T
he incidence of heart failure (HF) in the Unit
ed States is alarming with more than 5 mil
lion people currently living with this disease.1
Individuals with HF exhibit a variety of physical
symptoms (eg, fatigue, dyspnea, edema, and ac
tivity intolerance) which contribute to functional
impairment,2 depressive symptoms,3 and poor self-
care.4 How individuals cope may play a key role
in how they adapt to increased HF physical symp-
toms and maintain their physical and psychologi-
cal well-being. However, whereas social support
and social problem-solving (ie, the way one solves
problems or makes decisions in everyday life)5 may
influence depressive symptoms and self-care behav-iors in those with HF,6,7 published research re-
garding these relationships often is either inad-
equate or inconsistent.8,10
Individuals with HF must assess symptoms ac-
curately, self-adjust medications (eg, diuretics),
and seek professional treatment when appropri-
ate.2,11 Researchers suggest that social support
plays a key role in assisting with symptom assess-
ment and management and adapting to functional
limitations.12,13 As symptoms of HF increase and
functional impairment occurs, social support may
be affected. However, empirical studies have not
investigated the influence that HF physical symp-
toms, specifically symptom severity, have on social
support.
Similarly, although evidence supports the criti-
cal role that problem-solving plays in adjusting to
severe HF physical symptoms (eg, using a shower
chair to prevent fatigue and dyspnea during a bath),
and in seeking treatment for HF symptoms,4,12 no
published reports have evaluated the relation-
ship between physical symptoms of HF and social
problem-solving. Yet, researchers suggest that so-
cial problem-solving may influence the perception
of physical symptoms.14 Thus, it is plausible that
how individuals with HF solve problems may influ-
ence their perception of HF physical symptoms.
Researchers agree that increases in HF physi-
cal symptoms influence depressive symptoms.15,16
In fact, upwards of 50% of individuals with HF
have reported clinically significant depressive
symptoms,17 including subjective feelings, such as
hopelessness, low energy, and depressed mood,16,18
with prior research suggesting that the association
increases when HF physical symptoms intensify.15
Additionally, although prior work suggests that
depressive symptoms can be treated effectively

Predicting Depressive Symptoms and
Self-care in Patients with Heart Failure

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**Objective:** To examine relationships among heart failure (HF) physical symptoms, social support, social problem-solving, depressive symptoms, and self-care behaviors in outpatients with HF. **Methods:** Cross-sectional data were collected from 201 outpatients. Structural equation modeling was used in this preliminary analysis to examine the relationships among the study variables. **Results:** HF physical symptoms and social support were predictors of depressive symptoms and self-care behaviors. Social problem-solving also predicted self-care behaviors. Social support mediated the relationship between HF physical symptoms and depressive symptoms. **Conclusions:** Social support may influence depressive symptoms and self-care behaviors, whereas social problem-solving may impact self-care behaviors. Future research should examine causality and subcomponents of social problem-solving on these outcome variables. **Key words:** heart failure; social support; social problem-solving; depressive symptoms; self-care

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through problem-solving training in those with other forms of heart disease (ie, coronary artery disease, heart attack, arrhythmias, and cardiomyopathies),

research investigating problem-solving in those with HF is scarce. Thus, there is a need for research to investigate the association between problem-solving and depressive symptoms in those with HF.

Likewise, the severity of HF physical symptoms may influence individuals’ ability to perform self-care behaviors. Self-care is a vital factor in maintaining health and well-being and involves specific activities that promote health, as well as assist with illness prevention and disease management, such as taking prescribed medications, adhering to a specialized diet, and responding to symptoms. Whereas empirical evidence indicates that severe HF physical symptoms and impaired functional status interfere with the ability to engage in self-care activities, findings from other studies are in disagreement.

Currently, no published reports examine whether social support influences social problem-solving in those with HF. Yet, both are resources that aid coping. However, in individuals with HIV, an increased perception of social support is related to adaptive problem-solving, and decreased perception of support is associated with maladaptive problem-solving. A similar association may exist in individuals with HF.

Several studies have examined the influence of social support on depressive symptoms in individuals with HF, although findings are inconsistent. Whereas some studies suggest that individuals who perceive higher levels of social support or who seek support experience fewer depressive symptoms, other research fails to identify a relationship between social support and depressive symptoms.

Likewise, research varies regarding social support and self-care behaviors. Family support in particular has been associated with better self-care behaviors (eg, consult with clinicians for HF physical symptoms and adhere to treatment regimens). Yet, other research has failed to identify social support as a factor influencing self-care behaviors.

Thus far, no published studies have investigated social problem-solving and depressive symptoms in individuals with HF. However, research has examined the influence of specific coping strategies on depressive symptoms, with findings suggesting that maladaptive coping strategies (eg, behavioral and mental disengagement, venting, and denial) are positively related to depressive symptoms; conversely, problem-focused coping strategies (eg, planful problem-solving and seeking social support) are negatively related to depressive symptoms. Even though these findings suggest that problem-solving efforts are likely to reduce or minimize depressive symptoms, it is also plausible that maladaptive problem-solving may be a consequence of depressive symptoms.

Similarly, the association between social problem-solving and self-care behaviors in individuals with HF has not been examined. In addition, social problem-solving influences how individuals take care of themselves in other clinical populations, for example, persons with diabetes mellitus; thus, social problem-solving also may influence HF self-care behaviors.

Lastly, there is some evidence supports that depressive symptoms influence self-care behaviors in individuals with HF. However, Heo et al. found that depressive symptoms were not predictors of self-care. Though, research often views depressive symptoms as an outcome of a problem (ie, illness, threat, etc.), or of ineffective problem-solving attempts, it is important to examine whether depressive symptoms influence self-care behaviors in those with HF.

Whereas the aforementioned factors are identified as significant factors related to depression and self-care in prior studies, their relationships to each other and their specific contributions to depression and self-care have not been evaluated. Additionally, no previous research has evaluated the influence of social problem-solving on depressive symptoms and self-care behaviors in individuals living with HF, creating a need for analysis of relationships among these variables. Therefore, the purpose of this descriptive, correlational study was 2-fold: (1) to examine the relationships among HF physical symptoms, social support, social problem-solving, depressive symptoms, and self-care behaviors; and (2) to identify which of these study variables predicted depressive symptoms and self-care behaviors in individuals with HF. Using structural equation modeling (SEM), we examined the following 5 research questions: (1) Is there an association between HF physical symptoms and depressive symptomatology? (2) Is there an association between HF physical symptoms and self-care behaviors? (3) Is there an association between depressive symptoms and self-care behaviors? (4) Is there an association between HF physical symptoms and depressive symptoms through social support and social problem-solving? And (5) Is there an association between HF physical symptoms and self-care behaviors through social support and social problem-solving? SEM was used in this study because, unlike multiple regression, it allows for the measurement of relationships between variables and examines the influence of predictors on more than one outcome variable in a single analysis. Thus, use of SEM is more efficient when answering the research questions noted above.

METHODS

Participants and Study Design
Outpatients with HF (N = 201) were recruited from 3 hospital-affiliated outpatient clinics in Northwest Florida between August and December
2013. Methods used to recruit this convenience sample included flyers displayed in each office and letters mailed to eligible patients. Interested patients then contacted the primary investigator to learn more about the study and undergo additional screening for inclusion.

Inclusion criteria included: (1) having a diagnosis of HF confirmed by a primary health care provider; (2) being age 55 years or older; (3) residing in an outpatient setting; and (4) being able to speak, read, and understand English. Patients with cognitive impairment were excluded from participation as determined by a score ≤ 30 on the Telephone Interview for Cognitive Status (TICS).32

This study used a cross-sectional, descriptive, correlational design to investigate relationships among study variables and their contribution to depressive symptoms and self-care behaviors. Selected constructs from the Stress, Appraisal, and Coping Theory by Lazarus and Folkman22 guided this study.

Procedure
Potential participants contacted the primary investigator to undergo cognitive and clinical screening over the telephone to determine eligibility. Those meeting inclusion criteria were enrolled in the study and scheduled for an interview with a data collector at the clinic in which the participant was a patient. Following consent, a set of self-report questionnaires, presented in random order, were used to guide participant interviews. Each interview was conducted in a private, quiet room within the supporting clinic. A computerized data entry system was used to record participant answers, with data assessed for completeness of all questionnaires prior to conclusion of each interview. There were no incentives offered by researchers for participation in this study.

Measures
The TICS32 was used during telephone screening for study eligibility to assess the potential for cognitive impairment. This survey consists of 11 items that assess 5 areas of cognitive function (e.g., orientation, attention, language, learning, and memory). The maximum score is 41. Scores of ≤ 30 represent the potential for cognitive impairment, and scores ≥ 31 represent lack of cognitive impairment. Content and construct validity, as well as internal consistency reliability, have been supported in previous studies.32 Sociodemographic information also was used to determine eligibility for the study, as well as assess key participant characteristics. Clinical information was gathered via self-report and included questions related to severity of HF (i.e., New York Heart Association [NYHA] classification) and length of time since HF diagnosis.

Heart failure physical symptoms. Physical symptoms of HF were assessed using the Heart Failure Symptom Survey (HFSS).33 This survey contains 14 physical symptoms commonly experienced by those with HF.34 Using an 11-point scale (i.e., 0–10), participants rate each symptom according to 4 domains (i.e., frequency, severity, interference with physical activity, and interference with enjoyment of life) based upon the last 7 days. Higher scores indicate more of the respective domain in relation to the particular symptom. Empirical evidence supports its content validity35 and reliability;34 however, prior studies have not reported whether the HFSS is best viewed as a single- or multidimensional instrument. Therefore, a factor analysis of this instrument was conducted, with results indicating that the 4 domains of the instrument could be viewed as one domain to represent physical symptoms of HF in this study, as exhibited by all items loading at .30 or higher on the first factor.35 In this study the Cronbach’s alpha was 0.96.

Social support. We used the Interpersonal Support Evaluation List – 12 (ISEL-12)36 to measure perceived belonging, appraisal, and tangible support. Scores range from 0-36, with higher scores indicating a higher perception of available functional support. Previous studies support its construct validity using the original 40-item version36 and its internal consistency reliability (α = .79).37 Following the convention of others,38 the 3 ISEL subscales were combined to obtain a single index of perceived support. The Cronbach’s alpha was 0.90 in the current study.

Actual or structural support was measured using the researcher developed Graven and Grant Social Network Survey (GGSNS). Participants rate their level of agreement with statements regarding their views about people with whom they are associated and provide them with assistance and support, as well as identify the number of people in their life upon whom they depend to provide support. Scores on this 12-item survey range from 12-84, with higher scores indicating higher levels of actual support. A modified Delphi Technique, using 3 content reviewers with expertise in the areas of social support, heart failure, and psychometrics was used to establish content validity.35 Construct validity of the GGSNS, as compared to the ISEL-12 was assessed (r = .521; p < .001). Although the correlation between these measures was low, this finding was not surprising given that the ISEL-12 measures functional support whereas the GGSNS measures structural support. The instrument was internally consistent, with a Cronbach’s alpha of 0.89 in this study.

Social problem-solving. The 25-item Social Problem-Solving Inventory Revised – Short (SPSIR-S)39,40 was used to measure social problem-solving, representing adaptive and maladaptive problem-solving styles. Although this instrument has not been used in studies involving individuals with HF, empirical evidence does support its content and construct validity and internal consistency reliability for general populations. Using adjusted total scores, higher scores represent a more adap-
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tive problem-solving style and lower scores indicate a more maladaptive problem-solving style. The Cronbach’s alpha was 0.91 in this study.

**Depressive symptoms.** Depressive symptoms were measured using the 20-item Center for Epidemiological Studies – Depression Scale (CES-D). Overall scores range from zero to 60, with higher scores indicating the presence of more depressive symptoms and a cutoff score of 16 indicating an individual is at risk for some degree of depression. Validity and reliability have been supported in previous studies involving individuals with HF. A Cronbach’s alpha of 0.90 was noted in the current study.

**Self-care behaviors.** Self-care behaviors were measured using the European Heart Failure Self-care Behaviour Scale - 9 (EHFScBS-9). Participants rate their level of agreement with activities specific to HF self-care on a 5-point scale, with higher scores indicating poorer self-care behaviors. Although, reliability and validity have been supported in previous studies examining self-care behaviors in those with HF, the Cronbach’s alpha was slightly low ($r = 0.67$) in this study.

**Data Analysis**

The Statistical Package for the Social Sciences (SPSS) version 20 and LISREL 9.1 statistical software were used to analyze data, with statistical significance set at .05 for all tests. Descriptive statistics were conducted to examine and report sample characteristics, as well as report scores

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Sample Characteristics and Descriptive Statistics for Study Variables (N = 201)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td>72.57 (8.94)</td>
</tr>
<tr>
<td>Sex</td>
<td>126</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>173</td>
</tr>
<tr>
<td>African American</td>
<td>27</td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>1</td>
</tr>
<tr>
<td>Highest Level of Education</td>
<td></td>
</tr>
<tr>
<td>6th grade or less</td>
<td>1</td>
</tr>
<tr>
<td>7th – 9th grade</td>
<td>6</td>
</tr>
<tr>
<td>10th – 12th grade</td>
<td>15</td>
</tr>
<tr>
<td>High school graduate</td>
<td>50</td>
</tr>
<tr>
<td>Some college</td>
<td>46</td>
</tr>
<tr>
<td>College graduate</td>
<td>63</td>
</tr>
<tr>
<td>Graduate degree</td>
<td>20</td>
</tr>
<tr>
<td>Annual Income</td>
<td></td>
</tr>
<tr>
<td>&lt; $30,000</td>
<td>34</td>
</tr>
<tr>
<td>$30,000 - $49,999</td>
<td>66</td>
</tr>
<tr>
<td>$50,000 - $74,999</td>
<td>62</td>
</tr>
<tr>
<td>$75,000 - $100,000</td>
<td>35</td>
</tr>
<tr>
<td>&gt; $100,000</td>
<td>4</td>
</tr>
<tr>
<td>Heart Failure Class (New York Heart Association)</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>39</td>
</tr>
<tr>
<td>II</td>
<td>95</td>
</tr>
<tr>
<td>III</td>
<td>23</td>
</tr>
<tr>
<td>IV</td>
<td>44</td>
</tr>
<tr>
<td>Heart Failure Symptom Survey</td>
<td>1.50 (1.53)</td>
</tr>
<tr>
<td>Graven &amp; Grant Social Network Survey</td>
<td>56.46 (18.74)</td>
</tr>
<tr>
<td>Interpersonal Support Evaluation List -12</td>
<td>29.09 (7.51)</td>
</tr>
<tr>
<td>Social Problem-Solving Inventory Revised –Short</td>
<td>9.76 (3.71)</td>
</tr>
<tr>
<td>Center for Epidemiological Studies – Depression</td>
<td>9.65(10.17)</td>
</tr>
<tr>
<td>European Heart Failure Self-care Behavior Scale – 9</td>
<td>25.65 (7.55)</td>
</tr>
</tbody>
</table>
on all study variables. Partial correlation analyses were conducted using Pearson product moment correlation coefficients to assess relationships between study variables, while controlling for covariates (ie, sex, age, race, income, and education) that may influence study variables. The partial correlation matrix was used for analysis in the LISREL software.

A true latent variable was extracted for social support (ISEL-12 and GGSN) and a causal model was developed to determine the effects of HF physical symptoms, social support, and social problem-solving on depressive symptoms and self-care behaviors while controlling for the above covariates; this allowed the proposed model to be run without violating Bollen’s rule with the sample size of 201 and provide a more parsimonious model without including a path for all of the covariates. Standard fit indices were used to evaluate and compare the models. The goodness-of-fit index and the adjusted goodness-of-fit index were used because they compare the models to a saturated model versus a nested model.

The proposed model was constructed with depressive symptoms and self-care behaviors as dependent variables (depressive symptoms as an outcome was nested within the overall model), with the other latent variable and observed variables serving as predictor variables (Figure 1). Social support and social problem-solving were modeled as potential mediators of the effects of HF physical symptoms on depressive symptoms and self-care behaviors. Additionally, tests of overall model fit and t-tests of the significance of each estimated path were examined; nonsignificant paths were fixed to zero to enhance model fit and parsimony. Whereas SEM allows for the directional testing of relationships, due to the correlational nature of this study, causality cannot be implied.

RESULTS
Sample Characteristics
A total of 205 participants underwent telephone screening. One participant had a TICS score less than 30 and was not enrolled in the study. Three other participants were enrolled, but failed to show for the individual interview. These participants were similar with regards to sex, race, and age (ie, all 3 were Caucasian men 65-72 years old). There were no incidents of missing data. Thus, complete data for 201 participants were included in the analyses. The sample size was supported by Bollen’s Rule for structural equation modeling, which states that 5 – 10 participants are needed for each path observed in the model. Descriptive characteristics of the sample (N = 201) and study variables are displayed in Table 1. Simple summary information was used for many of the instruments, including HFSS, GGSNS, ISEL-12, SPSIR-S, CES-D, and EHFScBS-9, as well as for the specified covariates (ie, sex, age, race, income, and education). For data analysis, sex and race were recoded into dichotomous variables (ie, male/female and non-minority/minority, respectively).

Model Specification and Trimming
Statistical control of covariates was accomplished using partial correlational analyses. Table 2 shows the partial correlation matrix for variables used in this analysis. Otherwise, SEM analysis proceeded in a logical manner, consistent with the recommendations of Anderson and Gerbing. Initially, the baseline model was specified to check the validity of the latent variable (ie, social support). A reference variable (ie, ISEL-12) was identified and specified for the one latent variable in the model that had 2 indicator variables. This stabilized the latent variable and provided a conservative solution by allowing the reference variable to remain in the model without removing its error variance. Dummy latent variables were constructed, with only one indicator variable, which served as the reference variable. The baseline model was tested first, with all variables correlated with each other. The minimum fit function chi-square for this model was $\chi^2(4, N = 201) = 9.31, p = .05$. Then the

Table 2
Partial Correlation Matrix for Study Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Heart Failure Symptom Survey</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Graven &amp; Grant Social Network Survey</td>
<td>-0.108</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Interpersonal Support Evaluation List</td>
<td>-0.189</td>
<td>0.542**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Social Problem-Solving Inventory Revised</td>
<td>0.154*</td>
<td>0.072</td>
<td>-0.134</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Center for Epidemiological Studies –</td>
<td>0.550**</td>
<td>-0.227**</td>
<td>-0.466**</td>
<td>0.136</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>6. European Heart Failure Self-care Behavior</td>
<td>0.220*</td>
<td>-0.282**</td>
<td>-0.306**</td>
<td>-0.118</td>
<td>0.177**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* p < .05  ** p ≤ .001

Note. The following covariates were controlled for in the above partial correlational analyses: sex, age, race, income, and education.
Table 3

<table>
<thead>
<tr>
<th>Fit Measures of Baseline, Causal, and Trimmed Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \chi^2 \text{(df)} )</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>Baseline Model</td>
</tr>
<tr>
<td>Full Causal Model</td>
</tr>
<tr>
<td>Trimmed Model</td>
</tr>
</tbody>
</table>

Note.

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Full causal model was specified, with no improvement of fit observed (ie, \( \chi^2(4, N = 201) = 9.31 \), \( p = .05 \)). However, several paths in the model were nonsignificant. Therefore, the model was trimmed by removing the least significant path (ie, the path with the lowest t value) one at a time and recalculating model fit following the removal of each path. This process continued until only statistically significant paths (ie, \( p < .05 \)) remained in the model. Data interpretation was conducted using the final trimmed model.

Several fit indices were evaluated during data analysis. The chi-square test (\( \chi^2 \)) is used to assess whether a significant difference exists between the population covariance matrix implied by the model and the covariance matrix. A nonsignificant \( \chi^2 \) indicates that the model implied fits the data well.\(^3\) The minimum fit chi-square for the final trimmed model was \( \chi^2(7, N = 201) = 12.44, p = .08 \). Yet, a chi-square difference test revealed no significant improvement in fit between the full and final trimmed model, \( \chi^2(3, N = 201) = 3.31, p > .05 \). The goodness-of-fit (GFI), as well as the adjusted goodness-of-fit index (AGFI), which takes into account the degrees of freedom in the model, range from 0 to 1 with values > 0.9 indicating good model fit. The root mean squared error of approximation (RMSEA), which is based upon residuals, indicates a good fit when values are below 0.10, a very good fit when values are below 0.05, and an outstanding fit when values are below 0.01.\(^3\) The standard fit indices (ie, GFI = 0.98, AGFI = 0.94, RMSEA = 0.06) for this model, as noted in Table 3, indicate that this model provides a good fit to the observed data. Model fit was not significantly enhanced by trimming non-significant paths, as evidenced by the \( \chi^2 \) difference test, as well as the amount of variance explained for depressive symptoms (44% for both the full and trimmed models). However, the trimmed model did explain a slightly higher percentage of the variance for self-care behaviors (16%), whereas the full model (with nonsignificant paths) explained 15% of the variance.

Figure 1 illustrates the trimmed model, including path coefficients in standardized form. The final trimmed model shows that HF physical symptoms were directly related to social support. Physical symptoms of HF and social support predicted depressive symptoms, yet social problem-solving did not. Also, HF physical symptoms, social support, and social problem-solving were directly associated with self-care behaviors. However, depressive symptoms did not predict self-care behaviors, nor did physical symptoms of HF and social support predict social problem-solving. However, HF physical symptoms were strongly predictive of social support (standardized coefficient = -0.19), depressive symptoms (standardized coefficient = 0.48), and self-care behaviors (standardized coefficient = 0.19). Thus, individuals experiencing more HF physical symptoms had less social support, experienced more depressive symptoms, and participated in less self-care behaviors. Social support was predictive of depressive symptoms (standardized coefficient = -0.38) and self-care behaviors (standardized coefficient = -0.29), suggesting that those with higher levels of social support experience fewer depressive symptoms and participate in more self-care behaviors. Finally, social problem-solving was predictive of self-care behaviors (standardized coefficient = -0.19), indicating that individuals with an adaptive problem-solving style have better self-care behaviors. As noted in Figure 1, in addition to these direct relationships, HF physical symptoms had a significant indirect association with depressive symptoms that was mediated by social support (standardized coefficient = 0.07).

DISCUSSION

This primary aim of this study was to examine the relationships among HF physical symptoms, social support, social problem-solving, depressive symptoms, and self-care behaviors, as well as identify predictors of depressive symptoms and self-care behaviors from among the study variables in individuals living with HF. Consistent with previous findings,\(^27\) individuals experiencing more symptoms of HF reported more depressive symptoms. Also, it appears that social support mediates the effect of symptom severity, thereby lowering the risk that an individual will experience depressive symptoms. This finding is also consistent with ones from previous studies that associate social support and decreased depressive symptoms,\(^7,16,43\)
as well with research by Lazarus and Folkman\textsuperscript{22} that suggests social support buffers stressful situations (eg, increased HF physical symptoms) and their psychological consequences.

Increased physical symptoms of HF were associated with poorer self-care behaviors. This was a logical finding, given that functional impairment commonly results as symptoms of HF increase and limit individuals’ ability to perform self-care activities.\textsuperscript{2} Similarly, individuals who had more physical symptoms of HF also reported less social support. Although prior research is sparse, findings suggest that increased frequency and severity of HF physical symptoms may interfere with maintaining social relationships that provide support. It also may be plausible that those with less social support perceive more severe physical symptoms of HF. Thus, this finding may need to be explored qualitatively.

These findings illustrate the importance of adequate social support as a coping resource\textsuperscript{22} for maintaining good self-care behaviors. Whereas
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Some studies suggest that social support is a critical resource for maintaining self-care,30,50 our findings also highlight the importance that social problem-solving has in self-care. Although not previously investigated in individuals with HF, it appears that persons with a more adaptive problem-solving style have better self-care. Similar findings have been found in other populations, such as in persons with diabetes mellitus, indicating that social problem-solving is related to components of self-care.29

The inability to find a relationship between depressive symptoms and self-care behaviors was somewhat surprising given that depressive symptoms may interfere with the ability to assess and respond to symptoms, as well as make decisions and influence physical activity, independent of symptom severity.51 Yet, these findings do support previous research findings,26 implying depressive symptoms are not a predictor of self-care, but rather, an outcome of a particular condition or situation. However, the average overall low scores for this sample on the instrument that measured depressive symptoms (Table 1) could have contributed to this nonsignificant finding. Descriptive statistics indicated that less than half the participants (N = 45; 22.4%) were experiencing depressive symptoms (CES-D score ≥ 16). Although the purpose of the SEM analysis was to evaluate the relationships of the study variables on overall HF self-care behaviors, in those participants with CES-D scores ≥ 16, depression was significantly associated with provider-based adherence self-care behaviors (a sub-dimension of the EHFScBS-9; eating a low salt diet and taking medication as prescribed).52

It appears that HF physical symptoms do not influence individuals’ problem-solving style; problem-solving style may be an inherent characteristic of one’s personality, independent of physical status. According to Rich and Bonner,53 individual differences in personality appear to influence social problem-solving, predisposing them to the use of specific problem-solving strategies. Although we did not investigate the influence of personality in our study, prior research indicates that the potential effect of personality on problem-solving should not be ignored. For example, Murberg, Bru, and Stephens54 found that coping styles (which includes problem-solving) in HF patients were moderately associated with the personality traits of neuroticism and extraversion. Therefore, the potential influence of personality on social problem-solving needs further investigation.

Lastly, an interesting finding of this study was that social problem-solving did not influence depressive symptoms. This was somewhat surprising because previous research involving other populations (eg, HIV) has identified a relationship between maladaptive problem-solving and increased risk for depressive symptoms.24 However, no previous research has indicated social problem-solving scores for heart failure patients. Patients with heart failure also may experience feelings of helplessness and uncertainty and get angry at insignificant things.52 With adjusted total scores ranging from 0-20 for the SFPSIR-S (Table 1), the mean score of 9.76 in this study suggests these heart failure patients may have experienced some of these feelings and future research is warranted. Further, failure to find a significant relationship between social problem-solving style and depressive symptoms in this study could possibly be due to the use of an adjusted total score to measure social problem-solving. Thus, in future studies, examining adaptive and maladaptive problem-solving strategies that may be more useful in lessening depressive symptoms and enhancing self-care behaviors would be more valuable. Nezu et al55 are conducting research examining the effectiveness of problem-solving interventions aimed at reducing stress and depressive symptoms in individuals with heart failure, which should add to the body of knowledge regarding how social problem-solving contributes to these psychological variables.

Whereas our findings provide insight into factors that predict depressive symptoms and self-care behaviors in individuals with HF, limitations and strengths of the study must be considered. Major limitations in this study included: (1) a high percentage of Caucasian men, which were not representative of current national HF statistics;1,56 (2) use of a convenience sample, predisposing the sample to a higher percentage of participants experiencing few symptoms of HF (ie, Class I and II NYHA HF); (3) use of a cross-sectional, descriptive correlational design which limited insight on how social support and social problem-solving needs may change over time, as well as limited the ability to infer causality; and (4) lack of investigation into factors which may have influenced the study variables (eg, co-morbidities, use of antidepressant medications, and personality). The number and severity of comorbidities, in addition to medication and personal factors that may influence study variables should be considered in future studies. Additionally, this study did not examine the influence of psychological symptoms of HF (eg, cognitive deficits), yet it would be valuable to investigate the influence of such symptoms on the outcome variables examined in this study.

A major strength of this study lies in the variables under investigation. Although previous studies have investigated relationships among HF physical symptoms, social support, depressive symptoms, and self-care behaviors, published research has yet to examine the effect of social problem-solving on depressive symptoms and self-care behaviors in those with HF. Therefore, this study provides insight into the influence of social problem-solving on these outcome variables for future research. In addition, the use of valid and reliable instruments to measure the study variables was also a strength of this study. With the exception of self-care behaviors (EHFScBS-9), which had a slightly
low Cronbach’s alpha (0.67), all other instruments appeared to be highly reliable. The high percentage of participants with NYHA Class I and II HF may be responsible for this lower alpha, given that these participants were not partaking in activities that are commonly part of the treatment regimen for those with higher classes of HF (ie, Class III or IV HF) (eg, restricting fluids, monitoring daily weights). Moreover, the length of the EHFSCBS-9 also may have contributed to the low alpha in this study. Future researchers may consider using another measure of self-care that examines the concept in a broader scope, such as the Self-Care of Heart Failure Index, which measures not only maintenance and management activities, but also confidence in self-care abilities.57

Our findings advance the work in this area with regards to cardiac health, specifically HF. As this was a preliminary analysis, more research is needed to investigate the influence of components of social support (ie, functional and structural support),58 as functional support has been found in other populations to be significantly associated with increases in depressive symptoms.23 Likewise, components of social problem-solving, particularly problem orientation should be evaluated, as associations between negative problem-orientation and depressive symptoms have been found in prior research.59

Our findings also provide implications for clinicians working with HF patients. Clinicians should assess for adequate support at each health care visit and include patients’ support systems in the educational process, as well as assess for the presence of depressive symptoms and make appropriate referrals. Given the importance of adequate self-care in maintaining well-being, it is important that clinicians work with patients to lessen maladaptive problem-solving and strengthen adaptive problem-solving skills. For example, clinicians can explore with patients those situations in their daily lives that are considered stressful and assist them with undergoing a cognitive analysis of these situations, as well as assist with planful problem-solving related to dietary and treatment regimens.60

CONCLUSION
Maintaining optimal health and well-being in persons with HF is crucial to preventing morbidity and mortality, as well as reducing frequent hospitalizations. However, depressive symptoms and poor self-care behaviors increase the risk of these outcomes occurring.11 Consequently, it is important to know which factors increase the risk of depressive symptoms and poor self-care behaviors. Findings indicate that social support may influence depressive symptoms and self-care behaviors, while social problem-solving may impact self-care behaviors in individuals with HF. Though longitudinal work is needed to examine causality, our findings advance the work in the area of social problem-solving19 with regards to HF and identify a need for continued analysis of the subcomponents of social problem-solving on these outcome variables.

Human Subjects Statement
The research study entitled “Relationships among Heart Failure-Related Physical Symptoms, Social Support, Social Problem-Solving, Depressive Symptomatology, and Self-care Behaviors in Individuals with Heart Failure” was approved by the institutional review boards at all study sites including: Florida State University, University of Alabama at Birmingham, and Tallahassee Memorial Healthcare. All participants provided informed consent prior to inclusion in the study.

Conflict of Interest Statement
The authors of this paper have no conflicts of interest to disclose.

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