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Improving Health Related Quality of Life and Reducing Suicide Risk in Primary Care: Can
Social Problem Solving Abilities Help?

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Abstract

Problem-solving deficits and poor health-related quality of life are associated with suicide risk; yet, little is known about the interrelations between these variables. In 220 primary care patients, 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 the Suicidal Behaviors Questionnaire-Revised, Social Problem Solving Inventory-Revised, and Short-Form 36 Health Survey. Utilizing bootstrapped mediation, our hypotheses were partially supported; mediating effects were found for mental health related quality of life on the relation between social problem solving and suicidal behavior. Physical health-related quality of life was not a significant mediator. Greater social problem-solving ability is associated with better mental health related quality of life and, in turn, to less suicidal behavior. Interventions promoting social problem-solving ability may increase quality of life and reduce suicide risk in primary care patients.

Improving Health Related Quality of Life and Reducing Suicide Risk in Primary Care: Can
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In the United States, suicide is a significant public health concern, with over 41,000 individuals dying by suicide each year, making suicide the 10th leading cause of death (Centers for Disease Control and Prevention [CDC], 2015). Rates of suicidal behavior, including thoughts about suicide, planning for suicide, and suicide attempts are thought to be much higher; for example, there are approximately 25 suicide attempts per death by suicide (Crosby, Han, Ortega, Parks, & Gfroerer, 2011). Within the past year, 8.3 million adults, approximately 3.7% of the U.S. population, thought about suicide, 2.2 million (1% of the U.S. population) made a suicide plan, and 1 million adults (0.5% of the population) attempted suicide (CDC, 2015; Crosby et al., 2011).

Vulnerable populations, including persons living in rural areas and medically compromised individuals may be at particular risk for suicide-related behavior and death by suicide; as such, rural medical settings, particularly primary care clinics, are a critical location for detecting and preventing suicidal behavior (Bryan & Rudd, 2011; Hirsch et al., 2009; Hirsch & Cukrowicz, 2014; Schulberg et al., 2004). Regarding prevalence of mental health concerns in primary care settings, major depression, a common risk factor for suicide, is estimated to occur in 5-10% of primary care patients (Katon & Schulberg, 1992; Nimalasuriya et al., 2009), and between 1-10% of primary care patients endorse suicidal ideation (Schulberg et al., 2004). Importantly, approximately 62% of people who die by suicide contact a primary care provider within one year of their death, 45% of individuals within one month prior to their death, and approximately 20% within 1 day (Luoma et al., 2002). Despite this documented risk, research

on suicidal behavior and its prevention is lacking in rural primary care settings, particularly among middle-aged patients, among whom rates of suicide continue to increase (CDC, 2013).

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. “Social problem solving” is defined as a purposeful coping strategy which includes cognitive, emotional, and interpersonal processes focused on overcoming “everyday” challenges occurring across home, school, and work environments (D’Zurilla & Nezu, 1982; D’Zurilla & Nezu, 1990). Social problem solving involved a conscious effort to solve real-world problems (e.g., interpersonal conflicts, occupational difficulty, and subjective personal challenges). Problem resolution may include the implementation of strategies such as problem definition, generation of alternative responses, and decision making. The most common conceptualization of this construct, as measured by the Social Problem Solving Inventory – Revised (SPSI-R), posits problem solving as comprised of five sub-domains, including two orientations: positive and negative, and three styles: rational, impulsive/careless, and avoidant (D’Zurilla et al., 2002).

Regarding problem solving orientation, 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 refers to negative cognitions, such as viewing problems as threats and feelings of frustration when trying to solve problems. In terms of problem-solving styles, a rational problem-solving style consists of taking a rational, deliberate, and systematic approach to problem solving by applying adaptive problem-solving techniques. The impulsive/careless style characterizes individuals who 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 others 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 et al., 1996), and problem-solving deficits differentiate between suicide attempters and non-attempters (Roškar et al., 2007). 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 (Pollock & Williams, 2004). In samples of suicidal and non-suicidal psychiatric inpatients, suicide attempters had significantly impaired problem-solving ability, characterized by passivity, compared to non-attempters (Linehan et al., 1987). Across twenty-two studies of social problem solving and suicidal behavior, comparing suicide attempters with suicide ideators and non-suicidal controls, attempters consistently demonstrated deficits in social problem solving (Speckens & Hawton, 2005).

Of note, 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 (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 et al., 2012; Stewart et al., 2009; Szanto et al., 2012).

In addition to psychological and social correlates of suicidal behavior, a growing body of literature has noted the associations between poor physical health, suicidal behavior and death by suicide (Conwell et al., 2010; Fishbain 1999; Klepsies et al., 2000). For instance, general medical illness is associated with increased suicidal behavior (Mackenzie & Popkin, 1990) and,

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 (Druss & Pincus, 2000).

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). Further, poor HRQL is a risk factor for predictors of suicidal behavior, such as depression, substance abuse, and hopelessness (Chen et al., 2010; Norlev et al., 2005; Pagura et al., 2010; Resch et al., 2008; Winter et al., 2012). 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 et al., 1982; Storm et al., 2006).

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. Further, most 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; little research has examined 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 individual subscales.

As such, in our sample of middle-age, primary care patients, 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. We also hypothesized that physical and mental component summary scores would mediate the relationship between positive and negative problem solving and suicidal behavior, such that 1) individuals with greater positive problem solving would report better physical and mental health which would, in turn, be associated with lower levels of suicidal behavior; and, 2) individuals with higher levels of negative problem solving would report poorer physical and mental health and, in turn, more suicidal behavior.

Method

Participants and Procedure

Two hundred and twenty adult participants (137 female, 61.2%; 82 male, 36.6%; 1 transgender, 0.4%) from a rural, Southeastern U.S. primary care clinic serving low-income, uninsured patients participated in this institutional review board-approved, cross-sectional study, over a 1-year period. Participants were approached in the waiting room prior to their scheduled appointment and completed study procedures in-person and online following their appointment. 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. Informed consent was obtained from all participants, who were compensated for their participation and received a list of local and national mental health resources upon completion.

Our sample had a mean age of 44.08 years ($SD = 12.11$), 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). 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. Within our sample, scores ranged from 0 to 18. Furthermore, 35.9% (n=80) scored above the clinical cut-off on the SBQ-R indicating significant suicide risk, and 55.2% (n=123) endorsed suicidal ideation within the past 12 months.

Measures

Suicidal Behavior. The Suicidal Behaviors Questionnaire-Revised (SBQ-R), a 4-item measure, was used to assess suicidal behaviors, including lifetime suicidal behavior (“Have you ever thought about or attempted to kill yourself?”), suicidal behavior in the past year (“How often have you thought about killing yourself in the past year?”), communication of intent (“Have you ever told someone that you were going to commit suicide, or that you might do it?”), and likelihood of future suicide attempt (“How likely is it that you will attempt suicide someday?”) (Osman et al., 2001). 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 indicate greater levels of suicidal behavior; items can also be analyzed individually. Across samples of adolescent and adult psychiatric inpatients, high school students and college undergraduates, the

measure demonstrated good internal consistency (.76-.88) (Osman et al., 2001). In the current study, internal consistency was good ($\alpha = .85$).

Social Problem Solving. 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*) (D’Zurilla et al., 2002). Sample items include “I try to see problems as challenges I can learn from” and “I go out of my way to avoid dealing with problems.” The SPSI-R-SF yields a total score and five subscales scores, calculated using the SPSI-R technical manual (D’Zurilla et al., 2002): positive problem orientation (PPO), rational problem solving (RPS), negative problem orientation (NPO), impulsive/careless style (ICS), and avoidant style (AS).

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. 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 (D’Zurilla et al., 2002). 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. 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 (D’Zurilla et al., 2002). 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. Psychometric properties of the SPSI-R-SF across multiple studies utilizing collegiate, clinical, and community samples (Hawkins et al., 2009; Morera et al., 2006; Nezu et al., 1989; Spence et al., 2002), reveal good internal consistency ($\alpha = .79$), test-retest reliability over a three-week 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). The overall internal consistency of this measure in our study was good ($\alpha = .80$).

Health-Related Quality of Life. 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) (Ware et al., 2000). Sample items include “How much bodily pain have you had in the past 4 weeks” and “During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with

your social activities (like visiting friends, relatives, etc.)?” 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.

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 (Ware et al., 1995; Ware and Kosinski, 2000). 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 were 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 (Hann & Reeves, 2008; Jenkinson et al., 2009; Razvi et al., 2005; Taft et al., 2004; Ware, 2004). Internal consistency scores for all subscales in this study were also good, ranging from .84 to .94. In the U.S. and globally, the SF-36v2 PCS and MCS composite scores exhibit good construct validity, with consistent factor loadings, and good internal consistency, with alpha levels exceeding .90 (McHorney, 1995; Ware et al., 1994; Ware et al., 1995). In this study, internal consistency was good for the MCS ($\alpha = .87$) and PCS ($\alpha = .81$).

Statistical Analyses

Pearson correlation coefficients (r) were calculated to examine independence of, and associations between, study variables, with a coefficient of $r > .80$ demonstrating multicollinearity (Field, 2005).

Simple mediation analyses, consistent with Hayes (2013), were used to examine the potential mediating role of physical and mental HRQL on the relation between 1) social problem-solving total score and suicidal behavior, and 2) social problem-solving subscale scores and suicidal behavior. All analyses were conducted using model 4 of “PROCESS,” (Hayes, 2013) with bootstrap resampling (10,000 samples), to yield 95% confidence intervals of the indirect effect. Covariates in all models included age, sex, and race.

Results

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 ($r = -.50, p < .001$) (See Table 1).

Supporting our hypotheses, mental HRQL was a significant mediator of the relationship between total social problem-solving ability and suicidal behavior. Mental HRQL was also a significant mediator of the relationship between all subscales of the SPSI-R-SF (See Table 2). 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 association between social problem-solving ability, health related quality of life, and suicidal behavior among rural and low-income primary care patients. At the bivariate level and consistent with previous research, greater positive social problem solving was 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 greater social problem -olving ability was associated with better mental health-related quality of life which, in turn, was associated with less 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 an association between problem-solving deficits and increased suicidal behavior and between problem-solving strengths and decreased risk for suicidal behavior (Chang et al., 2004; Becker-Weidman et al., 2010; Hirsch et al., 2012). 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 (D’Zurilla et al., 2002). 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 (Chang et al., 2004; Hirsch et al., 2012). 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 (Bell & D’Zurilla, 2009). 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 (Koivumaa-Honkanen et al., 2001; Pompili et al., 2009).

Conversely, patients who have problem solving deficits, such as those who view problems as threats or who feel unable to solve 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 (Pollock & Williams, 2004). 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 (D’Zurilla et al., 1998; D’Zurilla & Nezu, 2010). 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 (Linda et al., 2012; Nezu et al., 1986; Nock & Mendes, 2008). 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 (Bartley & Roesch, 2011; Nezu et al., 2013).

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 more robustly influence mental health outcomes. It may be that problem-solving ability is more likely to influence a person’s perception of emotional health than their physical health. Because problem solving deficits are most often associated with psychological outcomes, such as symptoms of depression and hopelessness (Linda et al., 2012), 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 (D’Zurilla et al., 1998), 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. Given that we did not have access to physician-rated health assessments, it

may be that this group lacked sufficient physical health limitations or variability in physical HRQL to adequately address this hypothesis. Future studies, using objective health assessments, and with chronically ill samples (e.g., fibromyalgia, arthritis), will help to elucidate disease-specific patterns of risk and protection.

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, reporting bias, such as underreporting of suicidal behavior, is possible. Our cross-sectional design precludes the examination of causality, and prospective, replicated research utilizing objective 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 necessary, particularly given the changing face of diversity in rural areas (Kirschner, Berry & Glasgow, 2009).

Implications

Our results may have clinical implications for suicide prevention efforts targeting rural primary care patients. Although some studies suggest that universal screening has only a negligible impact on detecting or reducing suicidal behavior (O'Connor et al., 2013), screening for suicidal ideation may 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 and older adults, whose prevalence rates ranged from 1.0%-14.3% (Heisel et al., 2010; Unützer et al., 2006; Wintersteen, 2010). 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 suicidal ideation within the past twelve months, followed by a more detailed assessment utilizing the entire SBQ-R in the instance of a positive screening. An additional tool for primary care providers is the 9-item Patient Health Questionnaire (PHQ-9), which is widely used to assess depression and suicidal ideation in primary care settings (Bauer et al., 2013).

Second, a multidimensional approach to treatment of suicidal patients may be in order, targeting both social problem-solving and HRQL. Evidenced-based 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 (Ghahramanlou-Holloway et al., 2012; Stewart et al., 2009). 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 (Marks et al., 2005; McAuley et al., 2006; Robison-Smith et al., 2006). Pertinent to our study setting, delivery of mental health services via an integrated behavioral health model, and through brief interventions such as Problem Solving Treatment (PST-PC) (Catlan et al., 1991; Mynors-Wallis, Gath, Day, & Baker, 2000), allows patients to receive mental health care within the primary care setting, increasing access to care.

Conclusion

Our results indicate that social problem-solving deficits are associated with reduced HRQL and increased suicidal behavior in rural primary care patients. 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.

Compliance with Ethical Standards:

Funding: The authors have no funding to report for this study.

Conflict of Interest: The authors declare that they have no conflicts of interest to report.

Ethical approval: All procedures performed in the current study were approved by our University Institutional Review Board, and are in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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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); * = $p < .05$; ** = $p < .01$; *** = $p < .001$

Table 2. Direct and Indirect Associations between SPSI (and subscales), MHRQL, and Suicidal Behavior

| Path | Estimate (SE) | BC 95% CI |
|---|----------------|--------------|
| Suicidal Behavior | | |
| <i>c</i> (SPSI → Suicidal Behavior) | -.44 (.07)*** | |
| <i>a</i> (SPSI → MHRQL) | 1.82 (.23)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | .23 (.04) | |
| <i>c'</i> | -.24 (.07)** | |
| <i>Ab</i> | -.20 (.05) | [-.31, -.13] |
| Suicidal Behavior | | |
| <i>c</i> (SPSI-PPO → Suicidal Behavior) | -.21 (.05)*** | |
| <i>a</i> (SPSI-PPO → MHRQL) | .94 (.18)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | -.13 (.02)*** | |
| <i>c'</i> | -.09 (.05) | |
| <i>Ab</i> | -.12 (.03) | [-.19, -.07] |
| Suicidal Behavior | | |
| <i>c</i> (SPSI-NPO → Suicidal Behavior) | .33 (.05)*** | |
| <i>a</i> (SPSI-NPO → MHRQL) | -1.40 (.17)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | -.11 (.02)*** | |
| <i>c'</i> | .18 (.06)** | |
| <i>Ab</i> | .15 (.03) | [.10, .23] |
| Suicidal Behavior | | |
| <i>c</i> (SPSI-RPS → Suicidal Behavior) | -.21 (.06)*** | |
| <i>a</i> (SPSI-RPS → MHRQL) | .91 (.19)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | -.13 (.02)*** | |
| <i>c'</i> | -.09 (.05) | |
| <i>Ab</i> | -.12 (.03) | [-.20, -.06] |
| Suicidal Behavior | | |
| <i>c</i> (SPSI-ICS → Suicidal Behavior) | .23 (.06)*** | |
| <i>a</i> (SPSI-ICS → MHRQL) | -.71 (.20)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | -.13 (.02)*** | |
| <i>c'</i> | .13 (.05)* | |
| <i>Ab</i> | .09 (.03) | [.04, .16] |
| Suicidal Behavior | | |

| | | |
|--|---------------|------------|
| <i>c</i> (SPSI-AS → Suicidal Behavior) | .22 (.05)*** | |
| <i>a</i> (SPSI-AS → MHRQL) | -.94 (.16)*** | |
| <i>b</i> (MHRQL → Suicidal Behavior) | -.13 (.02)*** | |
| <i>c'</i> | .09 (.05)* | |
| <i>Ab</i> | .12 (.03) | [.07, .18] |

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); * = $p < .05$; ** = $p < .01$; *** = $p < .001$

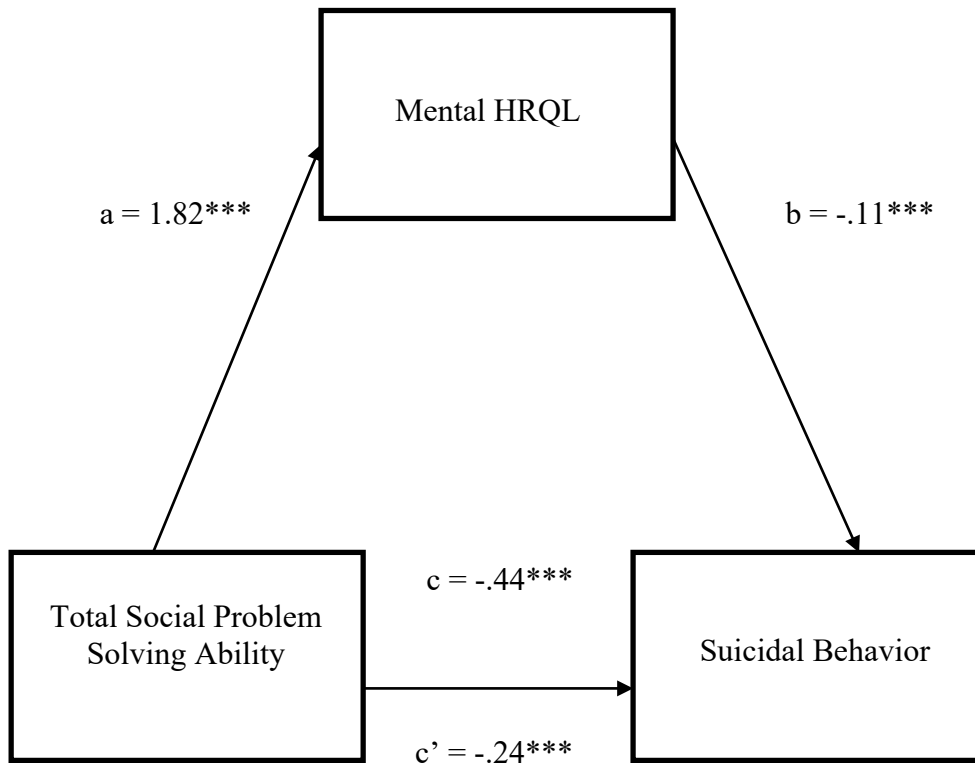


Figure 1. Simple Mediation Model: Total Social Problem Solving Ability and Suicidal Behavior: Conditional Indirect Effects of Mental HRQL

Note: c = total effect (SPSI related to suicidal behavior), ab = total indirect effect (SPSI related to suicidal behavior through mental HRQL), c' = indirect effect (SPSI related to suicidal behavior accounting for mental HRQL)