPS, encompasses a rational, deliberate, skillful, and systematic approach to problem solving that involves the application of adaptive problem solving techniques. The ICS characterizes individuals who make active attempts to solve problems, but do so in an impulsive, hurried, careless, and incomplete fashion. Finally, avoidant style is characterized by passivity, inaction or avoidance, procrastination, and dependency on others to make decisions (D'Zurilla et al., 2002).

When calculating a total score, the negative subscales are reverse-scored, so that higher total scores are indicative of increased social problem-solving ability. The psychometric

properties of the SPSI-R-SF have been evaluated across multiple studies utilizing collegiate, clinical, and community samples (D’Zurilla et al., 2002; Hawkins, Sofronoff, & Sheffield, 2009; Morera, Maydeu-Olivares, Nygren, White, Fernandez, & Skewes, 2006; Nezu, Nezu, & Perri, 1989; Spence, Sheffield, & Donovan, 2002), in which the SPSI-R-SF has demonstrated good internal consistency ($\alpha = .79$), test-retest reliability over a three-week time period ($r = .91$) and adequate convergent validity with depression ($r = .57$) and anxiety ($r = .61$). Additionally, confirmatory factor analysis has validated the five-factor organization of the SPSI-R-SF (Maydeu-Olivares & D’Zurilla, 1996), and D’Zurilla et al. (2002), with a comparative fit index (CFI) of .91 and an adjusted goodness of fit index (AGFI) of .89. In this study, internal consistencies for the total and subscale scores for the SPSI-R-SF were good, ranging from $\alpha = .77-.85$.

The NEO-Five Factor Inventory (NEO-FFI) (McCrae & Costa, 2004) is a 60-item measure assessing five domains of personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Each domain is comprised of 12 questions. Unlike the NEO-PI-R (a 240-item version), the NEO-FFI does not provide information on specific facets within each domain, although sub-cluster scoring is available (Chapman, 2007). Although the NEO-FFI provides five domain scores, only the neuroticism subscale will be used in the current study, given its strong association with suicidal behavior and hopelessness (Bowen et al., 2011; Duberstein, Conwell, Seidlitz, Denning, Cox, & Caine, 2000; Roy, Rylander, & Sarchiapone, 1997; Statham et al., 1998). The core of the neuroticism domain is the tendency for people “to experience negative affect such as fear, sadness, embarrassment, anger, guilt, and disgust” (McCrae & Costa, 2004, p. 14). Individuals with higher scores on this subscale are considered to have more neuroticism (McCrae & Costa, 2004).

The NEO-FFI has good internal consistency ($r = .86$ for neuroticism), good convergent validity with the NEO-PI-R, and adequate test-retest reliability over a three-year time period ($r = .62$ for neuroticism) in an adult community sample (McCrae & Costa, 2004). In our sample, internal consistency was also good for the neuroticism subscale ($\alpha = .83$). The NEO-FFI has been used successfully in multiple primary care studies, with predictive validity evidenced for a variety of constructs including perceived need for mental health care (Seekles et al., 2012), medical illness burden (Chapman, Lyness, & Duberstein, 2007), depression and anxiety (Spinhoven et al., 2011), perceived health and functional status (Duberstein et al., 2003) and nonresponse to treatment (Katon et al., 2002).

The Beck Hopelessness Scale (BHS) is a 20-item measure designed to assess the extent of negative attitudes about the future (Beck, Weissman, Lester, & Trexler, 1974). The measure consists of true (0) or false (1) items, with 9 keyed as false and reverse-scored, and 11 keyed as true; higher scores indicate greater hopelessness. Total score may range from 0 (no hopelessness) to 20 (extreme hopelessness). Scoring guidelines among samples of psychiatric inpatients and outpatients indicate that scores ranging from 0 to 3 = minimal hopelessness, 4 to 8 = mild hopelessness, 9 to 14 = moderate hopelessness, and 15 to 20 = severe hopelessness (Beck et al., 1974).

Psychometric properties of the BHS have been examined in multiple samples including longitudinal studies of suicide attempters, adults recruited from community mental health centers, and adults with diagnosed depression or dysthymia, and across these studies, the BHS exhibited good internal consistency ($r = .82-.93$) and test-retest reliability during a one-week period ($r = .69$) and a six-week period ($r = .66$) (Beck, Steer, & McElroy, 1982; Beck et al., 1985; Steer, Beck, & Shaw, 1985; Steer, Beck, Brown, & Berchik, 1987).

The BHS has high levels of construct validity, in that it assesses symptoms of hopelessness and not depressive symptoms, and good discriminant validity, in that it can distinguish suicide attempters from non-attempters (Beck, Steer, Beck, & Newman, 1993). Further, hopelessness is consistently a stronger predictor of suicidal behavior than depressive symptoms (Beck et al., 1985; Beck, Brown, Berchik, & Stewart, 1990; Brown, Beck, Steer, & Grisham, 2000); some argue that assessing hopelessness, rather than depression, may be important in clinical settings (Minkoff, Bergman, Beck, & Beck, 1973). Internal consistency in this study was excellent ($\alpha = .94$).

Statistical Analyses

Pearson correlation coefficients (r) were calculated to examine independence of, and associations between, study variables. Mediation, otherwise known as an indirect effect, occurs when the relationship between an independent variable (X) and a dependent variable (Y) is explained, or partially explained, by the presence of a third variable (M) (Preacher, Rucker, & Hayes, 2007). Bootstrapping, a procedure for surmounting limitations of statistical methods that assume a normal distribution of data, was used in all analyses, as it is becoming a preferred method for analyzing data and involves repeated random samples of observations and computation of the test statistic (F-statistic in this instance) in each resample (Shrout & Bolger, 2002). Across many re-samplings, an approximation of the sampling distribution is calculated and utilized to test the hypothesis. These statistical techniques estimate path coefficients and generate confidence intervals (percentile, bias-corrected, and bias-corrected and accelerated) for total and specific indirect effects of X on Y through the mediator variable M . This process adjusts all paths for the potential influence of covariates not proposed to be mediators in the

model. If a true zero falls between the upper and lower confidence intervals, there is not a significant indirect effect via the mediator.

Additionally, however, it may be important to determine whether or not that mediating relationship remains constant across levels of a given variable. For example, “the strength of an indirect effect may depend linearly upon the value of a moderator (W) that is measured on an interval or ratio scale” (Preacher et al., 2007, p. 186). When these effects are present, they are referred to as moderated mediation or conditional indirect effects. Furthermore, this technique can be used to explore conditional direct effects to determine if the relationship between the predictor and outcome variable is dependent on the level of a moderator.

Analyses will be conducted using a publicly available SPSS syntax file, “PROCESS” (Hayes, 2013), which tests for significant moderating effects within mediation analyses. This program also uses an additional *post-hoc* bootstrap resampling process to calculate estimates of asymmetric confidence intervals (CIs) of conditional indirect effects at particular values of the moderator. CIs that do not contain zero indicate that the indirect effect at the specified value of the moderator is statistically significant (Preacher & Hayes, 2008; Preacher et al., 2007).

Covariates in all models included age, sex, and race.

Results

In our low-income primary care sample of 220 adults, 66.1% (n=148) of participants had an annual income between \$0 and \$9,999.00, and 20.5% (n=46) reported an annual income between \$10,000 and \$19,999.00. Sixty-eight percent (n=152) did not have any health insurance. Twenty percent (n=86) of our sample reported moderate levels of hopelessness, and 18.5% (n=42) reported severe hopelessness. Among our participants, 55.2% (n=123) reported lifetime suicidal ideation, and 38.1% (n=85) reported suicidal ideation during the past 12 months; 10%

(n=22) had communicated to another person that they felt suicidal, and 8.1% (n=18) reported that it was likely or very likely that they would attempt suicide sometime in the future.

Additional descriptive results including variable means and standard deviations can be found in Table 1.

Table 1. Sample descriptives and bivariate correlations of study variables

	Mean	SD	SPSI- Total	NEO-FFI Neuroticism	BHS	SBQ-R
Age	44.08	12.15	-.06	.03	.13	.03
Social problem-solving ability (SPSI) – Total Score	12.01	3.67	-	-.65***	-.63***	-.40***
NEO-FFI Neuroticism Subscale	27.32	9.22	-	-	.60***	.50***
Beck Hopelessness Scale (BHS)	7.41	6.32	-	-	-	.56***
Suicidal Behavior (SBQ-R)	6.16	3.70	-	-	-	-

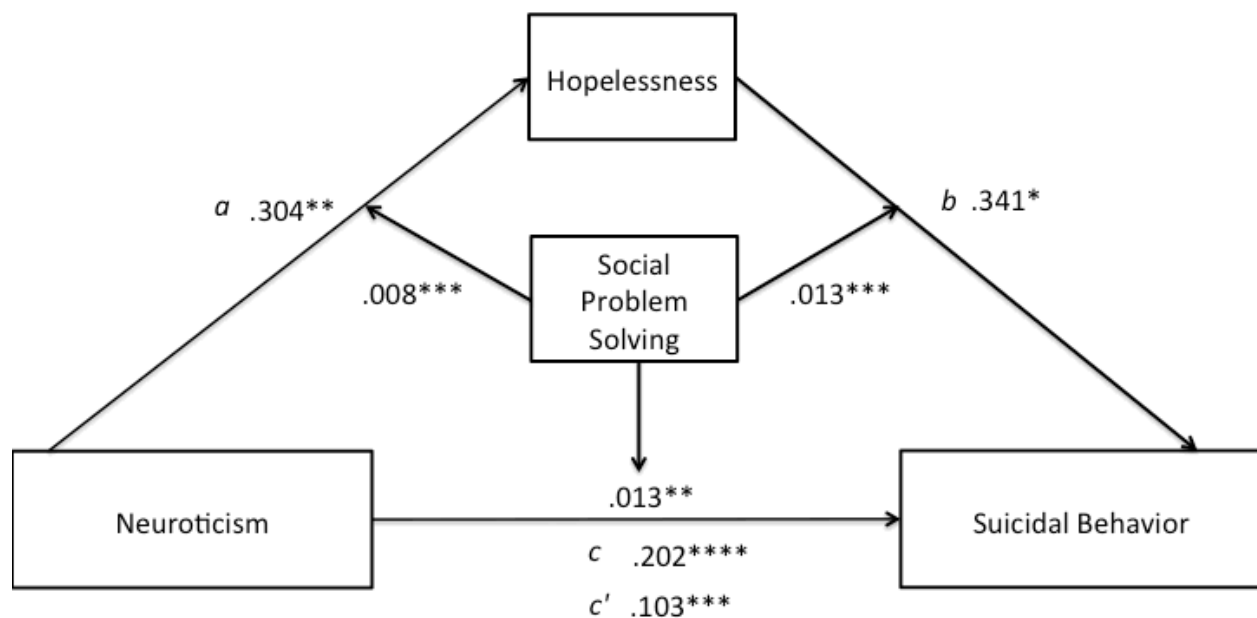
Note: Neuroticism = NEO Five Factor Inventory; Suicidal Behavior = Suicidal Behaviors Questionnaire-Revised Total Score; Hopelessness = Beck Hopelessness Scale; Social Problem Solving = Social Problem Solving Inventory-Revised Total Score; *** = $p < .001$

Significant bivariate correlations were found for several study variables. Neuroticism was significantly positively associated with hopelessness ($r = .60, p < .001$) and suicidal behavior ($r = .50, p < .001$), and hopelessness was significantly positively associated with suicidal behavior ($r = .56, p < .001$). Social problem-solving ability was significantly negatively associated with neuroticism ($r = -.65, p < .001$), hopelessness ($r = -.63, p < .001$), and suicidal behavior ($r = -.40, p < .001$).

At the multivariate level, hopelessness was a significant mediator of the relationship between neuroticism and suicidal behavior (IE lower 95% CI= .05, upper 95% CI= .63). Further, social problem-solving ability was a statistically significant moderator of the relationship between neuroticism and hopelessness (IE lower 95% CI= .03, upper 95% CI= .13) and between

hopelessness and suicidal behavior (IE lower 95% CI= .01, upper 95% CI= .10), indicating the presence of conditional indirect effects. Additionally, social problem-solving ability was a significant moderator of the relationship between neuroticism and suicidal behavior (IE lower 95% CI= .02, upper 95% CI= .19), indicating the presence of a conditional direct effect. See Figure 1.

Figure 1. Conditional indirect and direct effects of social problem solving on the associations between neuroticism, hopelessness, and suicidal behavior



* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$; **** $p \leq .001$

Illustration of a conditional indirect effect model. Note: A *total effect* (c) occurs if there is a relationship between the IV and DV without accounting for the MV. That is, neuroticism affects suicidal behavior without accounting for hopelessness. A *direct effect* (c') occurs if there is a relationship between IV and DV after accounting for the MV. An *indirect effect* (ab) occurs if the MV plays a role in the relationship between the IV and DV. That is, neuroticism affects suicidal behavior through hopelessness. *Conditional indirect effects* occur if the relationship between the IV and the MV, and the MV and DV, differ at levels of the moderating variable. That is, the relationship between neuroticism and hopelessness and between hopelessness and suicidal behavior differs at levels of social problem-solving ability. A *conditional direct effect* occurs if the relationship between the IV and DV differs at levels of the moderating variable. Adapted from Preacher and Hayes (Preacher & Hayes, 2008a).

Post-hoc analyses were also conducted, which confirmed the statistically significant presence of conditional indirect effects at 5 percentiles of the moderator: 10th (lower 95% CI=

.03, upper 95% CI= .15), 25th (lower 95% CI= .03, upper 95% CI= .11), 50th (lower 95% CI= .02, upper 95% CI= .10), 75th (lower 95% CI= .01, upper 95% CI= .10), and 90th (lower 95% CI= .01, upper 95% CI= .10). Statistically significant conditional direct effects were found at each percentile: 25th (lower 95% CI= .03, upper 95% CI= .18), 50th (lower 95% CI= .05, upper 95% CI= .18), 75th (lower 95% CI= .05, upper 95% CI= .21), and 90th (lower 95% CI= .04, upper 95% CI= .23), with the exception of the 10th (lower 95% CI= -.01, upper 95% CI= .20) which was not significant.

Discussion

In our sample of low-income, primary care patients, we examined the associations between neuroticism, hopelessness, social problem solving, and suicidal behavior. In bivariate analyses, and in support of our hypotheses, neuroticism was positively associated with hopelessness and suicidal behavior, and social problem solving was negatively associated with neuroticism, hopelessness, and suicidal behavior. Also in support of our hypotheses, in moderated mediation analyses, hopelessness mediated the relationship between neuroticism and suicidal behavior, such that higher levels of neuroticism were associated with more hopelessness and, in turn, to greater reported suicidal behavior. Social problem solving moderated these relationships such that the relationships between: 1) neuroticism and hopelessness, 2) hopelessness and suicidal behavior, and 3) neuroticism and suicidal behavior, were stronger at lower levels of social problem-solving ability (10th and 25th percentiles) and weaker at higher levels of problem solving (50th, 75th, and 90th percentiles) indicating conditional indirect and direct effects.

Our results are consistent with previous research indicating a relationship between neuroticism and suicidal behavior, and highlight a potential mechanistic pathway – the role of

hopelessness. Individuals with higher levels of neuroticism, a stable and pervasive personality trait, have an increased propensity to experience distorted and maladaptive cognitive-emotional functioning and are at increased risk for negative outcomes, including feelings of hopelessness (Chioqueta & Stiles, 2005; McCann, 2010; Statham et al., 1998). The vulnerabilities contributed by neuroticism may contribute to feelings of hopelessness, and this combination of low mood and lack of positive future orientation, as suggested by escape-based theories of suicide, may make death by suicide appear to be a viable coping solution. (Baumeister, 1990; Chioqueta & Stiles, 2005).

Our findings also confirm previous research associating hopelessness with increased risk for suicidal behavior. Similar to Beck's (1985) argument that hopelessness serves as the link between depression and suicide, we found that hopelessness serves as the link between neuroticism and suicide. Regardless of etiology, whether situation-specific, depression-based or stemming from neuroticism, a sense of hopelessness continues to be an important risk factor for suicide, to be addressed in continued research and prevention efforts (Beck et al., 1985).

Most importantly, our findings extend the literature by highlighting a critical point of potential intervention – social problem-solving ability. In each path of our model, social problem solving affected well-established junctures of risk – when adaptive problem solving was reported, associations were weakened, but were exacerbated with poor problem solving ability. From a risk-perspective, the relation between neuroticism and suicidal behavior (direct effect) and the indirect effect of neuroticism and suicidal behavior through the mediating role of hopelessness was stronger for individuals with lower levels of social problem-solving ability, suggesting that social problem solving may be a potential point for intervention.

Given that neuroticism is often associated with a perceived inability to cope with life's challenges, it is understandable that these individuals may view problems as threats and employ passivity, impulsivity, or avoidance in their approach to problem solving (Chang & D'Zurilla, 1996; D'Zurilla et al., 2011; Huband et al., 2007; McMurrin et al., 2001), thereby engendering hopelessness (Speckens & Hawton, 2005). Additionally, neuroticism was also negatively related to adaptive problem solving in our sample, including rational problem management, suggesting that it may be difficult for persons with a neurotic personality style to engage in adaptive coping strategies.

Yet, our unique findings also indicate that, for individuals who maintain a positive, rational and goal-oriented method toward stressor resolution, vulnerability was reduced across our model. This is consistent with research showing problem solving strengths are associated with less suicidal ideation and attempts (Chang et al., 2004; Becker-Weidman et al., 2010; Hirsch et al., 2012). Although a neurotic personality style may always increase likelihood of instability across interpersonal and socioemotional functioning and, whether directly or indirectly, may contribute to suicide risk, our results indicate that patients who have problem solving strengths are at less risk for these negative linkages and outcomes.

Limitations

Our results should be interpreted in the context of minor study limitations, including the cross-sectional aspect of our study, which precludes the examination of causality. Our findings should be replicated prospectively and longitudinally. There may be other variables not considered in our models that contribute risk for or protection from suicidal behavior, and which should be addressed in future research; for instance, some research suggests that it is a lack of positive affect, a component of the extraversion personality trait, that is more predictive of

hopelessness and suicidal behavior, than neuroticism (Duberstein, Conner, Conwell, & Cox, 2001). Our finding that neuroticism and suicidal behavior was not moderated at low-levels of problem-solving (i.e. 10th percentile) need to be further explored and replicated. One possibility may be that there were not enough participants in that group to generate meaningful findings. Furthermore, our sample was predominantly middle-aged, female, and White, which may limit generalizability to other important groups. Future research utilizing diverse samples is needed to confirm that our findings apply to other age and racial groups. Finally, the use of self-report questionnaires may result in underreporting of suicidal behavior, as participant responses to these questions may be subject to demand characteristics, such as social desirability. However, in our sample, 55.4% (n=123) endorsed suicidal ideation within the past 12 months and 35.9% (n=80) had scores above the clinical cut-off on the SBQ-R. Such rates are higher than those reported in many primary care samples and are evidence that underreporting is less likely (Heisel, Duberstein, Lyness, & Feldman, 2010; Schulberg et al., 2004; Unützer et al., 2006; Wintersteen, 2010). Importantly, however, our use of a primary care sample, is an extension of previous research on personality, social problem solving and psychopathology outcomes, most of which has been conducted with student and psychiatric samples; the incidence of suicidal behavior in our sample is a strong indicator of the need for assessment and treatment of suicidal behavior in the primary care setting.

Implications

Our results may have clinical implications for suicide prevention efforts within primary care settings. Although some studies suggest that universal screening has only a minimal impact on detecting or reducing suicidal behavior (O'Connor, Gaynes, Burda, Soh, & Whitlock, 2013) screening for suicidal ideation may still be beneficial (Bostwick & Rackley, 2012). The number

of patients in our primary care sample (55.4% n=123) that endorsed suicidal ideation is significantly higher compared to other studies with adolescents, middle-aged, and older adults, whose prevalence rates ranged from 1.0%-14.3% (Heisel et al., 2010; Unützer et al., 2006; Wintersteen, 2010). Primary care providers often have limited time with each individual patient; one potential screening option could be that, during triage, nurses utilize Item 1 of the SBQ-R, a one-item screener, to assess for the presence of suicidal ideation within the past twelve months. This brief screening could be followed by a more thorough assessment utilizing the complete SBQ-R if the patient positively endorses Item 1. Another possible tool for primary care providers to use for screening is the 9-item Patient Health Questionnaire (PHQ-9), which has also been used to assess suicidal ideation in primary care settings (Bauer, Chan, Huang, Vannoy, & Unützer, 2013).

Second, for patients who endorse thoughts of suicide, an integrated approach to treatment that targets feelings of hopelessness as well as increasing problem solving skills may be in order. Cognitive-behavioral interventions may help to reduce the hopelessness patients are experiencing by helping them to identify and restructure negative automatic thoughts or to become more behaviorally engaged in their environment (Brown, Have, Henriques, Xie, Hollander, & Beck, 2005; Stanley et al., 2009). Evidence-based interventions such as Problem Solving Therapy, or use of the problem solving modules in Dialectical Behavior Therapy and Cognitive Behavioral Therapy, may allow patients to improve their social problem-solving ability, including being able to correctly identify and define the problem or challenge they face, generate alternative solutions, and determine whether or not the solution they chose was effective in addressing the problem (Ghahramanlou-Holloway et al., 2012; Neacsiu, Rizvi, & Linehan, 2010; Stewart et al., 2009; Warmerdam, van Straten, Jongasma, Twisk, & Cuijpers, 2010). As an example, in a sample of

recent suicide attempters, Cognitive Therapy that underscored the importance of problem-solving appraisal resulted in improvements in appraisal of, and approach to, problems (Ghahramanlou-Holloway et al., 2012) and, also among attempters, Problem-Solving Therapy, compared to treatment as usual, resulted in decreased suicidal ideation (Stewart et al., 2009). This ability to manage everyday problems will likely increase a patient's self-efficacy and reduce the likelihood of feeling hopeless, thereby reducing suicide risk (Marks, Allearante, & Lorig, 2005; McAuley, Konopack, Motl, Morris, Doerksen & Rosengren, 2006; Robinson-Smith, Johnston, & Allen, 2000; Townsend et al., 2001).

Finally, although neuroticism is a stable and pervasive personality trait, suggesting that it may be less malleable to change, the interventions mentioned above are likely to similarly ameliorate many of the negative characteristics often associated with neuroticism. For instance, Cognitive Behavioral Therapy strategies such as reframing, or cognitive restructuring, may be helpful in challenging seemingly-hopeless situations, and Problem Solving Therapy, with techniques such as goal adjustment, may be ways to bolster adaptive problem solving in persons with neurotic risk (Beck, 2011; D'Zurilla & Nezu, 2010; Ghahramanlou-Holloway et al., 2012; Stewart et al., 2009). Similarly, techniques such as mindfulness, or strategies from Dialectical Behavior Therapy, might be used to improve emotional dysregulation and reduce likelihood of engaging in maladaptive problem solving efforts, which would otherwise be risk factors for suicide (Amstadter, 2008; Stanley, Brodsky, Nelson, & Dulit, 2007).

Conclusions

To our knowledge, this is the first published data to examine how the relationships between neuroticism, hopelessness and suicidal behavior are moderated by social problem-solving ability. We found that greater levels of neuroticism were related to more hopelessness

and, in turn, to increased incidence of suicidal behavior. Furthermore, the indirect relationship between neuroticism and suicidal behavior, through hopelessness, and the direct relationship between these constructs were moderated by social problem-solving ability. Primary care physicians, behavioral health consultants, and nursing staff may be better able to detect and treat suicidal ideation and prevent suicide attempts among their patients by: 1) screening for suicide risk, 2) assessing for levels of hopelessness and problem solving deficits and 3) utilizing brief, evidence-based treatments to improve social problem solving skills and reduce feelings of hopelessness.

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CHAPTER 5

INTEGRATED DISCUSSION

Across three studies using a sample of 220 middle-aged, low-income primary care patients, we examined a biopsychosocial model of risk and protective factors for suicidal behavior, namely the interrelationships between the following constructs: 1) health related quality of life, 2) interpersonal needs, 3) neuroticism, 4) hopelessness, and 5) social problem-solving ability. Of particular interest were social problem solving that was examined in all models and in relation to physical and mental health, social relationships, personality, and suicidal behavior, which served as the outcome for all analytic models.

In Manuscript 1, we found that mental health related quality of life (HRQL) was a mediator of the relationship between social problem solving (total score and subscales) and suicidal behavior. Individuals with lower problem solving ability reported lower mental HRQL, which was in turn associated with higher levels of suicidal behavior. Conversely, for individuals with higher levels of positive problem solving, this was associated with higher mental HRQL, which was in turn associated with lower levels of suicidal behavior. In Manuscript 2, we determined that thwarted interpersonal needs mediated the relationship between social problem solving (total and subscale scores), whereby individuals with lower social problem solving reported increased perceived burdensomeness and thwarted belongingness, which was associated with increased suicidal behavior. Individuals with better problem solving reported lower levels of perceived burdensomeness and thwarted belongingness, which was in turn, associated with decreased suicidal behavior. Finally, in Manuscript 3, we found that hopelessness mediated the relationship between neuroticism and suicidal behavior and that the indirect effects were moderated by social problem-solving ability, where the relationships between neuroticism and

suicidal behavior, neuroticism and hopelessness, and hopelessness and suicidal behavior were strengthened at lower levels of problem solving and weaker at higher levels of problem solving.

Risk Factors for Suicidal Behavior

In support of study hypotheses, we found several risk factors associated with suicidal behavior in our sample. First, across all three papers we found that lower social problem solving scores were associated with higher levels of suicidal behavior at the bivariate level. Our results are consistent with previous research demonstrating a relationship between social problem solving deficits and increased suicidal behavior (Becker-Weidman et al., 2010; Chang et al., 2004; Hirsch et al., 2012). Patients who view problems as threats or do not feel able to solve their problems, who have an impulsive or careless approach to problem solving, or who avoid problems until they become unmanageable are at greater risk for negative outcomes, including suicidal ideation or suicide attempts (McAuliffe et al., 2006; McLaughlin et al., 1996; Pollock & Williams, 2004; Roskar et al., 2007).

Second, at the bivariate level we found that greater levels of neuroticism were associated with increased hopelessness and higher levels of suicidal behavior. Individuals with higher levels of neuroticism, a stable and ubiquitous personality trait, are more likely to experience negative affect and are at increased risk for hopelessness (Chioqueta & Stiles, 2005). The combined experience of neuroticism and hopelessness may be tied to a person's desire for suicide as a viable option to cope with these feelings (Chioqueta & Stiles, 2005; McCann, 2010; Statham et al., 1998). Third, we found that hopelessness was associated with increased risk for suicidal behavior. Prior findings of the relationship between hopelessness and increased risk for suicidal behavior were confirmed by our data. Extending the argument that hopelessness serves as the link between depression and suicide (Beck et al., 1985), we found that hopelessness serves as a

mediator between neuroticism and suicide and that when individuals are experiencing negative affect, an inability to cope, and also believe there is no way out of an intolerable situation, suicide may be considered a reasonable alternative (Beck et al., 1985).

Fourth, we found that thwarted interpersonal needs, namely perceived burdensomeness and thwarted belongingness, were associated with greater suicidal behavior. Our results extend the growing body of research demonstrating a relationship between thwarted interpersonal needs and suicidal behavior as well as research indicating that thwarted belongingness and perceived burdensomeness relates to suicide risk in primary care patients (Cukrowicz, Jahn, Graham, Poindexter, & Williams, 2013; Nsamenang, Webb, Cukrowicz, & Hirsch, 2013).

Protective Factors for Suicidal Behavior

In support of our hypotheses we found that problem-solving strengths were associated with less suicidal behavior at the bivariate level. Positive problem solving including having a positive problem orientation and using a rational problem solving style are related to reduced risk of negative outcomes including suicidal behavior but were also associated with lower levels of neuroticism, hopelessness, and thwarted interpersonal needs.

We also found that the mental health component of HRQL was associated with lower levels of suicidal behavior. Additionally, better perceived mental HRQL was associated with less negative problem-solving ability, greater positive problem-solving ability and less suicidal behavior. Problem-solving strengths are associated with higher reported quality of life (QOL) in the mental domain, which is related to lower levels of suicidal behavior, but higher mental QOL likely reduces risk factors for suicide as well, such as depression and hopelessness (Becker-Weidman et al., 2010; Chang et al., 2004; Ghahramanlou-Holloway et al., 2012). The ability to cope with daily stressors across multiple domains such as work, home life, and relationships in a

reasoned and positive manner appears to be directly linked to a person's perception of his or her mental and emotional health, and when this perception is more positive, patients are less likely to consider suicide as an option for managing their problems (Koivumaa-Honkanen et al., 2001; Pompili et al., 2009).

The Tie that Binds: Social Problem-Solving Ability

A key element of this project was to determine the impact of social problem-solving ability on suicidal behavior as well as to examine how social problem solving interacted with other variables to influence suicidal behavior. We found that mental HRQL significantly mediated the relationship between problem solving and suicidal behavior. Specifically, mental HRQL was a mediator of total social problem solving and suicidal behavior as well as the positive subscales of problem solving (PPO, RPS), whereby more adaptive problem solving was related better mental HRQL and, in turn, to less suicidal behavior. Mental HRQL also mediated the negative subscales of problem solving (NPO, ICS, and AS) whereby problem solving deficits were associated with lower mental HRQL, which was related to greater levels of suicidal behavior. A negative or ineffective problem solving style, particularly in the context of life stress, may contribute to a sense of mental fatigue, lower reports of vitality, and perceived inability to meet the demands of daily life, with consequent risk for suicidal behavior (Linda, Marroquin, & Miranda, 2012; Nezu, Nezu, Saraydarian, Kalmar, & Ronan, 1986; Nock & Mendes, 2008). Conversely, a positive and adaptive problem solving style may promote increased mental and emotional energy as well as a goal-oriented approach toward completion of daily routines, thereby reducing suicide risk (Bartley & Roesch, 2011; D'Zurilla & Nezu, 2010; Nezu, Maguth-Nezu, & D'Zurilla, 2013).

In further support of our hypotheses, we found that thwarted belongingness and perceived burdensomeness mediated the relationship between total score and subscales of social problem-solving ability and suicidal behavior; specifically, greater social problem-solving ability was associated with lower levels of thwarted interpersonal needs that were, in turn, related to lower levels of suicidal behavior. Furthermore, thwarted belongingness and perceived burdensomeness mediated the positive subscales of problem solving (PPO, RPS), where PPO and RPS were associated with fewer thwarted interpersonal needs and, in turn, to less suicidal behavior, and also mediated the negative subscales of problem solving (NPO, ICS, and AS), where NPO, ICS, and AS were related to greater thwarted interpersonal needs and, in turn, to higher levels of suicidal behavior. Our results add to the literature by highlighting the relationship between social problem solving and interpersonal needs as well the mechanistic role of interpersonal needs in the relationship between problem solving and suicidal behavior. Research suggests that suicide attempters report poorer quality in interpersonal relationships such as increased hostility and limited networks as well as problem-solving deficits including perceiving problems as unable to be solved and being careless in their approach to problem solving (Szanto et al., 2012).

Our unique findings that interpersonal needs mediate the relationship between social problem solving and suicidal behaviors also highlight two important areas for assessment and intervention: social problem solving and interpersonal needs. Individuals with a positive problem orientation and/or a rational problem solving style are at lower risk for feeling disconnected from others as well as feeling like a burden in their relationships. An absence or low level of thwarted interpersonal needs is then associated with a lower risk for suicidal behavior in primary care patients. Having an understanding of these downstream buffering effects of social problem solving is important for prioritizing effective evidence based interventions to reduce negative

psychosocial outcomes such as hopelessness and thwarted interpersonal needs as well as for the prevention of suicidal behavior. Conversely, those patients with problem-solving deficits including having a negative problem orientation and/or an impulsive or avoidant style may manifest higher levels of perceived social isolation and burdensomeness and, in turn, increased risk of suicidal ideation and future suicide attempts. An awareness of a patient's problem solving deficits may provide primary care healthcare personnel with an intervention target by which to reduce an array of negative outcomes.

Also in support of our hypotheses, in moderated mediation analyses hopelessness mediated the relationship between neuroticism and suicidal behavior such that higher levels of neuroticism were associated with feelings of hopelessness that, in turn, were associated with greater incidence of suicidal behavior. Further, social problem solving moderated these relationships such that the relations between: 1) neuroticism and hopelessness, 2) hopelessness and suicidal behavior, and, 3) neuroticism and suicidal behavior were stronger at lower levels of social problem-solving ability, indicating that these relationships were dependent upon the level of the individual's social problem-solving ability.

Our finding that problem-solving ability was associated with each of our study variables, serving as both a direct and indirect influence on suicide risk, demonstrates the fundamental importance of this variable in understanding suicidal behavior. These findings also add important information to existing theories of suicide. First, related to Joiner's Interpersonal-Psychological Theory of suicide, our results demonstrate the thwarted interpersonal needs not only increase suicide risk but also are influenced by a person's social problem-solving ability (Joiner, 2005). Second, Baumeister's (1990) theory of suicide as escape from self is further elucidated by our findings that social problem-solving ability interacts with relationships between neuroticism and

suicidal behavior as well as neuroticism and hopelessness and hopelessness and suicidal behavior.

Our finding that a person's problem solving approach and style can be either a risk or protective factor for suicide and that it interacts with mental and physical health, interpersonal relationships, and cognitive-emotional processing has notable implications for assessment and intervention. Importantly, social problem solving is a malleable construct and one that has been shown to improve with intervention (Ghahramanlou-Holloway et al., 2012). Our use of a primary care sample highlights another critical setting for the development and implementation of brief problem-solving based interventions. If such interventions prove successful in primary care, other negative outcomes, such as those assessed in our study, can be potentially reduced, in addition to reducing suicide risk.

Limitations

Our novel results must be interpreted in the context of minor limitations including the use of self-report questionnaires, which, although necessary, may be subject to the influence of demand characteristics such as social desirability; therefore, underreporting of suicidal behavior may be a possibility. However, 35.9% (n=80) of our sample had scores above the clinical cut-off on the SBQ-R, and 55.4% (n=123) endorsed suicidal ideation within the past 12 months, rates that are higher than those reported in most primary care samples and evidence that underreporting is less likely. The cross-sectional aspect of our study precludes the examination of causality and allows for the possibility of bidirectionality in study findings such as the possibility that mental HRQL or thwarted interpersonal needs impacts social problem-solving ability. Longitudinal studies are important to conduct in the future to examine potential causal factors for suicidal behavior and to better predict suicidal ideation and attempts. Although a

significant strength of our study is the focus on two groups who are vulnerable for suicidal behavior - Whites and middle-aged adults - this homogeneity may limit generalizability. Thus, future research is needed using diverse demographic, community, and clinical samples to confirm that our findings apply to other groups and to determine the appropriateness of using resources to examine social problem-solving ability in other samples and to develop and test problem-solving interventions in primary care.

Implications

Our findings have clinical implications for suicide prevention efforts in primary care settings. Although some studies suggest that universal screening has a minimal impact on detecting or reducing suicidal behavior (O'Connor, Gaynes, Burda, Soh, & Whitlock, 2013), our results suggest that screening for suicidal ideation may be beneficial (Bostwick & Rackley, 2012), particularly for vulnerable samples, perhaps those who are financially distressed, undereducated, and underserved such as our sample. Of note, the number of patients in our sample (55.4% n=123) who endorsed suicidal ideation is significantly higher compared to other studies with middle-aged and older adults and adolescent samples, whose prevalence rates ranged from 1.0%-14.3% (Heisel, Duberstein, Lyness, & Feldman, 2010; Schulberg et al., 2004; Unützer et al., 2006; Wintersteen, 2010).

Primary care providers often have limited time available for each individual patient, and for screening to be effective, additional burden on providers needs to be minimized. Given this constraint, one potential screening option could be that health personnel, whether physician, nurse, or office staff, use Item 1 of the SBQ-R, a one-item screener, to assess for suicidal ideation within the past year, followed by a more detailed assessment using the complete SBQ-R if the patient screens positive for that item. An additional tool for providers is the widely used

and oft-cited 9-item Patient Health Questionnaire (PHQ-9), which has also been used to assess suicidal ideation in primary care settings (Bauer, Chang, Huang, Vannoy, & Unützer, 2013).

Across all of the studies of this dissertation, social problem-solving deficits were related to biopsychosocial markers of suicide risk as well as directly to greater levels of suicidal behavior. This pattern of findings suggests that a multidimensional, and perhaps multiorientation, approach to the treatment of primary care patients endorsing suicidal ideation may be needed, that targets social problem-solving ability and other important malleable risk factors such as interpersonal needs and hopelessness. As an example, Problem Solving Therapy is designed to reduce psychopathology, enhance behavioral functioning, improve the ability to identify and define a salient problem, generate alternative solutions, and assess whether the solution chosen was effective in addressing the problem (Ghahramanlou-Holloway et al., 2012; Stewart et al., 2009). When successfully applied, the ability to manage everyday problems such as financial stress or relationship strain may increase a patient's self-efficacy, thereby reducing feelings of burdensomeness and decreasing suicide risk (Marks, Algrante, & Lorig, 2005; McAuley et al., 2006; Robinson-Smith, Johnston, & Allen, 2000). Cognitive Behavioral Therapy may be simultaneously employed to help patients identify maladaptive or distorted cognitions that are underlying feelings of isolation or burden-laden perceptions and may also be used to bolster the social support networks of patients by using homework assignments or behavioral activation to increase engagement with others (Beckner, Vella, Howard, & Mohr, 2010; Newman et al., 2011; Stangier, Schramm, Heidenreich, Berger, & Clark, 2011). Furthermore, Interpersonal Therapy, which focuses on strengthening a sense of social connectedness and improving the quality of interpersonal relationships, may serve to decrease feelings of thwarted belongingness as well as

suicide risk (de Mello, de Jesus Mari, Bacaltchuk, Verdeli, & Neugebauer, 2005; Beckner et al., 2010).

As well, an integrated approach to treatment that targets feelings of hopelessness as well as increasing problem-solving skills may be in order. Cognitive-behavioral interventions may help to reduce the hopelessness by helping individuals to identify and restructure negative automatic thoughts and to become more engaged in their environment (Brown et al., 2005; Stanley et al., 2009). Evidence-based interventions such as Problem Solving Therapy, or use of the problem solving modules in Dialectical Behavior Therapy and Cognitive Behavioral Therapy, may allow patients to improve their social problem-solving ability including increasing their ability to correctly identify and define the problem they face, to create alternative solutions, and to determine whether or not the solution they chose was helpful in addressing the problem (Ghahramanlou-Holloway et al., 2012; Neacsiu, Rizvi, & Linehan, 2010; Stewart et al., 2009; Warmerdam, van Straten, Jongasma, Twisk, & Cuijpers, 2010). This ability to cope with everyday problems will likely increase a patient's self-efficacy and decrease negative outcomes such as strained interpersonal relationships or feelings of hopelessness, thereby reducing suicide risk (Marks et al., 2005; McAuley et al., 2006; Robinson-Smith et al., 2000; Townsend et al., 2001).

A major implication of our findings is support to develop and conduct additional studies examining the role of social problem-solving ability and its impact on psychopathology (e.g. hopelessness, interpersonal needs, suicidal behavior) not only in primary care settings but perhaps also in other vulnerable samples. Groups that are particularly vulnerable to suicide and problem-solving deficits such as individuals with schizophrenia (Bellack, Sayers, Mueser, & Bennett, 1994; Roy & Pompili, 2009; Tatarelli, Pompili, & Girardi, 2007; Ventura, Tom, Jetton, & Kern, 2013) may benefit significantly from a better understanding of how these constructs

operate. Furthermore, replicating this research in inpatient settings where individuals have recently endorsed thoughts of suicide or have made a suicide attempt is an important area for increased proximal understanding.

Directions for Future Research

To our knowledge, these data are the first to directly address the relationships between social problem solving, health related quality of life, interpersonal needs, neuroticism, hopelessness, and suicidal behavior in a sample of low-income primary care patients. In our study we used a cross-sectional approach in data collection, and our findings revealed that social problem solving plays an important role in understanding risk and protection for suicidal behavior both as an independent predictor as well as a moderator variable. Our findings also confirmed prior research on the relationships between neuroticism, hopelessness, thwarted interpersonal needs, and increased risk for suicidal behavior; yet, even in the context of these novel findings, several additional areas for future research emerge.

First, this study did explore intrapersonal and interpersonal risk and protective factors including health related quality of life in a vulnerable sample, but given the complexity of suicidal behavior, the consideration of more objective biological variables is also important. Future research should explore the role of biological factors such as neurotransmitters (e.g. serotonin) and familial linkages to intergenerational mood dysfunction and suicidal behavior to determine if such factors may also be involved in social problem-solving ability. Second, our sample was vulnerable for several reasons including economic distress, lack of health insurance, lower education levels, and endorsement of significant levels of psychopathology including depressive symptoms, hopelessness, and suicidal behavior. These are but a few potential risk factors, and future research should elucidate other determinants of suicidal risk, as well as

protection, in this vulnerable population. Third, we recommended the use of universal screening for suicidal ideation for patients presenting at a primary care clinic. Follow-up studies to determine the effectiveness of such screening are needed to evaluate the prevalence of suicidal ideation in primary care as well as to determine practitioner adherence to a screening protocol.

Our findings clearly demonstrate that problem-solving deficits are associated with increased levels of suicidal behavior; therefore, treatment involving improving social problem-solving ability may directly reduce suicide risk. The creation of a brief intervention designed to improve social problem-solving ability within the primary care setting would likely help to reduce negative outcomes. Finally, randomized controlled trial studies to assess the efficacy of existing brief problem-solving interventions or the development of a new problem solving intervention are needed. These studies should test interventions with a focus on both efficacy and effectiveness. Such studies could employ participants like those in our sample to see how these interventions operate in and generalize to real-world clinical settings. Furthermore, studies that have stricter eligibility criteria including perhaps the absence of comorbid diagnoses or the presence of substance abuse and use trained, reliable clinicians could determine the efficacy of such interventions. If these interventions are proved to be successful, they could contribute to suicide prevention efforts in primary care settings.

Conclusions

This series of papers examined suicidal behavior including ideation, previous suicide attempts, and likelihood of future attempts in a low-income, underserved primary care sample and the interrelationships among intrapersonal and interpersonal risk and protective factors. Our results indicate that social problem-solving deficits are associated with reduced HRQL and increased suicidal behavior and that mental HRQL mediated the relationship between both

positive and negative problem solving styles and suicidal behavior. We also found that social problem-solving ability when maladaptive serves as a risk factor for poor relationships and suicidal behavior, whereas when adaptive problem solving is employed, interpersonal functioning benefits and suicide risk is lower. Social problem-solving ability also beneficially impacts the often-deleterious attribute of neuroticism as well as the cognitive-emotional characteristic of hopelessness, and suicidal behavior, and their interrelationships. Thus, overall, our pattern of findings highlight social problem solving as a construct intimately involved with markers of suicide risk, as well as suicidal behavior itself, suggesting an essential target for prevention and intervention efforts.

Within the healthcare setting, primary care physicians, behavioral health consultants, and nursing staff may engage in effective suicide prevention efforts by: 1) screening for suicide risk, 2) assessing for levels of hopelessness, thwarted interpersonal needs, and problem-solving deficits and, 3) using brief, evidence-based treatments to improve social problem-solving skills and HRQL, and reduce feelings of hopelessness, thwarted belongingness, and perceived burdensomeness. If staff engages in these efforts, they are likely to significantly increase their ability to determine if a person is at risk for suicide. More importantly, they will have the knowledge and ability to potentially prevent individuals from prematurely taking their own life. Finally, this study demonstrates the truth in the quote, “Suicide is not the problem. It is the solution to a perceived unsolvable problem” (Quinnett, 2009).

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APPENDIX

PROCEDURES & METHODS

The Laboratory of Rural Psychological and Physical Health (LRPPH) and a Student-Faculty Research Grant from the School of Graduate Studies funded this study. Key personnel from LRPPH who are involved in the study include the two principal investigators, Jameson K. Hirsch, PhD, and Kristin L. Walker, MA, a clinical psychology graduate student, and additional graduate lab members as required. The principal investigators and graduate students are responsible for participant recruitment and payment. Additionally, primary care clinic staff aided the study by distributing study packets to interested participants and collecting completed survey packets. Prior to beginning data collection, this study was approved by the ETSU Institutional Review Board.

Participants and Procedures

The site for data collection was a primary care clinic, in operation for 22 years, and originally established to serve the health needs of the homeless population of a rural community. Although the clinic continues to maintain a site to serve the homeless, it has expanded over the past 15 years to include service provision to uninsured and underinsured patients as well as state-insured and Medicare/Medicaid patients; this clinic serves all patients, turning away no-one for an inability to pay for services. Services provided at this clinic include child and adult primary care services as well as physician consults and obstetrics and gynecological services. Additionally, this clinic is one of few nurse-managed community health centers (CHC) in the United States to receive designation as a Federally Qualified Health Center (FQHC) and operates under the management of the College of Nursing at a rural Southeastern university.

In order to achieve a recommended *a-priori* power of .80 (Fields, 2009), 223 individuals were recruited for participation in this study. Participants were required to be at least 18 years old. The IRB proposal that was submitted for this project requested exempt status, meaning that no risk is involved in participation and, therefore, that informed consent could be waived. However, each participant received a brief description of the study to review prior to participation as well as the opportunity to have questions answered that may have arisen from the study. Contact information for the study personnel was provided to each participant.

To recruit participants flyers, posters, and brochures were displayed in the waiting room and each exam room of the clinic. Participants were given the option to complete a pencil-and-paper survey or an online survey. The online survey was administered through Survey Monkey, and participants were able to retrieve a link to the survey from the study brochures and flyers. The Internet is being used increasingly in psychological studies, and research indicates that data from internet-based samples produces results similar to traditional formats (Gosling, Vazire, Srivastava, & John, 2004). Alternatively, participants were also able to complete the pencil-and-paper survey at the clinic or take the survey packet home, complete, and return to the clinic.

Participants were compensated \$20 upon completion of the study and submission of their packet. They were also required to provide their name and contact information, which is stored separately from survey responses. The principal investigators were responsible for distributing payments to participants and keep a logbook to track all payments. The payment logbook is kept in a locked payment box and a password-protected Microsoft Excel file. Participants were assigned a unique ID code, and all study data were deidentified.

Measures

Demographic Questionnaire

A basic demographic survey was administered to each participant. This survey yielded descriptive information about the sample and specific items served as covariates in statistical analyses. The demographic survey assessed age, sex and gender, race and ethnicity, education (measured by formal years of schooling), marital status, social security disability status, annual income, health insurance status, veteran status, perceived rural status, religious or spiritual affiliation, and living situation (i.e., alone, with family, with friends, etc.).

Suicidal Behaviors Questionnaire-Revised

Suicidal behaviors were assessed using the *Suicidal Behaviors Questionnaire-Revised* (SBQ-R) (Osman et al., 2001). This measure is comprised of four questions designed to assess suicidal behaviors including lifetime history of ideation and attempts (“Have you ever thought about or attempted to kill yourself?”), suicide ideation in past year (“How often have you thought about killing yourself in the past year?”), communication (“Have you ever told someone that you were going to commit suicide, or that you might do it?”), and likelihood of future attempts (“How likely is it that you will attempt suicide someday?”).

Each question on the SBQ-R is scored on a 5-point to 7-point Likert-type scale from 1 (no/never) to 7 (very likely), where higher numbers indicate increased frequency or severity. The items are summed for a total score, and higher total scores are indicative of greater levels of suicidal behavior. The items can also be examined and analyzed individually, as each item asks a different question about suicidal behavior (Osman et al., 2001).

In a study by Osman et al. (2001) researchers administered the SBQ-R to adolescent psychiatric inpatients (N=120), high school students (N=138), adult psychiatric inpatients

(N=120), and college undergraduates (N=135), and the measure demonstrated good internal consistency across samples (.76-.88). The SBQ-R exhibited adequate discriminant validity, as it differentiates suicidal versus nonsuicidal inpatients (standardized estimate = .79). Further, a cutoff score of 7 for nonclinical samples (sensitivity rate of .83 and specificity rate of .96) and 8 for clinical samples (sensitivity rate of 0.87 and specificity rate of 0.93) were identified. The first item of the SBQ-R can also be used as a screener, with a cut-off score of 2; use of the screener resulted in sensitivity of 0.80 and specificity of 0.97 for at-risk inpatients (Osman et al., 2001).

Social Problem Solving Inventory-Revised-Short Form

Social problem-solving ability was assessed via the *Social Problem Solving Inventory-Revised Short Form* (SPSI-R-SF) (D’Zurilla et al., 2002), a 25-item self-report questionnaire that is scored using a 5-point Likert-type scale ranging from 0 (*not at all true of me*) to 4 (*very true of me*). The items in the SPSI-R-SF are designed to reflect cognitive, behavioral, and emotional responses to real-life problems and challenges. The SPSI-R-SF yields a total score and five subscales scores: positive problem orientation (PPO), rational problem solving (RPS), negative problem orientation (NPO), impulsive and careless style (ICS), and avoidant style (AS) (D’Zurilla et al., 2002).

The positive problem orientation subscale is described as a constructive problem-solving set that involves viewing problems as challenges rather than threats, holding a belief that problems are solvable, having a sense of self-efficacy, believing that successful problem solving takes time and effort, and making a commitment to solving problems as opposed to avoiding them. Example items from the PPO include “When I have a problem, I try to see it as a challenge, or opportunity to benefit in some positive way from having the problem” and “Whenever I have a problem, I believe that it can be solved” (D’Zurilla et al., 2002).

In contrast, a negative problem orientation involves a negative and/or dysfunctional cognitive set that involves viewing problems as threats, doubting personal ability to solve problems, and feeling frustrated when confronted with daily problems. Example items from this subscale include “I feel threatened and afraid when I have an important problem to solve” and “Difficult problems make me very upset” (D’Zurilla et al., 2002).

In addition to the orientations assessed by the SPSI-R-SF, there are also three problem solving style subscales. The first, rational problem solving, encompasses a rational, deliberate, skillful, and systematic approach to problem solving that involves the application of adaptive problem solving techniques. This style involves four specific tasks: problem definition and problem formulation, generating alternative solutions, making decisions, and implementing and verifying solutions. Example items include “When I have a decision to make, I try to predict the positive and negative consequences of each option” and “Before I try to solve a problem, I set a specific goal so that I know exactly what I want to accomplish” (D’Zurilla et al., 2002).

The impulsive and careless style characterizes individuals who make active attempts to solve problems but do so in an impulsive, hurried, careless, and incomplete fashion. People with high ratings on this subscale consider one or a limited number of alternative solutions, often going with the first solution that comes to mind. Example items from this subscale include “When making decisions, I go with my “gut feeling” without thinking too much about the consequences of each option” and “I am too impulsive when it comes to making decisions” (D’Zurilla et al., 2002).

Finally, avoidant style is characterized by passivity, inaction or avoidance, procrastination, and dependency on others to make decisions. Individuals with this style will avoid problems as long as they can, wait for problems to solve themselves, or put the

responsibility or solving the problem onto someone else. “I wait to see if a problem will resolve itself first, before trying to solve it myself” and “I spend more time avoiding my problems than solving them” are example items from this subscale (D’Zurilla et al., 2002).

When calculating a total score, the negative subscales are reverse scored so that higher total scores are indicative of increased social problem-solving ability. The psychometric properties of the SPSI-R-SF have been evaluated across multiple studies using collegiate, clinical, and community samples (D’Zurilla et al., 2002; Hawkins, Sofronoff, & Sheffield, 2009; Morera et al., 2006; Nezu, Nezu, & Perri, 1989; Spence, Sheffield, & Donovan, 2002) in which the SPSI-R-SF has demonstrated good internal consistency ($\alpha = .79$), test-retest reliability over a 3-week time period ($r = .91$) and adequate convergent validity with depression ($r = .57$) and anxiety ($r = .61$). Additionally, confirmatory factor analysis has validated the five-factor structure of the SPSI-R-SF (Maydeu-Olivares & D’Zurilla, 1996) and D’Zurilla et al. (2002), with a comparative fit index (CFI) of .91 and an adjusted goodness of fit index (AGFI) of .89.

Short-Form 36 Health Survey

The QualityMetric version of the 36-item Health Survey version 2 (SF-36v2) consists of 36-items assessing eight domains of perceived health status and quality of life (Ware, Kosinski, & Dewey, 2000) including Physical Functioning (PF), Role-Physical (RP), Bodily Pain (BP), General Health (GH), Vitality (VT), Social Functioning (SF), Role-Emotional (RE), and Mental Health (MH). The questions are measured on a Likert scale (with different scales according to the specific question) that ranges from higher levels to lower levels of health functioning. The measure is not intended to provide an objective or comprehensive evaluation of health functioning (Ware et al., 2000).

Physical Subscales

The Physical Functioning subscale consists of 10 items that assess a range of physical activities and associated limitations as well as 1 self-care item. Low scores are indicative of significant physical limitations, and higher scores reflect minimal to no limitations. Instructions state, “Does your health now limit you in *these* activities? If so, how much?” and include items assessing vigorous activities (e.g. running, lifting weights), moderate activities (e.g. pushing a vacuum cleaner, carrying golf clubs), and lower energy activities such as climbing one flight of stairs or carrying groceries (Ware et al., 2000).

The Role-Physical subscale consists of 4 items that cover physical-health related role limitations in several domains: limitations in kind of work, reductions in amount of time spent on work, difficulty performing work tasks, and not accomplishing as much as normal. The Bodily Pain subscale is comprised of two items, “How much bodily pain have you had during the past 4 weeks?” and “During the past 4 weeks, how much did pain interfere with your normal work?” (Ware et al., 2000). The General Health subscale consists of five items including one item that solicits a health rating, and four items that assess views and expectations of health. Example items include “In general would you say your health is...excellent, very good, good, fair, or poor?” and “I expect my health to get worse...definitely true, mostly true, don’t know, mostly false, and definitely false” (Ware et al., 2000).

Mental/Emotional Subscales

The Vitality subscale is a four-item measure of energy level and fatigue. Low scores indicate an individual who is feeling tired and worn out, whereas high scores reflect an individual who feels full of energy. The Social Functioning subscale consists of two items that assess health-related effects on quantity and quality of social activities. Lower scores are

indicative of greater interference of health problems on social functioning. The three-item subscale of Role-Emotional assesses mental-health related role limitations as they impact work or other usual activities. Finally, the Mental Health subscale is comprised of five items that assess each of four major mental health dimensions: depression, anxiety, loss of emotional or behavioral control, and overall psychological well-being. Low scores on this subscale indicate an individual frequently feels nervous and/or depressed; high scores reflect someone who feels calm and happy all or most of the time (Ware et al., 2000).

Component Summary Scales

The SF-36v2 can also be scored into two component summary scores: Physical Component Summary (PCS) and Mental Component Summary (MCS). The PCS and MCS were created to reduce the eight-scale profile to two domains that are more readily usable for researchers and statistical analyses. The eight scales of functioning are aggregated across the two domain summary scores to create the physical and mental components. Factor analyses across the eight scales have consistently identified two primary domains, mental and physical (Ware, Kosinski, Bayliss, & McHorney, 1995). Orthogonal rotation of factors to determined that the PCS and MCS accounted for over 80% of the variance across the eight scales of the SF-36v2 (Ware & Kosinski, 2001) in both general and patient populations. The PF, RP, BP, and GH load on the PCS component, and the MH, RE, SF, and VT load on the MCS component.

Low scores on the PCS indicate limitations in physical functioning and role participation, the experience of bodily pain, and poor general health. High scores reflect an absence of these limitations as well as few or no physical limitations or disabilities and good general health. Low scores on the MCS are indicative of frequent psychological distress including depressive and anxiety symptoms, social dysfunction and role limitations due to emotional problems and poor

general health. Similarly, high scores reflect frequent positive affect, limited distress, and good general health (Ware et al., 2000). For this study the PCS and MCS were used in statistical analyses.

Internal consistency for the SF-36v2 has been consistently demonstrated to be good ($\alpha = .80-.95$) across the eight scales in multiple studies (Hann & Reeves, 2008; Jenkinson et al., 1999; Razvi, Ingoe, McMillan, & Weaver, 2005; Taft et al., 2004; Ware, 2004). The SF-36v2 PCS and MCS composite scores have good internal consistency, with alpha levels exceeding .90 (Razvi et al., 2005; Ware, 2004). Han and Reeves (2008) conducted test-retest reliability during a 3-week time period, and the values were acceptable across the eight domains ($r = .71-.89$).

Factor analytic studies among adults in the United States and worldwide have shown the SF-36v2 to have construct validity; items consistently load on the eight domain and two summary component scores (McHorney et al., 1993; Ware & Kosinski, 2001; Ware, Kosinski, & Keller, 1994, 1995). Concurrent validity estimates of health status and HRQL were gathered using data from the U.S. 2000 population samples and data from the Medical Outcomes Study (MOS) (Ware, Kosinski, Dewey, & Gandek, 2001), and ranged from ($r = .76-.93$). In a study of predictive validity using the Mental Component Summary score individuals with low MCS scores (below 20) were more likely to receive care from a psychiatrist or psychologist; lower scores on the Physical Component Summary score predicted greater likelihood of dying within 2 years (Ware, 2004).

Interpersonal Needs Questionnaire

The Interpersonal Needs Questionnaire-Revised (INQ-R) was used to assess thwarted belongingness (nine items) and perceived burdensomeness (six items) (Van Orden, Cukrowicz, Witte, & Joiner, 2012). The scale uses a 7-point Likert scale, ranging from 1 “Not at all true for

me” to 7 “Very true for me” (Van Orden et al., 2012). Several versions of the INQ scale exist within the literature; the researchers used the revised 15-item version upon suggestion that this briefer version retains sound psychometric properties (Van Orden et al., 2012). The measure can be found in the public domain and is available at the primary author’s website (www.psy.fsu.edu/~joinerlab/).

The INQ-R-R is comprised of two subscales: thwarted belongingness, which assesses the extent to which the individual feels connected to other people, and perceived burdensomeness, which measures an individual’s perception of feeling like a burden to others. The perceived burdensomeness subscale of the INQ-R includes items such as “These days the people in my life would be happier without me,” “These days I think I am a burden on society,” and “These days I think the people in my life wish they could be rid of me.” This subscale has a range of scores from 6 (no perceived burdensomeness) to 42 (extreme perceived burdensomeness). The thwarted belongingness subscale of the INQ-R includes items such as “These days, I rarely interact with people who care about me,” “These days I feel disconnected from other people,” and “These days I often feel like an outsider in social gatherings,” with potential scores ranging from 9 (no thwarted belongingness) to 63 (extreme thwarted belongingness). Items that reflect feelings of belongingness or a lack of burdensomeness will be reverse scored so that higher scores on the subscales will indicate increased feelings of thwarted belongingness and perceived burdensomeness.

Although the INQ is a relatively new measure (Van Orden et al., 2008), it is being used increasingly in the literature on suicide research (Davidson et al., 2010; Rasmussen & Wingate, 2011; Van Orden, Cukrowicz, Witte, & Joiner, 2012; Wong, Koo, Tran, Chiu, & Mok, 2011). Several studies demonstrate psychometric support for the INQ total and subscale scores

(Davidson et al., 2010; Rasmussen & Wingate, 2011; Van Orden et al., 2012; Wong et al., 2011). Among samples including college students and older adult community samples, the perceived burdensomeness subscale has shown good internal consistency ($\alpha = .74-.92$) and convergent validity with suicidal ideation ($r = .35-.38$) and depressive symptoms ($r = .52-.57$). Similarly, the thwarted belongingness subscale has also shown good internal consistency ($\alpha = .74-.90$) and adequate convergent validity with suicidal ideation ($r = .31$) and depressive symptoms ($r = .52-.56$) (Davidson et al., 2010; Rasmussen & Wingate, 2011; Wong et al., 2011).

NEO-Five Factor Inventory

The NEO-Five Factor Inventory (NEO-FFI) (McCrae & Costa, 2004) is a 60-item measure assessing five domains of personality: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. Each domain is comprised of 12 questions. Unlike the NEO-PI-R (a 240-item version), the NEO-FFI does not provide information on specific facets within each domain, although subcluster scoring is available (Chapman, 2007). With regard to scoring, if a participant does not answer 10 or more items, the inventory should be discarded, and when 9 or fewer items have been left blank, the *neutral* response choice should be imputed in place of missing data (McCrae & Costa, 2004).

Although the NEO-FFI provides five domain scores, only the neuroticism subscale was used in the current study, given its strong association with suicidal behavior and risk factors for suicidal behavior such as depression, anxiety, and hopelessness (Bowen et al., 2011; Duberstein et al., 2000; Roy, Rylander, & Sarchiapone, 1997; Statham et al., 1998). The core of the neuroticism domain is the tendency for people “to experience negative affect such as fear, sadness, embarrassment, anger, guilt, and disgust” (McCrae & Costa, 2004, p. 14); in addition, individuals with greater levels of neuroticism often fail to cope effectively with stress, are prone

to have irrational ideas, and are less able to control their impulses. The neuroticism subscale is the most stable domain of the personality scale and contrasts adjustment and emotional stability with maladjustment and neuroticism. Individuals with higher scores on this subscale are considered to have more neuroticism (McCrae & Costa, 2004).

The NEO-FFI has been shown to have adequate internal consistency ($r = .86$ for neuroticism), good convergent validity with the NEO-PI-R, and adequate test-retest reliability over a three year time period ($r = .62$ for neuroticism) in an adult community sample (McCrae & Costa, 2004). The NEO-FFI has been used successfully in multiple primary care studies, with predictive validity evidenced for a variety of constructs including perceived need for mental health care (Seekles et al., 2012), medical illness burden (Chapman, Lyness, & Duberstein, 2007), depression and anxiety (Spinhoven et al., 2011), perceived health and functional status (Duberstein et al., 2003), and nonresponse to treatment (Katon et al., 2002).

Beck Hopelessness Scale

The Beck Hopelessness Scale (BHS) is a 20-item measure designed to assess the extent of negative attitudes about the future (Beck, Weissman, Lester, & Trexler, 1974). The measure consists of true (0) or false (1) items, with 9 keyed as false and reverse-scored, and 11 keyed as true; higher scores indicate greater hopelessness. Total score may range from 0 (no hopelessness) to 20 (extreme hopelessness). Example items include “My future seems dark to me,” “I just can’t get the breaks, and there’s no reason I will in the future,” “I have enough time to accomplish the things I want to do,” and “I don’t expect to get what I really want.” Scoring guidelines among samples of psychiatric inpatients and outpatients indicate that scores between 0-3 = minimal hopelessness, 4 to 8 = mild hopelessness, 9 to 14 = moderate hopelessness, and 14 to 20 = severe hopelessness (Beck et al., 1974).

Psychometric properties of the BHS were examined during a 12-year (1970-1982) longitudinal study including 499 individuals who attempted suicide and 207 individuals who endorsed suicidal ideation (Beck et al., 1985); additional samples of adults from a community mental health center include substance abusers (Steer, Beck, & Shaw, 1985; Beck, Steer, & McElroy, 1982), and individuals with depression and dysthymia (Steer, Beck, Brown, & Berchik, 1987). Across these studies, the BHS has shown good internal consistency ($r = .82-.93$) and test-retest reliability during a one week period ($r = .69$) and a six week period ($r = .66$) (Beck et al., 1985; Beck et al., 1982; Steer et al., 1987; Steer et al., 1985).

The BHS has high levels of construct validity in that it assesses symptoms of hopelessness and not depressive symptoms and good discriminant validity in that it can distinguish suicide attempters from nonattempters (Beck, Steer, Beck, & Newman, 1993). Further, hopelessness is consistently a stronger predictor of suicidal behavior than depressive symptoms (Beck et al., 1985; Beck, Brown, Berchik, & Stewart, 1990; Brown, Beck, Steer, & Grisham, 2000); some argue that assessing hopelessness rather than depression may be important in clinical settings (Minkoff et al., 1973).

Indeed, the BHS has been used most often in mental health care settings (Brown et al., 2000; Brown et al., 2005); therefore, there is a paucity of information on the use of the BHS in primary care samples. In one of only a few studies the Beck Depression Inventory (BDI-II) and Beck Depression Inventory Fast Screen (BDI-FS), which both contain an item assessing hopelessness, along with a two-item depression screening that asks “Over the past two weeks, have you ever felt down, depressed, or hopeless?” (Sharp & Lipsky, 2002), have been used successfully in a primary care setting.

Covariates

Because of their close associations with suicidal behavior, I assessed whether the covariates of age, race and ethnicity, sex, and depressive symptoms should be included in analytic models. Age has been found to be consistently associated with suicidal behavior, with peaks in risk occurring during adolescence and older adulthood (CDC, 2011). Additionally, while males die by suicide more often than females, females attempt suicide at a much higher rate (CDC, 2011), suggesting sex differences. Race and ethnic group differences in suicidal behavior may also exist; Caucasians and Native Americans have the highest rates of suicide attempts and death by suicide, and African Americans have the lowest rates (CDC, 2011). Finally, covariation of depressive symptoms is based on the well-established association between depressive symptoms and suicidal behavior (Beck, Brown, Berchik, & Stewart, 1990; Minkoff et al., 1973).

Analyses

All Manuscripts

Prior to conducting any analyses, a graphical and statistical review of the data was conducted to assess the presence of any outliers or missing data as well as to confirm the normality of the data. Mahalanobis distance values were calculated for all predictor variables to assess for outliers. There were no outliers determined by this statistic (>15), rendering removal from analyses unnecessary (Barnett & Lewis, 1978; Field, 2009). Missing data were coded as 99 and were addressed as follows: for each measure completed by each participant, when there was more than 20% missing data, the entire measure for that participant was removed from analyses. For less than 20% missing data, a person-mean imputation was calculated and replaced for each missing item (Bono, Ried, Kimberlin, & Vogel, 2007).

Internal consistency was calculated using an intra-class correlation coefficient, Cronbach's alpha, for total score and subscale scores on all measures (Field, 2009). Regarding data distribution, normally distributed data are not a requirement for Preacher and Hayes (2008) mediation techniques due to the bootstrapping process (detailed below). Pearson product-moment correlations were used to determine bivariate associations among study variables and to assess for multicollinearity; no variables reached an established cut-off level for multicollinearity ($p > .80$), so all variables were included in analyses (Field, 2009).

Manuscript 1 – Social problem solving moderates the relationship between health related quality of life (HRQL) and suicidal behavior

Mediation Analyses

Simple mediation, otherwise known as an indirect effect, occurs when the relationship between an independent variable (X) and a dependent variable (Y) is influenced by a third variable (M). Essentially, X affects Y because X is related to M, which, in turn, is associated with Y (Preacher, Rucker, & Hayes, 2007). The analyses for this manuscript used a process called bootstrapping, which is a procedure for surmounting limitations of statistical methods that assume a normal distribution of data. Bootstrapping (Shrout & Bolger, 2002) is becoming a preferred method for analyzing data and involves repeatedly randomly sampling observations and computing the statistic (F-statistic in this instance) in each resample. Across many resamplings an approximation of the sampling distribution is calculated and used to test the hypothesis. These statistical techniques estimate path coefficients in a mediator model and generate bootstrap confidence intervals (percentile, bias-corrected, and bias-corrected and accelerated) for total and specific indirect effects of X on Y through the mediator variable M. This process adjusts all paths for the potential influence of covariates not proposed to be

mediators in the model. If a true zero falls between the upper and lower confidence intervals, there is not a significant indirect effect via the mediator.

In this manuscript simple mediation models (those including only one mediator and one independent variable) were analyzed. The first set of models examined the mediating relationship of physical HRQL on the relationship between 1) social problem solving total score and suicidal behavior and 2) social problem solving subscale scores and suicidal behavior. The second set analyzed the mediating role of mental HQRL on the relationship between 1) social problem solving total score and suicidal behavior and 2) social problem solving subscale scores and suicidal behavior.

Manuscript 2 – Perceived burdensomeness and thwarted belongingness mediate the relationship between social problem-solving ability and suicidal behavior

Mediation Analyses

Simple mediation, otherwise known as an indirect effect, occurs when the relationship between an independent variable (X) and a dependent variable (Y) is influenced by a third variable (M). Essentially, X affects Y because X is related to M, which, in turn, is associated with Y (Preacher, Rucker, & Hayes, 2007). The analyses for this manuscript used a process called bootstrapping, which is a procedure for surmounting limitations of statistical methods that assume a normal distribution of data. Bootstrapping (Shrout & Bolger, 2002) is becoming a preferred method for analyzing data and involves repeatedly randomly sampling observations and computing the statistic (F-statistic in this instance) in each resample. Across many resamplings, an approximation of the sampling distribution is calculated and used to test the hypothesis.

In this manuscript simple mediation models (those including only one mediator) were analyzed, one examining the mediating relationship of thwarted belongingness on the relationship between social problem solving and suicidal behavior; the second analyzed the mediating role of perceived burdensomeness on the relationship between social problem solving and suicidal behavior.

Often there are multiple mediators affecting the relationship between X and Y , which can be tested using techniques presented by Preacher and Hayes (2008). Multiple mediation analyses (Preacher & Hayes, 2008) use a series of multiple linear regression analyses to determine the impact of more than one mediator in a direct relationship. In this study thwarted belongingness and perceived burdensomeness were simultaneously analyzed in a full model as mediators of the relationship between social problem solving and suicidal behavior. These statistical techniques estimate path coefficients in a multiple mediator model and generate bootstrap confidence intervals (percentile, bias-corrected, and bias-corrected and accelerated) for total and specific indirect effects of X on Y through one or more mediator variable(s) M . This allows for more than one mediator and adjusts all paths for the potential influence of covariates not proposed to be mediators in the model. If a true zero falls between the upper and lower confidence intervals, there is not a significant indirect effect via the mediator.

Manuscript 3 – Conditional indirect effects of neuroticism and suicidal behavior via social problem-solving ability and hopelessness

Moderated Mediation Analyses

As mentioned above, mediation analyses are used to determine the presence of a third variable that may be influencing an existing relationship between variables. Additionally, however, it may also be important to determine whether or not that mediating relationship

remains constant across levels of a given variable. For example, “the strength of an indirect effect may depend linearly upon the value of a moderator (W) that is measured on an interval or ratio scale” (Preacher et al., 2007, p. 186). When these effects are present, they are referred to as moderated mediation or conditional indirect effects. In this manuscript I explored the mediating role of hopelessness on the relationship between neuroticism and suicidal behavior, and I hypothesized that social problem solving (high versus low) would moderate the relationship between neuroticism and hopelessness as well as between hopelessness and suicidal behavior.

To conduct these analyses Preacher et al. (2007) have hypothesized a “Model 5” that tests the possibility that a single moderator affects the relationship between the independent variable (e.g. neuroticism) and the mediator (e.g. hopelessness), and between the mediator (e.g. hopelessness) and the dependent variable (e.g. suicidal behavior). Analyses were conducted using a publicly available SPSS syntax file, “PROCESS” (Hayes, 2012; www.afhayes.com), which tests for significant moderating effects within mediation analyses. This program also uses an additional *post-hoc* bootstrap resampling process to calculate estimates of asymmetric confidence intervals (CIs) of conditional indirect effects at particular values of the moderator. CIs that do not contain zero indicate that the indirect effect at the specified value of the moderator is statistically significant (Preacher et al., 2007).

Power Analyses

The program G*Power 3 (available online at: <http://www.psych.uni-duesseldorf.de/abteilungen/aap/gpower3/>; Faul, Erdfelder, Lange, & Buchner, 2007; Faul, Erdfelder, Buchner, & Lang, 2009) was used to calculate *a-priori* sample size. Sample size (N) was computed as a function of the recommended power level (.80), a prespecified alpha level (0.05) and a prespecified chosen effect size of small (0.10). These parameters for statistical

power and alpha level are considered standards in psychological research and will minimize the likelihood of Type I and Type II error (Cohen, 1988, 1992). To my knowledge, no published research has provided effect sizes for the relationships hypothesized across the three manuscripts, so I chose the smallest effect size, a conservative approach designed to increase the likelihood of finding the hypothesized effects if they exist (Cohen, 1992; Fields, 2009; Forshaw, 2007).

While there are multiple manuscripts, the parameters for calculating sample size remained the same, as the DV (suicidal behavior) is continuous, and multivariable linear regression were used across all analyses. While there is not currently a known statistical power program designed to calculate *a priori* sample size for mediation analyses using Preacher and Hayes (2008) techniques, a minimum sample size of 25 is needed to use the bootstrapping technique required in mediation analyses (Preacher & Hayes, 2004, 2008). The calculated sample size (N=114), and the number of participants (N=223) surpassed this requirement and sufficed for the mediation and moderated mediation analyses.

Identification of Research Journals

As part of this dissertation proposal, potential journals were identified for each manuscript written. The preselection of journals aided in structuring each manuscript according to the journal's submission guidelines. Official selection of journals was made after the data were collected and analyzed, and these journals were the ones chosen for initial publication submission.

Manuscript 1: Quality of Life Research (Impact Factor = 2.30)

Manuscript 2: Journal of Clinical Psychology (Impact Factor = 2.116)

Manuscript 3: European Journal of Personality (Impact Factor = 2.44)

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- Publications: El-Mallakh, R. S., & Walker, K. L. (2010). Hallucinations, pseudohallucinations, and parahallucinations. *Psychiatry: Interpersonal and Biological Processes*, 73(1), 34-42. doi:10.1521/psyc.2010.73.1.34
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Hirsch, J. K., Walker, K. L., Chang, E. C., & Lyness, J. M. (2012). Illness burden and symptoms of anxiety in older adults: Optimism and pessimism as moderators. *International Psychogeriatrics*, 24(10), 1614-1621. doi:10.1017/S1041610212000762
Rowe, C. A., Walker, K. L., Britton, P. C., & Hirsch, J. K. (2013). The relationship between negative life events and suicidal behavior: Moderating role of basic psychological needs. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 34(4), 233-241. doi:10.1027/0227-5910/a000173

Hirsch, J.K., Walker, K.L., Wilkinson, R.B., & Lyness, J.M.
(2013). Family criticism and depressive symptoms in older
adult primary care patients: Optimism and pessimism as
moderators. *American Journal of Geriatric Psychiatry*
(*In Press*).

Honors and Awards:

Excellence in Teaching Award for Graduate Teacher Associates
from ETSU School of Graduate Studies 2012