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# Limited Association Between Perceived Control and Health-Related Quality of Life in Patients with Heart Failure

Teesta Banerjee  
*Stanford University*

Kyoung Suk Lee  
*University of Wisconsin - Madison*

Steven R. Browning  
*University of Kentucky, srbrown@uky.edu*

Claudia Hopenhayn  
*University of Kentucky, claudia.hopenhayn@uky.edu*

Susan C. Westneat  
*University of Kentucky, swest1@email.uky.edu*

*See next page for additional authors*

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**Authors**

Teesta Banerjee, Kyoung Suk Lee, Steven R. Browning, Claudia Hopenhayn, Susan C. Westneat, Martha J. Biddle, Cynthia Arslanian-Angoren, Jo-Ann Eastwood, Gia Mudd, and Debra K. Moser

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## Limited Association Between Perceived Control and Health-Related Quality of Life in Patients with Heart Failure

**Teesta Banerjee, MBBS, MPH [Clinical Researcher],**

Department of Oncology, Cancer Genetics Program, Stanford School of Medicine

**Kyoung Suk Lee, PhD, RN, MPH [Assistant professor],**

University of Wisconsin-Madison School of Nursing, Madison, WI, USA

**Steven R Browning, PhD [Assistant Professor],**

University of Kentucky College of Public Health, Lexington, KY, USA

**Claudia Hopenhayn, PhD [Associate Professor],**

University of Kentucky College of Public Health, Lexington, KY, USA

**Susan Westneat, MA,**

University of Kentucky, College of Nursing, Lexington, KY, USA

**Martha J. Biddle, PhD, APRN [Assistant Professor],**

University of Kentucky, College of Nursing, Lexington, KY, USA

**Cynthia Arslanian-Engoren, PhD, RN [Associate Professor],**

University of Michigan, School of Nursing, Ann Arbor, MI, USA

**Jo-Ann Eastwood, PhD [Assistant professor],**

University of California-Los Angeles, School of Nursing, Los Angeles, CA, USA

**Gia Mudd, PhD, RN, MPH [Assistant professor], and**

University of Kentucky, College of Nursing, Lexington, KY, USA

**Debra K Moser, DNSc, RN, FAAN [Professor]**

University of Kentucky, College of Nursing, Lexington, KY, USA

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Heart failure (HF) is a chronic, incurable, debilitating condition, in which a major management goal is improvement in health-related quality of life (HRQOL). Although patients with HF have to learn how to live with HF, the process of adaptation to HF is not simple. Patients with HF often are overwhelmed by their therapeutic regimen and frustrated with inability to perform social and leisure activities that they used to enjoy.<sup>1,2</sup> The illness trajectory of HF, which is hard to predict and differs from patient to patient, is a source of uncertainty or loss of control.<sup>3,4</sup> In qualitative studies, HF patients' experiences were described as "*feeling imprisoned in illnesses*"<sup>5</sup> or "*feeling powerless*."<sup>6</sup>

Despite advances in medical management in HF, older adults who have HF experience worse HRQOL than those who do not have HF<sup>7,8</sup> or who have other chronic illnesses.<sup>8</sup> Impaired HRQOL is associated with adverse outcomes, such as increased rates of

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Corresponding author: Kyoung Suk Lee, PhD, RN, MPH, Assistant professor, University of Wisconsin-Madison School of Nursing, Address: University of Wisconsin-Madison School of Nursing, H6/342 Clinical Sciences Center, 600 Highland Ave., Madison, WI 53792-2455, kslee4@wisc.edu, Tel: 608-263-5272.

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hospitalizations and mortality.<sup>9</sup> It is essential to identify factors influencing HRQOL in HF in order to develop strategies to improve patients' HRQOL.

Perceived control (i.e., the belief that one has resources needed to cope with negative events and the ability to positively influence consequences of those negative events) is potentially an important factor in an individual's HRQOL, because of its inverse relationship to anxiety and depression, major predictors of HRQOL.<sup>10–13</sup> Perceived control is essential to successful adjustment to stressful events and improvement in HRQOL among individuals after myocardial infarction and heart transplant.<sup>14, 15</sup> In post-cardiac transplantation patients,<sup>14</sup> there is a positive relationship between perceived control and HRQOL among female heart transplant recipients. However, the relationship between perceived control and HRQOL has not been studied in patients with HF. Therefore, the purpose of this study was to determine whether perceived control is an independent predictor of HRQOL in patients with HF.

## Methods

### Study design, sample, and setting

A cross-sectional study was conducted among patients recruited from HF clinics in three Midwestern states in the United States. The conduct of the study was approved by Institutional Review Boards at each study site. Nurse practitioners or physicians in the clinics identified eligible patients and referred them to trained research nurses. After a detailed explanation about the study, patients who agreed to participate gave signed informed consent.

Patients were invited to participate if they had a documented medical diagnosis of HF from either systolic or diastolic dysfunction, were free of myocardial infarction within three months prior to enrollment, and able to speak and read English. Patients who had life-threatening comorbid conditions (e.g., end-stage renal diseases and cancer other than skin cancer) or obvious cognitive impairment that limited their ability to provide informed consent or complete questionnaires were excluded.

### Measures

**Health-related quality of life**—The Minnesota Living with HF Questionnaire (MLHFQ) was used to measure HRQOL.<sup>16</sup> The MLHFQ consists of 21 items rated by patients using a 6-point Likert scale (0= no impact to 5=serious impact). Scores of each item are summed to yield a total score, which can range from 0 to 105. A higher score reflects worse HRQOL. A change or a difference in score of > 5 on this instrument is considered clinically meaningful.<sup>17</sup>

**Perceived control**—Perceived control was measured using the Control Attitude Scale-Revised (CAS-R).<sup>11</sup> The CAS-R is an 8-item instrument where items are rated on a scale from 0 (totally disagree) to 5 (totally agree). Total scores can range from 8–40, with a higher score denoting higher perceived control. The validity and reliability of the CAS-R has been supported in a number of cardiac populations, including HF.<sup>11</sup>

**Psychological status**—Psychological status was evaluated using the Brief Symptom Inventory (BSI) subscales for depressive symptoms (six items) and anxiety (six items).<sup>18</sup> For each subscale, patients are asked to rate how much they have been bothered by each symptom item in the past seven days using a five-point scale (0= “not at all” to 4=“extremely”). Total scores of each subscale scores are determined by averaging item ratings. The possible range of each subscale is from 0 to 4, with higher scores indicating

higher levels of depressive symptoms or anxiety. There are published mean scores in healthy individuals to indicate high and low levels of depressive symptoms ( $< 0.28$  vs.  $> 0.28$ ) and anxiety ( $< 0.35$  vs.  $> 0.35$ ).<sup>18</sup> The validity and reliability of the BSI have been demonstrated.<sup>18, 19</sup>

**Demographic and clinical variables**—Age, gender, marital status, etiology of HF, New York Heart Association (NYHA) functional class, and prescribed medications were collected via patient interview and medical records review. Total comorbidity burden was measured with the Charlson Comorbidity Index via patient interview.<sup>20</sup> NYHA functional class was determined by trained research nurses through structured patient interview. The Charlson Comorbidity Index<sup>20</sup> can range from 0–30, with a higher score indicating a higher levels of burden from comorbid diseases.

## Data Analyses

Data analyses were conducted using SAS 9.3 (Cary, North Carolina). Pearson's correlation coefficients ( $r$ ) were used to examine the linear associations of HRQOL with perceived control and psychological status (i.e., depressive symptoms and anxiety). Linear regression modeling was used to examine the relationship between perceived control and HRQOL. A univariate linear regression model was used to examine the association between perceived control and HRQOL. Hierarchical multiple linear regression then was used to examine the independent contribution of perceived control to HRQOL after adjusting for the following covariates: age, gender, ethnicity, marital status, total comorbidity burden, NYHA functional class, etiology of HF, and psychological status. Two model blocks were tested. In the first block, covariates were regressed on scores of HRQOL. In the second block, perceived control was added to the variables included in the first block. Model assumption (e.g., linearity) and multi-collinearity were evaluated. Covariates included in the model were identified from the literature.

## Results

### Sample characteristics

The study sample consisted of 423 patients with HF (Table 1). Approximately half of patients (47%) were 65 years or older with a range of 24 to 97 years. Patients were primarily men, white, and in NYHA functional class III and IV. Mean scores of perceived control was  $26.1 \pm 5.1$ , indicating relatively high levels of perceived control. When comparing our results with the mean reported scores of the BSI,<sup>18</sup> 66.0% and 46.5% of patients in this study had levels of depressive symptoms and anxiety, respectively, higher than the reported non-patient mean.

### Correlations of health-related quality of life, perceived control, and psychological status

HRQOL was significantly correlated with perceived control, depressive symptoms, and anxiety. Scores of HRQOL (higher scores indicate worse HRQOL) were negatively correlated with scores of perceived control ( $r = -0.49$ ,  $p < 0.01$ , 95% confidence interval [CI]  $-0.56$ – $-0.41$ ), meaning that worse HRQOL were related to lower levels of perceived control. Scores of HRQOL were positively correlated with scores of depressive symptoms ( $r = 0.64$ ,  $p < 0.01$ , 95% CI  $0.59$ – $0.70$ ) and anxiety ( $r = 0.64$ ,  $p < 0.01$ , 95% CI  $0.57$ – $0.69$ ), indicating that worse HRQOL were related to higher levels of depressive symptoms and anxiety. There were moderate levels of correlation between scores of perceived control and scores of depressive symptoms ( $r = -0.46$ ,  $p < 0.01$ , 95% CI  $-0.53$ – $-0.38$ ) and anxiety ( $r = -0.44$ ,  $p < 0.01$ , 95% CI  $-0.52$ – $-0.36$ ) indicating that higher levels of perceived control were associated with lower levels of depressive symptoms and anxiety.

### Association between perceived control and health-related quality of life

In univariate linear regression, perceived control explained 23.9% of the variance in HRQOL (unstandardized  $\beta = -2.34$ ; standardized  $\beta = -0.49$ ;  $p$ -value  $< 0.001$ ). In hierarchical linear regression (Table 2), sociodemographic, clinical variables, and psychological status explained 53.6% of the variance in HRQOL. Adding perceived control to the model explained an additional 1.4% of the variance in HRQOL. Higher perceived control scores were associated with lower HRQOL scores, indicating that higher levels of perceived control were associated with better HRQOL ( $p$ -value  $< 0.001$ ). Marital status (married or cohabitating vs. single/divorced/widowed), total comorbidity burden score, NYHA functional class (III/IV vs. I/II), depressive symptoms, and anxiety also predicted HRQOL.

### Discussion

In this study, we examined the relationship between perceived control and HRQOL in patients with HF. We found that higher levels of perceived control were strongly associated with better HRQOL in univariate analysis, but this relationship was strongly attenuated after controlling for known factors associated with HRQOL. The variance in HRQOL explained by the addition of perceived control to a model containing demographic, clinical and psychological covariates was small (1.4%).

There have been many efforts to understand HRQOL in HF and identify its determinants to enhance HRQOL. Heo and colleagues<sup>21</sup> asked HF patients to define HRQOL. In this qualitative study, patients reported that they had a good HRQOL despite limitations in their daily lives due to HF; a good HRQOL meant being able to pursue happiness and have fulfilling relationships with others, rather than the mere absence of psychological distress. Given that HRQOL involves patients' active efforts to have a positive perspective to their lives, a sense of control appeared to be one component that contributed to maintenance of a good HRQOL.<sup>21</sup>

Despite the apparent importance of perceived control to HRQOL evident in the qualitative study by Heo and colleagues,<sup>21</sup> we found a significant, yet weak relationship between perceived control and HRQOL in patients with HF. The relationship between perceived control and HRQOL in this study was attenuated after adding covariates to the regression model. The unadjusted  $\beta$  coefficient of perceived control ( $-2.34$ ) in the univariate linear regression model was decreased by 68.5%, compared to the unadjusted  $\beta$  coefficient of perceived control ( $-0.74$ ) in the hierarchical linear regression model after adjusting for covariates. This finding suggests that covariates included in the model may partially mediate the relationship between perceived control and HRQOL.

Given the strong relationship between higher perceived control and both lower anxiety and lower depression in this and other studies,<sup>10, 11, 15</sup> we postulate that psychological status may mediate the association between perceived control and HRQOL in this study (Figure 1). Perceived control plays an important role in psychological adjustment in individuals facing stressful events. Among patients who had experienced a cardiac event, perceived control was a significant determinant of psychological recovery (i.e., lower levels of depression, anxiety, and hostility over time).<sup>15</sup> Similarly, HF patients with high perceived control had significantly less emotional distress than patients with low perceived control.<sup>10</sup> Therefore, it is possible that perceived control indirectly influences HRQOL via psychological status in patients with HF.

There are limitations to note. Majority of the sample in this study was white and younger, and had less comorbidity burden, which limits the generalizability of findings in this study to the HF population. The cross-sectional, observational design limits causal inference of

relationships between HRQOL and perceived control. However, we used valid and reliable instruments with a large number of patients from multiple cardiology clinics in the three Midwestern states.

## Conclusions

As perceived control is a modifiable factor unlike intrinsic personality characteristics, interventions to enhance perceived control may be promising to improve HRQOL. However, we found only a weak relationship between perceived control and HRQOL when considered in the presence of demographic, clinical, and psychological factors. The result of this study suggests a possible mediation effect of psychological status on the association between perceived control and HRQOL in patients with HF; however, more studies are needed to support this suggested relationship among perceived control, psychological status, and HRQOL.

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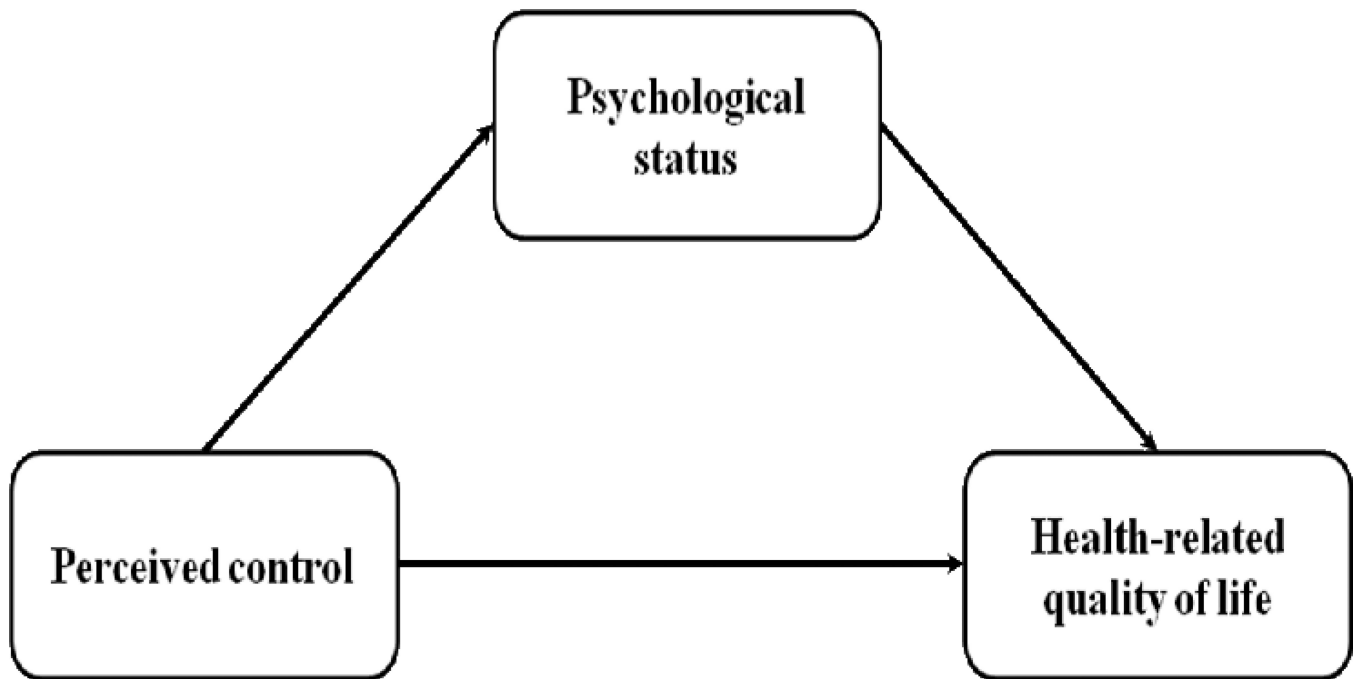
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### What's New and Important

- We found only a weak relationship between perceived control and HRQOL when considered in the presence of demographic, clinical, and psychological factors.
- Given the strong relationship between perceived control and psychological factors, the result of this study suggests a possible mediation effect of psychological status on the association between perceived control and HRQOL in patients with HF.
- More research is needed to examine whether perceived control indirectly influences HRQOL via psychological status in patients with HF.



**Figure 1.** Conceptual model of potential relationships among perceived control, psychological status, and health-related quality of life

**Table 1**

## Sample characteristics (N= 423)

	Mean $\pm$ SD or N (%)
Age, years	63 $\pm$ 12
Gender	
Male	283 (66.9%)
Female	140 (32.7%)
Marital Status	
Single/divorced/widowed	146 (35.1%)
Married/co-habiting	270 (64.9%)
Ethnicity	
White	242 (57.2%)
Minority	181 (42.8%)
NYHA class	
I/II	182 (43.0%)
III/IV	241 (57.0%)
Charlson Comorbidity Index	3.1 $\pm$ 1.8
Ischemic etiology of HF	297 (70.2%)
Psychological factors	
Perceived control	26.1 $\pm$ 5.1
Health-related quality of life	44.1 $\pm$ 24.5
Anxiety	0.7 $\pm$ 0.7
Depressive symptoms	0.8 $\pm$ 0.8
Medications	
ACEI or ARB (n=419)	361 (86.2%)
Beta Blocker (n=419)	355 (84.7%)

Note. NYHA=New York Heart Association; HF= Heart Failure; ACEI = angiotensin converting enzyme inhibitor; ARB = angiotensin receptor blocker

**Table 2**  
Hierarchical regression analysis of predictors of health-related quality of life (N= 423)

Step	Variables	Unstandardized $\beta$	Standardized $\beta$	p-value	Model statistics	
					p-value	adjusted R <sup>2</sup>
1	Age	-0.11	-0.05	0.088	<0.001	0.54
	Female (vs. male)	-2.60	-0.05	0.116		
	Minority (vs. White)	0.49	0.30	0.764		
	Married/co-habiting (vs. Single/ divorced/ widowed)	3.91	0.08	0.014		
	Charlson Comorbidity Index	1.07	0.08	0.011		
	NYHA class III/IV (vs. I/II)	11.92	0.24	<0.001		
	Ischemic etiology of HF (vs. non-ischemic)	-2.02	-0.04	0.218		
	Anxiety	8.17	0.24	<0.001		
	Depressive symptoms	10.29	0.35	<0.001		
2	Perceived control	-0.55	-0.11	0.003	<0.001	0.55

Note. NYHA=New York Heart Association; HF= Heart Failure

p-value and estimates of independent variables in the table were from the final model (Model 2).