Jordan Journal of Nursing Research

Journal homepage: https://jjnr.just.edu.jo/jjnr/

The Role of Psychological Flexibility in Heart Failure: Structural Equation Model Analysis

Mohammed Munther Al-Hammouri, RN, IBA, CHPE, PhD [1*]; Jehad A. Rababah, RN, PhD [2]; Yousef S. Khader, BDS, MSc, MSPH, MHPE, FFPH, ScD [3]; Lynne A. Hall, RN, DrPH [4]; Debra K. Moser, RN, FAAN, PhD [5]; Wafa'a F. Ta'an, RN, PhD [6]; Nihaya Al-sheyab, PhD [7]; Tareq L. Mukattash, BPharmSc, PhD [8]; Samah F. Al-Shatnawi, Pharm.D., PhD [9]; Othman A. Alfuqaha, RN, PhD [10]; Michael L. Rowland, PhD [11]

*1 Community and Mental Health Nursing Department, Faculty of Nursing, Jordan University of Science & Technology, Irbid, Jordan. * Corresponding Author: Email: mmalhammouri@just.edu.jo*
2 Adult Health Nursing Department, Faculty of Nursing, Jordan University of Science & Technology, Irbid, Jordan.
3 Dist. Prof. of Epidemiology, Medical Education and Biostatistics, Jordan University of Science & Technology, Irbid, Jordan.
4 Associate Dean of Research, School of Nursing, University of Louisville, 555 South Floyd Street, Louisville, KY 40202.
5 Professor and Linda C. Gill Chair of Cardiovascular Nursing, Assistant Dean for the PhD Program and Scholarly Affairs, Director, RICH Heart Program, University of Kentucky, College of Nursing, 2201 Regency Rd, Suite 403, Lexington, KY 40503.
6 Associate Professor, Community and Mental Health Nursing Department, Faculty of Nursing, Jordan University of Science & Technology, Irbid, Jordan.
7 Dean of Applied Medical Sciences, Professor of Child and Adolescent Health, Adjunct Professor at the Faculty of Nursing, Jordan University of Science and Technology, Irbid, Jordan.
8 Faculty of Pharmacy, Deanship of Research-Dean, Jordan University of Science and Technology, Irbid, Jordan.
9 Assistant Professor, Department of Clinical Pharmacy, Faculty of Pharmacy, Jordan University of Science and Technology, Irbid, Jordan.
10 Department of Nursing, Jordan University Hospital, The University of Jordan, Amman, Jordan.
11 Associate Dean, Faculty Development, College of Medicine, University of Kentucky, Lexington, Kentucky 40536.

ARTICLE INFO

Article History:
Received: April 5, 2022
Accepted: May 10, 2022

ABSTRACT

Background: The Acceptance and Commitment Therapy Model has gained empirical support, with limited evidence on the role of psychological flexibility in persons with heart failure. ***Objective*:** To examine the role of psychological flexibility in persons with heart failure. ***Methods*:** A total of 172 persons with heart failure from three major referral hospitals participated in the study. A proposed model based on the acceptance and commitment therapy was tested. ***Results*:** The results showed that the path between psychological flexibility and emotional outcomes is statistically significant. Psychological flexibility explained 52% of the variance. On the other hand, the path between psychological flexibility and behavioral outcomes was not significant**.** ***Conclusions***: This study suggests that psychological flexibility plays a significant role in determining emotional outcomes in persons with heart failure. ***Implications to Nursing***: Nurses need to assess persons with compromised psychological flexibility as a predictor of adverse emotional outcomes. Targeting psychological flexibility may improve stress and depression in persons with heart failure.

Keywords: Psychological flexibility, Heart failure, Acceptance and commitment therapy, Depression, Stress.

What does this paper add?

1. This is the first study to examine the role of psychological flexibility in persons with heart failure.
2. Psychological flexibility is considered as a predictor of adverse emotional outcomes.
3. Nurses need to target these persons through specific interventions to promote psychological flexibility.

Introduction

Heart failure is a chronic illness characterized by the heart's inability to function appropriately and pump enough blood into the body. The disease process of heart failure involves a compensation mechanism that worsens the heart's condition. Consequently, persons with heart failure suffer a progressive decline in their ability to carry out their daily activities. The progression is dependent on the person's compliance with the planned self-care activities (Al-Hammouri et al., 2020b). To avoid serious complications, such as hospitalizations and early mortality, persons with heart failure must identify and respond promptly to the signs of exacerbations (Lopez et al., 2020). Despite the extensive research on heart failure, much is still to be explored for an in-depth understanding and control of the disease process and poor self-care in persons with heart failure (Fetensa et al., 2021). The ACT model may add more insight into heart failure's behavioral and emotional outcomes.

The ACT model presents psychological flexibility as a complex psychological variable that results from a set of psychological processes and it has been associated with individuals' engagement in adaptive behaviors (Al-Hammouri et al., 2020a; Davis et al., 2020; Glosteret et al., 2017). Psychological flexibility is the central concept in the Acceptance and Commitment Therapy (ACT) model (Hayes et al., 2011). Hayes et al. proposed the ACT model to suggest the psychological process that underlies human adaptive behaviors and it is considered a model that offers psychological interventions for maladaptive behaviors (Hayes et al., 2011). The following explanation of the model is based on Hayes et al. (2011) description of the ACT model.

According to Hayes et al. (2011), psychological flexibility is a central concept determining a person's tendency to engage in maladaptive behaviors. Psychological flexibility is a product of three response styles. These response styles are open, centered and engaged response styles, with two psychological processes under each response style. The psychological processes under the open response style are acceptance and diffusion. These psychological processes deal with individuals' tendency to engage in adaptive behaviors by solving experiential avoidance and cognitive fusions. Experiential avoidance refers to avoiding new experiences due to the inability to deal with the emotions associated with them, even if they are perceived to be adaptive in dealing with the current behavioral problems. Cognitive fusion refers to the effect of language and words on our behaviors.

The psychological processes under the centered response style are the present moment and self as a context, such as being mindful of the current moment (Hayes et al., 2011). The present moment process refers to the individual's ability to focus on events in the current moment and the emotions associated with them. Self as a context refers to the individual's ability to reconsider personal experience from different perspectives of self, time and place. Under the engaged response style, the psychological processes are values and committed actions (Hayes et al., 2011). Values focus on higher-order verbal rules and beliefs that may facilitate the individual's ability to engage in adaptive behaviors. Committed actions refer to the individual's ability to engage in value-driven behaviors. Through its central psychological flexibility concept, the current study examined how these response styles affect health-related behaviors and outcomes in persons with heart failure. Despite the growing evidence on the ACT model, the model's potential for health-related behavioral and emotional issues in chronic illnesses, such as heart failure, is minimal.

Behavioral outcomes refer to the disease outcomes manifested in a person's life and daily activities, such as hospitalizations and compliance with the prescribed regimen. Hospitalizations are considered critical events that represent a high-risk period for other clinical outcomes, including recurrent hospitalizations and death (Sano & Majima, 2018; Vaduganathan et al., 2020). Recurrent hospitalizations contribute to higher healthcare services and costs (Vaduganathan et al., 2020). Compliance has been associated with lower hospitalization expenses (Fu et al., 2020). Compliance in persons with heart failure can prevent complications, improve quality of life and minimize hospitalizations (Sen et al., 2020).

Emotional outcomes refer to the emotional impact of the disease on persons with heart failure. Generally, older adults suffer from severe stress and depression (Kim et al., 2017). However, heart failure complicates such emotional and psychological conditions (Al-Hammouri et al., 2020b). Depression has been reported as the most prevalent mental-health illness among older adults affecting self-care behavior (Smith et al., 2020; Yazew et al., 2019). Specifically, the literature shows

that most persons with heart failure suffer from mild to severe depression (Al-Hammouri et al., 2020b). Depression has been associated with adverse health outcomes, such as all-cause recurrent hospitalizations, poor quality of life and higher morbidity and mortality in persons with heart failure and post-stroke populations (Lau et al., 2012; Patel et al., 2020).

Persons with heart failure reported higher stress levels than the general population (Al-Hammouri et al., 2020a). Similarly, depression predicted the level of compliance and recurrent hospitalizations in persons with heart failure (Hiriscau & Bodolea, 2019; Patel et al., 2020) and was also associated with the level of independence in the daily activity living and suicidal thought in older adults (Lee et al., 2020). Stress has been associated with low functional status in persons with heart failure (Endrighi et al., 2019). Stress has been shown to be associated with low hemodynamic function, compliance with diet and medication, hospitalizations and self-care behavior (Endrighi et al., 2019). Besides, it has been shown that stress can predict compliance and hospitalizations in persons with heart failure (Endrighi et al., 2019). Stress and depression have been studied concerning various psychological factors, but not psychological flexibility (Provencher, 2007). The ACT model guided the study model by incorporating cognitive fusion, mindfulness and committed action from the three response styles; open, centered and engaged response styles. The model suggests that these three variables form a latent variable representing psychological flexibility (see Figure 1). Then, two latent variables were proposed to represent behavioral and emotional outcomes. Behavioral outcomes are represented by three observable variables; all-cause admissions, admissions due to heart failure and compliance with the treatment. Emotional outcomes are represented by stress and depression. Thus, the current study aimed to examine the role of psychological flexibility in behavioral and emotional outcomes in persons with heart failure in light of the ACT model.

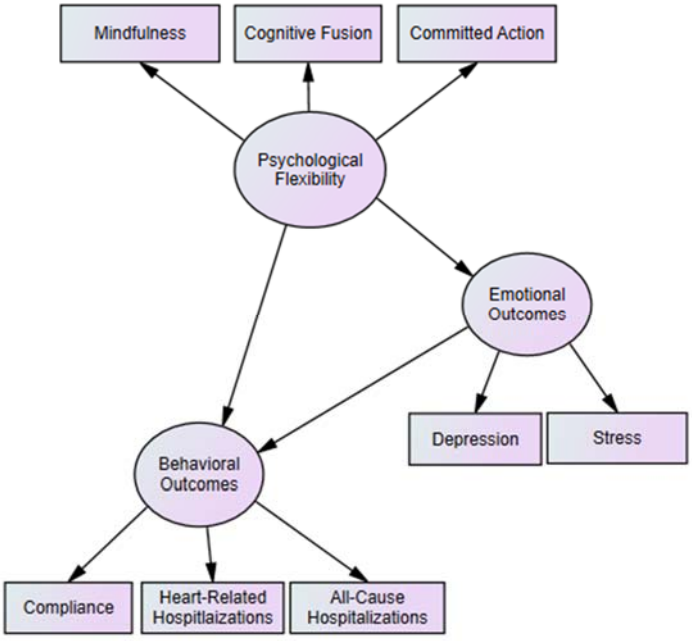

Figure 1. Conceptual model of the current study

Methods

Study Design

This study is an exploratory cross-sectional study. This design is considered helpful in providing information about a certain phenomenon before planning more complicated studies requiring more effort, time and financial resources (Setia, 2016), which fits the purpose of the current study.

Sample

Purposive sampling was used in this study. The inclusion criteria were being diagnosed with heart failure, being 18 years old or older and the absence of any memory problems. Purposive sampling was mainly used to exclude those with memory problems. Questions were asked about past events that extend to the previous year and are associated with memory issues that will

affect the validity of such data. We collected data from eligible participants who were admitted to three major referral hospitals in northern Jordan. Structural Equation Modeling (SEM) with Maximum Likelihood Estimation (MLE) was conducted. A 100-400-participant sample size is recommended when MLE is used (Hair et al., 2014). A smaller sample size of less than 100 negatively impacts the results' validity, whereas samples of more than 400 participants can result in poor goodness-of-fit indices (Hair et al., 2014). The data was planned to be collected between March and August 2021. By the end of August 2021, we had a total of 172 participants.

Data Collection

Data in this study was collected using self-report measures using a paper-and-pencil format. A trained research assistant collected the data from the participants. The research assistant holds a Master's degree and has extensive experience in similar research projects. The research assistant contacted eligible persons with heart failure and invited them to participate in the study. Some behavioral measures (i.e., all-cause and heart-related hospitalizations) were collected directly from participants' health records. The Institutional Review Board (IRB) approval was obtained from the institutions where the study was carried out. All participants completed and signed the informed consent prior to filling out the study questionnaires. The study questionnaires were administered in Arabic. Participants were informed that they could withdraw from the study without penalties. We replaced participants' names with serial numbers and kept data in a physically secured place to ensure confidentiality. The data was planned to be collected between March and August 2021.

Measurements

Psychological Flexibility

Psychological flexibility was evaluated using three variables from the ACT model. These variables are cognitive fusion, committed action and mindfulness. Cognitive fusion was assessed using a Cognitive Fusion Questionnaire (CFQ). CFQ consists of seven items with a 7-point Likert-like response scale ranging from 1 "never true" to 7 "always true". The possible cumulative score of the CFQ ranges from 7 to 49. (Gillanders et al., 2014). A higher CFQ score indicates a higher cognitive fusion level (Ruiz et al., 2017). The CFQ showed sufficient psychometric properties. For example, Cronbach's α reported for CFQ for the different translations of the CFQ ranged between 0.87 and 0.93 (Gillanders et al., 2014; Romero-Moreno et al., 2014, Solé et al., 2016). The Cronbach's α of the CFQ in this study was 0.89.

Mindfulness was assessed by the Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003). The MAAS consists of 15 items about a respondent's everyday experience with a 6-point Likert-like response scale ranging from 1 to 6 (from "almost always" to "almost never") (McCracken & Yang, 2008). The MAAS score is calculated by taking the mean average of the 15 items, with higher scores indicating higher dispositional mindfulness. MAAS Cronbach's alpha value was reported to be above 0.80 (McCracken & Yang, 2008). The Cronbach's α of the MAAS in the current study was 0.87.

Committed action was assessed by using the Committed Action Questionnaire, 8-item version (CAQ-8) (McCracken et al., 2015). The CAQ consists of 8 items using a 7-point Likert-like scale ranging from 0 "never true" to "always true". The higher CAQ score indicates a higher commitment to the respondent's action. The CAQ-8 showed sufficient psychometrics with Cronbach's α of 0.87 (McCracken et al., 2015). The Cronbach's α of the CAQ in the current study was 0.72.

Behavioral Measures

In this study, behavioral measures were the previous year's all-cause hospitalizations, the previous year's heart-related hospitalizations and compliance. Last year's heart-related and all-cause hospitalizations' measures were taken from the participants' health records. All-cause hospitalizations included all hospitalizations in the previous year, regardless of the reason for admission. Heart-related hospitalizations included any hospitalization directly associated with heart failure or its exacerbations in the last year. The last-year hospitalization is the most frequently used time frame for assessing hospitalizations in persons with heart failure (Abel et al., 2021; Madelaire et al., 2019). Noncompliance was measured by a 4-point Likert-like scale ranging from 1 (very compliant) to 4 (not complaint at all). The participant's compliance was about how the participant complied with the cardiac specialist's prescribed treatment regimen.

Emotional Variables

Emotional variables in this study included perceived stress and depression in persons with heart failure. Perceived stress was assessed by the Perceived Stress Scale-10 (PSS) (Lee et al., 2011). The PSS-10 is a 10-item measure with 5-point Likert-like response options from 0 to 4 (from "never" to "very often"). The total score of the PSS-10 ranges from 0 to 40, with higher scores indicating higher levels of perceived stress. According to Lee (2012), test-retest reliability for PSS-10 was acceptable across 4 major studies (Lee, 2012). The Cronbach's α of the PSS-10 in the current study was 0.76.

Depression was measured using the Patient Health Questionnaire–9 (PHQ-9) (Kroenke et al., 2001). The PHQ-9 consists of 9 items about the frequency of depressive symptoms that patients suffered from within the last two weeks. The PHQ-9 questions are rated on 4-point Likert-like response options from 0 to 3 (from "not at all" to "nearly every day"). A higher PHQ-9 score indicates a higher level of depressive symptoms. The psychometrics of PHQ-9 showed that it has sufficient internal consistency with Cronbach's α of 0.83 (Kroenke et al., 2001). The Cronbach's α of the PHQ-9 in the current study was 0.84.

Data Analysis

We used the Statistical Package for Social Sciences (SPSS), version 23 and Analysis of Moment Structures (AMOS), version 23, to perform the analyses in the current study. Initially, data management was applied to address any issues with missing data and relevant assumptions. We used SPSS for descriptive data analysis and estimation of internal consistencies of the study instruments. We performed Structural Equation Modeling (SEM) with Maximum Likelihood Estimation, which involved two phases. We performed a pooled Confirmatory Factor Analysis (CFA) to assess the proposed measurement model's appropriateness in the first phase. We performed the CFA to evaluate the validity and measurement model's factor structure parameters. In this phase, we entered all latent constructs into the analysis to test them simultaneously within the proposed model. The measurement model parameters and criteria are discussed in the "Results" section of this paper. We used pooled CFA in this study for two main reasons. First, assessing the whole model structure is always better than examining separate constructs' factor structures. Second, examining the CFA for individual construct cannot be accomplished by any single study.

In the next phase, we tested the SEM pathways of the structural model. We examined the direct effect of psychological flexibility on emotional and behavioral outcomes. In the current study, the interpretation of the results was not only based on the Chi-square values. We did that because Chi-square is a sample size-sensitive statistic (Hair et al., 2014). Hair et al. recommended evaluating the model fitness using at least one fit index from the absolute fit, incremental fit and parsimonious fit model fitness categories (Hair et al., 2014). Thus, we set the following model fitness indices *a priori* for analysis presentation and interpretation. The Comparative Fit Index (CFI), from the incremental fit, was set to be higher than 0.95. From the absolute fit category, the Root Mean Square of Error Approximation (RMSEA) was set to be lower than 0.07. Finally, the Chi-square/Degrees of Freedom, from the parsimonious fit category (Chisq/df) was lower than 5. The values of RMSEA and CFI were set based on the number of observed variables in the proposed model and the sample size of the current study (Hair et al., 2014). We also assessed and interpreted the standardized regression weights (β) during this analysis phase of this study.

Results

We recruited 172 persons with heart failure in the current study. Our sample's average age was 58.9 (SD = 11.33), ranging between 31 and 87 years. Participants' demographic characteristics are summarized in Table 1.

Pooled CFA Measurement Model

We initially assessed the factor structure of the measurement model. Discriminant validity was evaluated using the correlations between the study's proposed model's constructs, with lower correlations indicative of discriminant validity (Hair et al., 2014). The results showed that the following inter-construct correlations were low: psychological flexibility-behavioral outcomes and emotional outcomes-behavioral outcomes (-0.20 and -0.29, respectively) (Table 2). The correlation between the constructs of psychological flexibility and emotional outcomes was not low. The squared root Average Variance Extracted (AVE) for each construct was assessed and evaluated against the inter-construct correlations to further assess discriminant validity. To support the discriminant validity, the squared root AVE of the individual

construct must be higher than the inter-construct correlation with any other construct in the proposed model in the study (Hair et al., 2014). The results supported the discriminant validity (see Table 2). The squared root AVE value for the construct psychological flexibility was lower than the construct's correlation with emotional outcomes: (0.30 and 0.53), respectively.

Table 1. Sample demographics (*N* = 172)

Variable		***n***	**~%**
Smoking	Yes	66	38
	No	106	62
Education	< high school	38	22
	High-school diploma	36	21
	Vocational or some college	63	36.6
	≥ College	35	20.4
Gender	Female	64	37
	Male	108	63
		Mean	SD
Mindfulness		3.92	0.92
Cognitive Fusion		20.75	9.75
Committed Action		27.60	7.11
Depression		13.70	6.23
Stress		19.97	6.24
None Compliance		2.52	0.60
Heart-related Hospitalization		2.00	0.35
All-cause Hospitalization		2.23	0.52

Table 2. Reliability and validity of the measurement model

	Psychological Flexibility	**Behavioral Outcomes**	**Emotional Outcomes**	**AVE**
Psychological Flexibility	**0.55**			0.30
Behavioral Outcomes	-0.20	**0.79**		0.62
Emotional outcomes	-0.72	-0.29	**0.73**	0.53

AVE, Average Variance Extracted.

The measurement model showed acceptable fit indices from all three goodness –of-fit categories (RMSEA = 0.057, CFI = 0.979 and Chisq/df = 1.56). Thus, we moved forward and conducted the SEM as planned. The measurement model, its reliability and validity, standardized factor loadings and explained variance (R^2) are presented in Figure 2.

Structural Model

The SEM analysis showed that the goodness -of-fit indices met the criteria set *a priori* sent for this study (RMSEA = 0.057, CFI = 0.98 and Chisq/df = 1.56 (df = 17)). Figure 3 summarizes the model with its fit indices and the other parameters. In this model, the R^2 value of the emotional outcomes construct was 0.52, meaning that psychological flexibility explained 52 percent of the variance in emotional outcomes. Regarding behavioral outcomes, the R^2 value was 0.08.

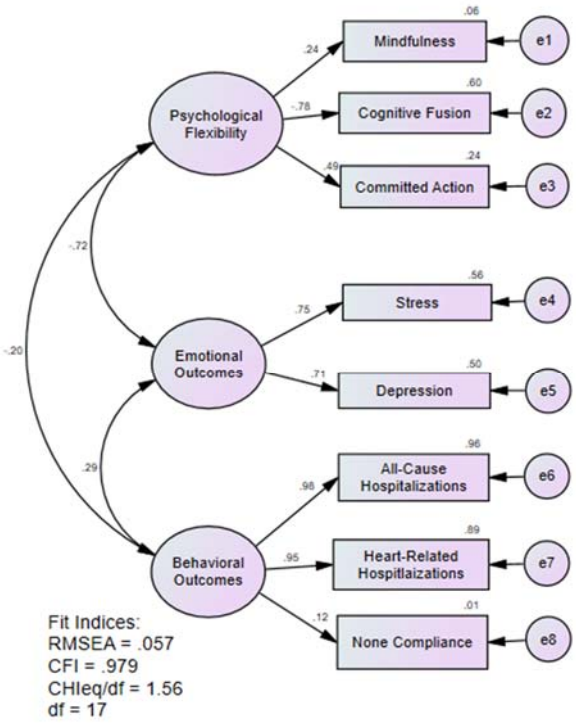

Figure 2. Summary of measurement model fitness, reliability and validity

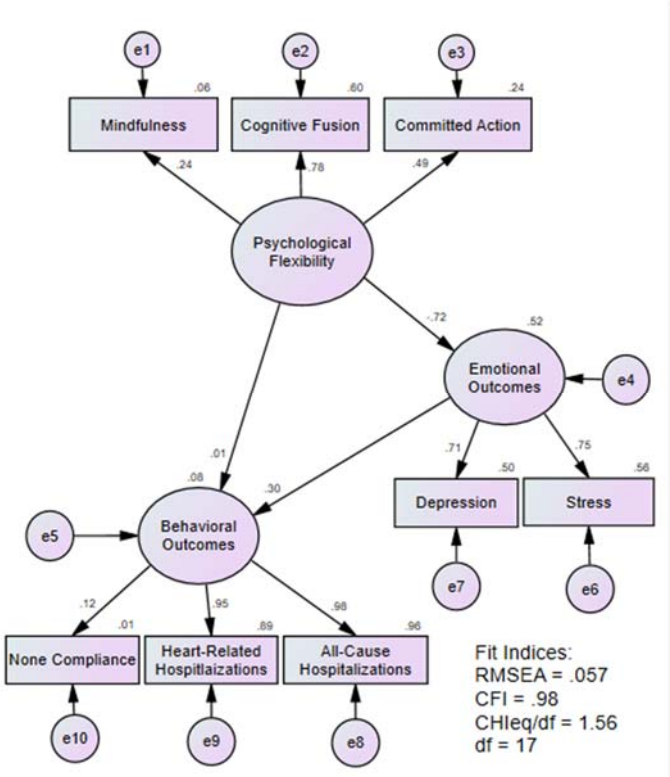

Figure 3. SEM model

Standardized Regression Weights (β)

The β value regarding psychological flexibility on the emotional outcomes was statistically significant ($p < 0.001$). The value of β was -0.72. The β value indicates that one standard deviation change in psychological flexibility resulted in a 0.72 standard

deviation change in the emotional outcomes (see Table 3). However, that was not the case for the effect of psychological flexibility on behavioral outcomes.

Table 3. Standardized regression weights (β)

Path	β	S.E.	C.R.
Emotional Outcomes ←Psychological Flexibility	-0.72**	0.22	-4.41
Behaviorl Outcomes ← Psychological Flexibility	0.01	0.00	0.07

** $p < 0.001$
Abbreviations: S.E.: Standard Error; C.R.: Critical Ratio; β: Standardized Regression Weight.

Discussion

The authors intended to examine the role of psychological flexibility in these domains to bring a new perspective to this research area in persons with chronic illnesses. The results indicated that the measurement model and its factor structure were sufficient. Then, the structural model was evaluated, where the findings supported the model fit indices. The structural model results showed that psychological flexibility had a statistically significant negative effect on emotional outcomes under investigation, but not on behavioral outcomes.

Perceived stress and depression, as emotional outcomes, are among the many emotional outcomes often experienced by persons with heart failure. The literature shows that such emotional outcomes negatively affect persons with heart failure, their overall health and their health-related behaviors (Al-Hammouri et al., 2020b; Cotter & Kelly, 2018). Thus, the present study showed that psychological flexibility could be used to minimize the risk of emotional outcomes in persons with heart failure. In other words, improving psychological flexibility may result in better emotional outcomes, evidenced by a negative association between psychological flexibility and emotional outcomes.

On the other hand, the path between psychological flexibility and behavioral outcomes was not significant. This result was not consistent with our expectations. However, this issue will remain open for further studies to elaborate on the current model, as discussed in the following parts. These outcomes could be attributed to several factors, such as the variables used to measure behavioral outcomes. So we may need to consider other measurable behavioral outcomes, such as compliance with medication, compliance with diet and exercise.

The present study's results were consistent with those of previous studies on other populations, showing a negative association between psychological flexibility and stress (Wersebe et al., 2018) and depression (Almarzooqi et al., 2017) in the general population and persons suffering from migraine, respectively. On the contrary, the current study was inconsistent with previous studies showing a significant association between psychological flexibility and behavioral outcomes, such as compliance with the prescribed treatment (Moitra & Gaudiano, 2016).

The ACT model was previously used to study the relationship between committed action and self-care behavior in persons with heart failure, moderated by cognitive fusion and mindfulness (Al-Hammouir et al., 2020). Although both studies used the ACT model as a guiding model, the current study examined different aspects of heart failure health-related outcomes from a different perspective. Both studies provided evidence to support the usefulness of the ACT model in explaining various aspects of health-related outcomes and behaviors in persons with heart failure.

Study Limitations and Future Research

The results of the present study must be read with caution, considering the study's limitations. This study was carried out in a single country; thus, the generalizability of the results is limited to the setting and population of the current study sample. A cross-sectional design was used in the present study. Employing other research designs, such as longitudinal research design, will improve the robustness of the findings. Nonprobability sampling employed in this study limits the generalizability of the current study's findings. In addition, the sample consisted of persons with heart failure in the inpatient setting. Thus, the study must be replicated in other settings to generalize the

current study's findings.

The present study showed that psychological flexibility could affect emotional outcomes, which, in turn, was demonstrated to affect other health outcomes as it was supported by previous studies (Al-Hammouri et al., 2020b). The current research results are best validated by studying ACT-based intervention in persons with heart failure.

The present study supports the role of psychological flexibility in the emotional outcomes in persons with heart failure. Future exploratory and interventional research studies are warranted and future research incorporating other potential emotional and behavioral outcomes' indicators is also warranted. Incorporating other health domains, such as physical health and cognitive outcomes, is crucial in providing in-depth insights considering the potential impact of psychological flexibility in persons with heart-failure health. We used an SEM analysis to examine the effect of psychological flexibility on persons with heart failure's behavioral and emotional outcomes. There is a need to integrate other potential mediators and/or moderators to improve the prediction power of emotional and behavioral outcomes in persons with heart failure. Examples include individuals' age, gender, functional status or other behavioral and emotional outcomes' indicators for a more comprehensive and in-depth understanding of chronic illnesses. Besides, replicating the current study with samples from different countries of various cultural and socio-demographic backgrounds should be considered to generalize the results.

Conclusions

This study showed that psychological flexibility mitigates specific heart-failure health outcomes, perceived stress and depression (i.e., emotional outcomes). These results of the current study add insights to the existing literature on chronic illness, emotional outcomes and behavioral outcomes. The present study also provides future research ideas to improve the current study findings' generalizability and improve the proposed model. The current study's results supported the conceptual model; however, other health domains should be added, modified and tested. Expanding the present study's model could play an essential role in improving health promotion interventions implemented specifically for persons with heart failure. Thus, the findings of the current study shed light on the importance of the ACT model in planning a long-lasting behavioral change by nurses as they plan the care for their patients; or at least, nurses can refer them to specialized psychiatrists and psychologists who are experts in the implementation of acceptance and commitment training.

Relevance to Clinical Practice

Heart failure is a chronic illness that is progressive in nature. Persons with heart failure suffer several adverse behavioral and emotional outcomes (such as stress and depression) that affect their lives. Persons with heart failure show higher levels of stress and depression than their healthy counterparts. Several studies have examined these adverse emotional outcomes in persons with heart failure, but more is still to be known about predicting and controlling these adverse outcomes. For the first time, our findings shed light on the role of psychological flexibility in emotional outcomes affecting persons with heart failure, but, unfortunately, not behavioral outcomes, such as hospitalizations and compliance. Thus, nurses will be able to target psychological flexibility to improve heart failure emotional outcomes (i.e., stress and depression).

Identifying persons at risk through screening upon admission or regular healthcare follow-up visits is recommended. Nurses need to assess persons with compromised psychological flexibility as a predictor of adverse emotional outcomes, as these emotional outcomes were associated with poor quality of life, higher morbidity, higher mortality, fatigue and poor functional status (Lau et al., 2012; Patel et al., 2020; Tang et al., 2010). After identifying persons with heart failure who are at higher risk for adverse emotional outcomes, nurses can target them through interventions that have been shown to promote psychological flexibility through acceptance and commitment training that has been shown to be effective with other populations (Zhang et al., 2018).

In addition, the current study supports the previous literature concerning the pragmatic utility of the ACT model (Zhang et al., 2018). The ACT model was recommended as a context-driven model to be used by practitioners to design and implement behavioral change interventions (Zhang et al., 2018).

Acknowledgment

The authors are thankful to Jordan University of Science and Technology and the Deanship of Scientific Research for supporting this research.

Funding Information

The study received no financial support from any source.

Conflict of Interest

All authors declare no conflict of interest.

REFERENCES

Abel, A., Samuel, N., Cuthbert, J., Kazmi, S., Cleland, J., & Clark, A. (2021). 120 hospital admissions in the last year of life in patients with heart failure. *Heart*, *107*, A90-A91. https://heart.bmj.com/content/107/Suppl_1/A90.2.

Al-Hammouri, M.M., Rababah, J.A., & Aldalaykeh, M. (2020a). Exploring the potential of acceptance and commitment therapy model in self-care behaviour in persons with heart failure. *Nursing Open*, *7* (5), 1560-1567. https://doi.org/10.1002/nop2.538

Al-Hammouri, M.M., Rababah, J.A., Hall, L.A., Moser, D.K., Dawood, Z., & Alawawdeh, A. (2020b). Self-care behavior: A new insight into the role of impulsivity in decision-making process in persons with heart failure. *BMC Cardiovascular Disorders, 20*, 1-8. https://doi.org/10.1186/s12872-020-01617-8

Almarzooqi, S., Chilcot, J., & McCracken, L.M. (2017). The role of psychological flexibility in migraine headache impact and depression. *Journal of Contextual Behavioral Science*, *6* (2), 239-243. https://doi.org/10.1016/j.jcbs.2017.04.004

Brown, K.W., & Ryan, R.M. (2003). The benefits of being present: Mindfulness and its role in psychological wellbeing. *Journal of Personality and Social Psychology*, *84* (4), 822-848. https://doi.org/10.1037/0022-3514.84.4. 822

Cotter, E.W., & Kelly, N.R. (2018). Stress-related eating, mindfulness and obesity. *Health Psychology*, *37* (6), 516-525. https://doi.org/10.1037/hea0000614

Davis, A.K., Barrett, F.S., & Griffiths, R.R. (2020). Psychological flexibility mediates the relations between acute psychedelic effects and subjective decreases in depression and anxiety. *Journal of Contextual Behavioral Science, 15*, 39-45. https://doi.org/10.1016/j.jcbs.2019.11.004

Endrighi, R., Dimond, A. J., Waters, A. J., Dimond, C. C., Harris, K. M., Gottlieb, S. S., & Krantz, D. S. (2019). Associations of perceived stress and state anger with symptom burden and functional status in patients with heart failure. *Psychology & Health, 34*, 1250-1266. https://doi.org/10.1080/08870446.2019.1609676

Fetensa, G., Fekadu, G., Turi, E., Tolossa, T., Wakuma, B., Etefa, W., Habye, A., Yadecha, B., & Bekele, F. (2021). Self-care behaviour and associated factors among chronic heart-failure clients on follow-up at selected hospitals of Wollega zones, Ethiopia. *International Journal of Africa Nursing Sciences*, *15*, 100355. https://doi.org/10.1016/j.ijans.2021.100355

Fu, R., Feng, S., Wu, Y., He, F., Lin, Z., Jiang, Y., & Hu, Z. (2020). Association between compliance with quality indicators and hospitalisation expenses in patients with heart failure: A retrospective study using quantile regression model in China. *BMJ Open, 10*, e033926. http://dx.doi.org/10.1136/bmjopen-2019-033926

Gillanders, D.T., Bolderston, H., Bond, F.W., Dempster, M., Flaxman, P.E., Campbell, L., Kerr, S., Tansey, L., Noel, P., Ferebach, C., Masley, S., Roach, L., LIoyd, J., May, L., Clarke, S., & Remington, B. (2014). The development and initial validation of the cognitive fusion questionnaire. *Behavior Therapy*, *45*, 83-101. https://doi.org/10.1016/j.beth.2013.09.001

Gloster, A.T., Meyer, A.H., & Lieb, R. (2017). Psycholiogical flexibility as a malleable public-health target: Evidence from a representative sample. *Journal of Contextual Behavioral Science, 6*, 166-171. https://doi.org/10.1016/j.jcbs.2017.02.003

Hair, J.F., Black, W.C., Babin, B.J., & Anderson, R.E. (2014). *Multivariate data analysis*. Pearson new international edition.

Hayes, S.C., Strosahl, K.D., & Wilson, K.G. (2011). *Acceptance and commitment therapy: The process and practice of mindful change*. Guilford Press.

Hiriscau, E.I., & Bodolea, C. (2019). The role of depression and anxiety in frail patients with heart failure. *Diseases, 7*, 45. https://doi.org/10.3390/diseases7020045

Kim, Y.S., Lee, H.Y., Lee, M.H., Simms, T., & Park, B.H.

(2017). Mental-health literacy in Korean older adults: A cross-sectional survey. *Journal of Psychiatric and Mental Health Nursing, 24*, 523-533. https://doi.org/10.1111/jpm.12395

Kroenke, K., Spitzer, R.L., & Williams, J.B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*, 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Lau, C.G., Tang, W.K., Wong, K.S., Mok, V., & Ungvari, G.S. (2012). Predictors of the depressive symptomatology of the family caregivers of Chinese stroke patients in Hong Kong. *Journal of Psychiatric and Mental Health Nursing, 19*, 285-293. https://doi.org/10.1111/j.1365-2850.2011.01782.x

Lee, C.C., Tseng, H.C., Wu, L.P., & Chuang, Y.H. (2020). Multiple brief-training sessions to improve nurses' knowledge, attitudes and confidence regarding nursing care of older adults with depression in long-term care facilities. *Research in Nursing & Health, 43*, 114-121. https://doi.org/10.1002/nur.21997

Lee, E.H. (2012). Review of the psychometric evidence of the perceived stress scale. *Asian Nursing Research, 6*, 121-127. https://doi.org/10.1016/j.anr.2012.08.004

Lee, E.Y., Mun, M.S., Lee, S.H., & Cho, H.S.M. (2011). Perceived stress and gastrointestinal symptoms in nursing students in Korea: A cross-sectional survey. *BMC Nursing, 10*, 22. https://doi.org/10.1186/1472-6955-10-22

Lopez, K.D., Chae, S., Michele, G., Fraczkowski, D., Habibi, P., Chattopadhyay, D., & Donevant, S.B. (2020). Improved readability and functions needed for health apps targeting patients with heart failure: An app-store review. *Research in Nursing & Health,* 1-10. https://doi.org/10.1002/nur.22078

Madelaire, C., Gustafsson, F., Kristensen, S.L., D'Souza, M., Stevenson, L.W., Kober, L., Torp-Pedersen, C., Gislason, G., & Schou, M. (2019). Burdens and causes of hospital admissions in heart failure during the last year of life. *JACC: Heart Failure*, *7* (7), 561-570. https://doi.org/10.1016/j.jchf.2019. 03.018

McCracken, L.M., & Yang, S.Y. (2008). A contextual cognitive-behavioural analysis of rehabilitation workers' health and well-being: Influences of acceptance, mindfulness and values-based action. *Rehabilitation Psychology, 53*, 479. https://doi.org/10.1037/a0012854

McCracken, L.M., Chilcot, J., & Norton, S. (2015). Further development in the assessment of psychological flexibility: A shortened committed action questionnaire (CAQ-8). *European Journal of Pain*, *19*, 677-685. https://doi.org/10.1002/ejp.589

Moitra, E., & Gaudiano, B.A. (2016). A psychological flexibility model of medication adherence in psychotic-spectrum disorders. *Journal of Contextual Behavioral Science, 5*, 252-257.

Patel, N., Chakraborty, S., Bandyopadhyay, D., Amgai, B., Hajra, A., Atti, V., Das, A., Ghosh, R.K., Deedwania P. C., Aronow, W.S., Lavie, C.J., Di Tullio, M.R., Vaduganathan, M., & Lavie, C. J. (2020). Association between depression and readmission of heart failure: A national representative database study. *Progress in Cardiovascular Diseases, 63* (5), 585-590. https://doi.org/10.1016/j. pcad.2020.03.014

Provencher, H.L. (2007). Role of psychological factors in studying recovery from a transactional stress-coping approach: Implications for mental-health nursing practices. *International Journal of Mental Health Nursing, 16*, 188-197. https://doi.org/10.1111/j.1447-0349.2007.00466.x

Romero-Moreno, R., Márquez-González, M., Losada, A., Gillanders, D.T., & Fernández- Fernández, V. (2014). Cognitive fusion in dementia caregiving: Psychometric properties of the Spanish version of the cognitive fusion questionnaire. *Behavioral Psychology*, *22*, 117-132.

Ruiz, F.J., Suárez-Falcón, J.C., Riano-Hernández, D., & Gillanders, D. (2017). Psychometric properties of the cognitive fusion questionnaire in Colombia. *Revista Latinoamericana de Psicología*, *49*, 80-87. https://doi.org/10.1016/j.rlp.2016.09.006

Sano, M., & Majima, T. (2018). Self-management of congestive heart failure among elderly men in Japan. *International Journal of Nursing Practice*, *24*, e12653. https://doi.org/10.1111/ijn.12653

Sen, H.T.N., Linh, T.T.T., & Trang, D.T.K. (2020). Factors related to treatment compliance among patients with heart failure. *Ramathibodi Medical Journal, 43*, 30-40. https://doi.org/10.33165/rmj.2020.43.2.239889

Setia, M.S. (2016). Methodology series-module 3: Cross-sectional studies. *Indian Journal of Dermatology*, *61* (3), 261. https://doi.org/10.4103/0019-5154.182410

Smith, M., Dietrich, B.J., Bai, E.-W., & Bockholt, H.J. (2020), Vocal-pattern detection of depression among older adults. *International Journal of Mental Health Nursing*, *29*, 440-449. https://doi.org/10.1111/inm. 12678

Solé, E., Tomé-Pires, C., de la Vega, R., Racine, M.,

Castarlenas, E., Jensen, M.P., & Miró, J. (2016). Cognitive fusion and pain experience in young people. *The Clinical Journal of Pain*, *32*, 602-608. https://doi.org/10.1097/AJP.0000000000000227

Tang, W.R., Yu, C.Y., & Yeh, S.J. (2010). Fatigue and its related factors in patients with chronic heart failure. *Journal of Clinical Nursing*, *19*, 69-78. https://doi.org/10.1111/j.1365-2702.2009.02959.x

Vaduganathan, M., Claggett, B.L., Desai, A.S., Anker, S.D., Perrone, S.V., Janssens, S., Milicic, D., Arango, J.L., Packer, M., Shi, V.C., Lefkowitz, M.P., McMurray, J. J. V., & Solomon, S. D. (2020). Prior heart failure hospitalization, clinical outcomes and response to sacubitril/valsartan compared with valsartan in HFpEF. *Journal of the American College of Cardiology, 75*, 245-254. https://doi.org/10.1016/j.jacc.2019.11.003

Wersebe, H., Lieb, R., Meyer, A.H., Hofer, P., & Gloster, A.T. (2018). The link between stress, well-being and psychological flexibility during an acceptance and commitment therapy self-help intervention. *International Journal of Clinical and Health Psychology, 18*, 60-68. https://doi.org/10.1016/j.ijchp.2017.09.002

Yazew, K.G., Salih, M.H., & Beshah, D.T. (2019). Self-care behavior and associated factors among adults with heart failure at cardiac follow-up clinics in West Amhara region referral hospitals, northwest Ethiopia, 2017. *International Journal of Africa Nursing Sciences*, *11*, 100148. https://doi.org/10.1016/j.ijans.2019. 100148.

Zhang, C.Q., Leeming, E., Smith, P., Chung, P.K., Hagger, M.S., & Hayes, S.C. (2018). Acceptance and commitment therapy for health-behavior change: A contextually-driven approach. *Frontiers in Psychology*, *8*, 2350. https://doi.org/10.3389/fpsyg.2017.02350