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The Mediating and Moderating Effect of Volunteering on Pain and Depression, Life Purpose, Well-Being, and Physical Activity

Elizabeth Salt, PhD, APRN^{*}, Leslie J. Crofford, MD[†], Suzanne Segerstrom, PhD[‡]

^{*} University of Kentucky, College of Nursing, Lexington, Kentucky

[†] Vanderbilt University, Department of Medicine, Nashville, Tennessee

[‡] University of Kentucky, Department of Psychology, Lexington, Kentucky

Abstract

To improve function and quality of life in patients with chronic pain, a prevalent and costly condition, an understanding of the relationships among well-being, physical activity, depression, and life purpose with pain is needed. Because of the role loss experienced by people with chronic pain, activities such as volunteering could have an important role in improving health and well-being. In one study, chronic pain patients who participated in volunteer activities reported both decreased pain and “a sense of purpose.” The aim of this study is to test the relationships among pain and well-being, physical activity, depression, and life purpose and then to determine if volunteering activities mediated or moderated these relationships. This observational study was conducted in a large university setting in Kentucky and used a sample of 200 women older than age 50. We found that people with higher pain were more depressed and had lower life purpose and well-being. People who volunteered less had more pain, lower perceived life purpose, more depressive symptoms, and decreased physical activity. Volunteer activities did have a significant mediating effect on the relationship between pain and depression; approximately 9% of the relationship between pain and depression can be accounted for by volunteering. Moderation by volunteering was found between pain and life purpose. We identified important relationships among pain, volunteering, and health outcomes and found that volunteering has a role in improving depressive symptoms and life purpose in women with pain.

INTRODUCTION

Chronic pain or persistent pain affects 37% of people residing in developing countries. The total (direct and indirect) U.S. costs attributed to this condition are estimated to be between \$560 and \$635 billion annually, and an estimated 3%–10% of the gross domestic product has been spent on this condition in European countries (Breivik, Eisenberg, & O’Brien, 2013; Phillips et al., 2016; Tsang et al., 2008). People with persistent pain have been found to have decreased well-being, physical activity, and life purpose and increased depression (Gureje, Von Korff, Simon, & Gater, 1998; Schleicher et al., 2005). In efforts to improve function and quality of life in this population, these factors are important. Despite the

Address correspondence to Elizabeth Salt, PhD, APRN, University of Kentucky, College of Nursing, 315 College of Nursing Building, 751 Rose Street, Lexington, KY, 40536-0232. egsalt0@uky.edu.

clinical importance of and vast resources used on a number of pharmacologic and nonpharmacologic strategies, the management of chronic pain remains a significant health problem (U.S. Department of Health and Human Services, 2016), suggesting a different approach to treatment is needed.

Volunteering is defined as providing a service without the intent of compensation (Klinedinst & Resnick, 2014). Health benefits of volunteering in older adults have been well-described, including (1) increased physical activity; (2) improved self-reported health, life satisfaction, and well-being; and (3) reduced depressive symptoms, pain, and mortality risk (Ahern & Hendryx, 2008; Ayalon, 2008; Cattan, Hogg, & Hardill, 2011; Choi, Stewart, & Dewey, 2013; Jenkinson et al., 2013; Klinedinst, Resnick, Yerges-Armstrong, & Dorsey, 2015; Pillemer, Fuller-Rowell, Reid, & Wells, 2010; Veerasamy, Sambasivan, & Kumar, 2013). The health benefits of volunteering in people with pain conditions are not well-studied. Yet the loss of roles in people with chronic pain has been described (Harris, Morley, & Barton, 2003). In the only study identified, people with chronic pain who participated in volunteer activities reported significantly decreased pain. Participants in this study also reported “a sense of purpose” after volunteering (Arnstein, 2002).

It is possible that volunteer activities could mediate or moderate the relationships among pain and well-being, physical activity, depression, and life purpose. A mediational relationship, or an indirect effect, would imply that pain affects volunteer activities, which, in turn, affects life purpose, depression, physical activity, and depression (Hayes, 2013). A moderated relationship, or a contingent effect, would imply that volunteer activity influences the effect of pain on well-being, physical activity, depression, and life purpose (Hayes, 2013). Because quality of life and function are targeted clinical outcomes, a furthered understanding of these relationships could affect care of patients with chronic pain.

Therefore, the purpose of this study was to test the relationship between pain and well-being, physical activity, depression, and life purpose and then to determine if volunteering activities mediate or moderate these relationships in a sample of older women. The following hypotheses were tested:

1. There will be a significant relationship between pain and depression, physical activity, life purpose, and well-being.
2. Volunteer activities will have a significant mediating effect on the relationship between pain and well-being, physical activity, depression, and life purpose.
3. Volunteer activities will have a significant moderating effect on the relationship between pain and well-being, physical activity, depression, and life purpose.

METHODS

Sample

Because pain disproportionately affects older women (Johannes, Le, Zhou, Johnston, & Dworkin, 2010), the hypotheses were tested on a sample of 199 women older than age 50. One additional participant was not included in the present study because of incomplete daily diary measures for pain. Mean age of the sample was 61.9 years (standard deviation [SD] =

6.4 years) with a mean of 16.7 (SD = 2.3) years of education. The majority (99%) were Caucasian, with the rest African American (Table 1).

Procedure

Women were recruited using the Kentucky Women's Health Registry, a registry of more than 15,000 women residing in the state of Kentucky, to participate in an observational study titled "Daily Activity and Health in the Lives of Adult Women" (Kentucky Women's Health Registry, 2016). Women with pain were over-sampled in this study, which addresses the study aims of investigating the effect of pain on well-being. More than half of the sample reported no pain (54%) and the remaining 46% reported pain in one (27%) or more (19%) body locations in their registry survey.

Women aged 50–75 years who resided in a seven-county area around Lexington, Kentucky were invited to participate in this study. Those who had a physical condition that significantly affected mobility, body mass index >40, pacemaker, serious heart conditions (e.g., recent heart attack), serious medical conditions (e.g., autoimmune disease), serious mental disorders, or use of oral, inhaled, or injected corticosteroids (e.g., prednisone) in the 3 months before enrollment were excluded from participation. Baseline data were collected during an initial in-person appointment. Self-report and interviewer-delivered questionnaires were completed at baseline and after completing a week-long diary using REDCap computer software. Women were compensated for their time in participating in this study. All procedures were approved by the Medical Institutional Review Board at the University of Kentucky.

Measures

Pain—Pain severity, pain interference, and a pain composite score were calculated by averaging a 7-day self-report of pain using the Patient Reported Outcomes Measures Information System (PROMIS; Cella et al., 2010; Department of Health and Human Services, 2015). Pain severity was measured with one PROMIS item asking, "In the past 7 days, how intense was your pain at its worst?" (had no pain = 0, worst imaginable pain = 10; range: 0–10). The six PROMIS pain interference items (example item: "In the past 7 days, how much did pain interfere with your activities of daily living?"; not at all = 1, a little bit = 2, somewhat = 3, quite a bit = 4, very much = 5; range: 6–30) were averaged for the measurement of pain interference. The pain composite was an equally weighted combination of the severity and interference score after interference scores were transformed to have the same range as severity. The Cronbach's α was .96 for the pain composite measure in this study.

Well-Being—Well-being was measured with the 84-item Scales of Psychological Well-Being (SPWB; Ryff, 1989), which has six subscales measuring personal growth, purpose in life, environmental mastery, autonomy, personal relations with others, and self-acceptance. The SPWB uses a 6-point Likert-type scale (6 = strongly agree, 1 = strongly disagree) and a total score is calculated (range: 84–504); a higher score identifies people with higher well-being. The Cronbach's α in this sample was .95.

Life Purpose—Life purpose was measured using the Life Purpose subscale of the SPWB (e.g., “I have a sense of direction and purpose in life”); range: 14–84; Ryff, 1989). The Cronbach’s α in this sample was .83.

Volunteering—Volunteer activities were measured by summing yes/no responses to two items (“Do volunteer work? Attend church or take part in church activities?”) of the Community Healthy Activities Model Program for Seniors scale (CHAMPS; Stewart et al., 2001).

Physical Activity—Physical activity was measured by summing the frequency scores for aerobic activities on the CHAMPS (e.g., “Ride a bicycle or stationary cycle?”; range: 0–672 hours [4 weeks]; Stewart et al., 2001). The interclass correlation coefficient for the CHAMPS frequency score has been reported to be .58-.62 and the test-retest reliability at 2 weeks has been reported to be .62-.76. Medium correlations were reported between self-reported physical functioning and the CHAMPS score (Stewart et al., 2001).

Depression—Depression was measured by summing yes/no responses to the 30 items of the Geriatric Depression Scale (Yesavage et al., 1983; example item: “Are you hopeful about the future?”; range: 0–30) The Cronbach’s α was .82 in this sample.

Data Analysis

Data were summarized using descriptive statistics including means and standard deviations or frequency distributions, as appropriate. Depression and pain were positively skewed. Therefore, analyses were conducted with both log-transformed and untransformed variables. For the purposes of moderation analysis, all predictor variables were mean centered (Aiken & West, 1991). For hypothesis 1, we investigated the relationship among pain (composite, severity, and interference) and volunteer activities, depression, well-being, life purpose, and physical activity using Pearson correlations in SPSS (Version 22.0; IBM Corp., Armonk, NY, USA). To test for a mediating effect of volunteer activities among pain and well-being, depression, physical activity, and life purpose (hypothesis 2), we used PROCESS macros provided by Hayes (2013). In these models $\hat{Y} = i_1 + cx$; $\hat{M} = i_2 + ax$; $\hat{Y} = i_2 + c'x + bM$, where x is the predictor (in this case, pain) and M is the mediator (in this case, volunteering). Hypothesis 3 (moderation) tested the main effects of pain and volunteering and their interaction on life purpose, physical activity, well-being, and depression. Because there were significant relationships among age and pain composite, pain interference, life purpose, well-being, and depression, we controlled for age in all mediation and moderation analyses. An α of .05 was set for all analyses.

RESULTS

Table 2 shows the means, standard deviations, and correlations among the study variables. Consistent with hypothesis 1, people with increased pain and depression volunteered less and had lower reports of well-being and life purpose, and people who volunteered more had higher reports of life purpose. People who were more physically active volunteered more

and reported higher well-being. Otherwise, physical activity did not have a significant relationship with pain, life purpose, and depression.

Hypothesis 2, in which volunteering mediates the relationships among pain and physical activity, depression, life purpose and well-being, was partially supported. Using transformed variables, the relationship between pain (composite and severity) and depression was mediated by volunteering (depression indirect effect = .03, .04, respectively; confidence interval [CI] = .0004-.0795, CI = .0005-.0995, respectively; Fig. 1). The relationships among pain (composite, severity, and interference) and well-being, physical activity, and life purpose were not mediated by volunteer activities using transformed or untransformed variables.

Hypothesis 3, in which volunteering moderates the relationships among pain and depression, life purpose, well-being, and physical activity, was also partially supported. Using transformed variables, volunteering did moderate the effect of pain severity and life purpose (interaction $\beta = 2.26$, $t = 2.19$, $p = .03$), as well as the effect of composite pain (interaction $\beta = 2.71$, $t = 2.08$, $p = .04$) (Fig. 2). People with higher pain composite had significantly lower life purpose than people with lower pain composite when they had volunteering scores 1.55. Similarly, people with higher pain severity had significantly lower life purpose than people with lower pain severity when they had a volunteering score of 1.46. This moderating effect was not found using the untransformed variables. Volunteer activities did not moderate the relationship between pain interference and life purpose. Volunteering did not moderate relationships among pain (composite, interference, or severity) and depression, physical activity, and well-being using the transformed or untransformed variables.

DISCUSSION

The purpose of this study was to test the relationships among pain and well-being, physical activity, depression, and life purpose and then to determine if volunteering activities mediate or moderate these relationships in a sample of older women. Hypothesis 1 was largely supported; people with higher pain were more depressed and people with higher pain and depression volunteered less and had lower perceived life purpose. People who volunteered more were more physically active. Hypothesis 2 was partially supported. Volunteer activities did have a significant mediating effect on the relationship between pain and depression. In regard to hypothesis 3, a moderating relationship between volunteering and pain was found for life purpose.

The positive relationships found between volunteering and indicators of psychological well-being and function and negative relationships between volunteering and psychological distress are supported by prior research (Arnstein, 2002; Gureje et al., 1998; Harris et al., 2003; Schleicher et al., 2005). The use of volunteering as a health care tool to improve pain and function in people with pain has not been studied. Thus, these findings are important in identifying a potential future direction for improved care of patients suffering from pain.

Hypothesis 2 was partially supported insofar as the relationship between pain and depression was mediated by volunteering. Approximately 9% of the relationship between pain and

depression could be accounted for by volunteering (Fig. 1). These findings suggest that volunteer activities could be a potential target to improve depressive symptoms in people with pain. Because the mediating effect was only identified with transformed variables, it is likely that people with higher pain are not influencing this finding unduly; rather, differences in pain in the middle and lower parts of the range are important. Thus, this finding is important for many people who experience pain at less than severe levels.

Our study findings also partially supported hypothesis 3. We found that volunteer activity moderated the relationship between pain and life purpose only. We found that women with pain who had a volunteer score of >1.55 had lower life purpose. These findings provide a further understanding the relationship between two constructs largely unexplored in pain research.

There are a number of limitations of this study. Because of the cross-sectional design, we were unable to establish temporal precedent or causality. Longitudinal and intervention studies are needed to establish temporal precedence (e.g., changes in pain precede changes in volunteering) and causality (e.g., experimental assignment to volunteering decreases the effect of pain on life purpose.) Second, the sample was demographically homogenous, which could affect the generalizability of study findings. Third, there are limitations related to our measures of physical activity and volunteer activities. Objective measures of physical activity with activity trackers and daily diaries of volunteer activities would likely be more accurate measures of these variables and should be considered for use in future studies.

Implications for Nursing Practice

These study findings have a number of clinical implications. First, these findings suggest that life purpose and volunteering, which are largely ignored in pain research, might have important associations with factors affecting health outcomes. Second, not only does volunteering have a significant relationship with the health indicators, it also play a mediating and moderating role, suggesting it might be a useful health care tool in this population.

CONCLUSION

This study described relationships among life purpose and volunteering and health outcomes such as well-being, pain, physical activity, and depression. It also described an important potential role of volunteering to improve depressive symptoms and increase life purpose in people with pain. Because people with higher life purpose have recently been found to have improved survival, this is clinically important (Steptoe, Deaton, & Stone, 2015).

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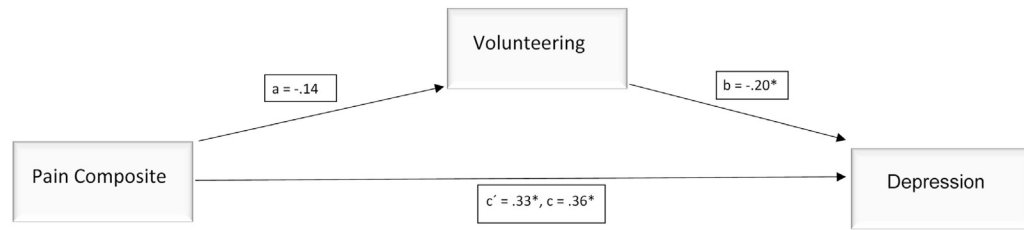


FIGURE 1.

Mediation model showing that the effect of pain composite on depression is mediated by volunteering. a = the direct path between pain composite and volunteering; b = the direct path between volunteering and depression; c' = the direct path between pain composite and depression; c = the total effect or the direct and indirect effect of pain composite and depression. *Significant at the .05 level.

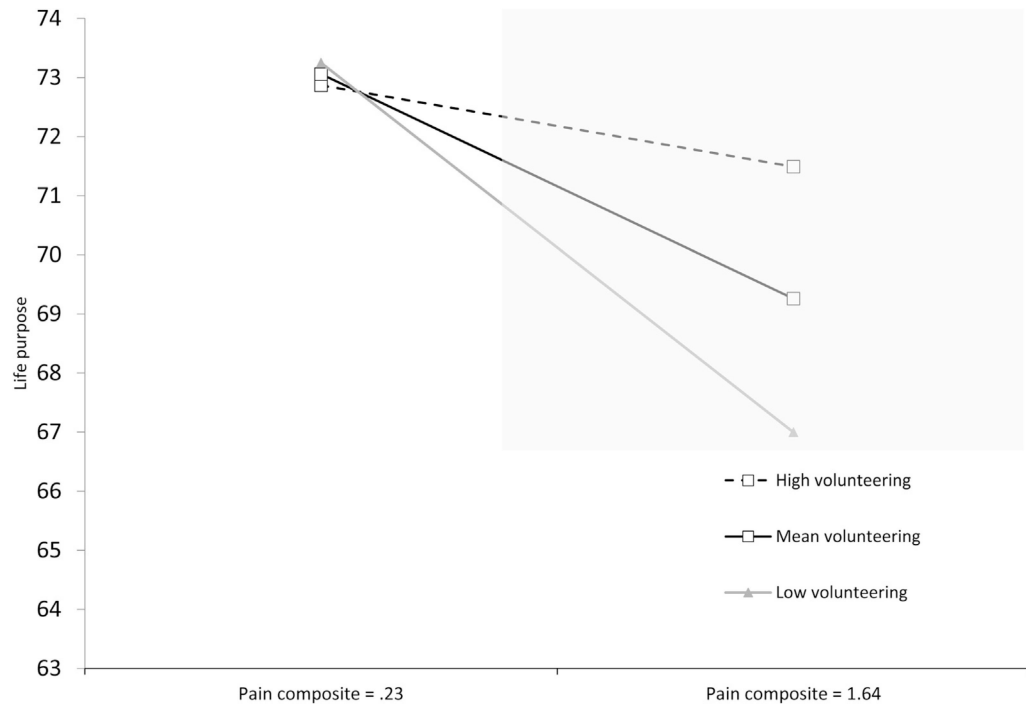


FIGURE 2. Moderating effect of volunteering between pain composite and life purpose. Simple main effects of pain on life purpose are shown for high (+1 standard deviation [SD]), mean, and low (−1 SD) levels of volunteering. The effect of volunteering is statistically significant.

Table 1.

Demographics Table

Age	61.9 yr \pm 6.4
Education	16.7 yr \pm 2.3
Ethnicity	
Caucasian	197 (99%)
Other	2 (1%)

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Table 2.

Descriptive Statistics and Correlations among Variables (N = 199)

	Mean ± SD	Age	Pain Composite	Pain Severity	Pain Interference	Volunteering	Depression	Well-Being	Life Purpose	Physical Activity
Age	61.9 ± 6.4	–								
Pain composite	2.28 ± 2.5	-.141*	–							
Pain severity	1.52 ± 1.5	-.126	.963 [†]	–						
Pain interference	.76 ± 1.17	-.145*	.940 [†]	.813 [†]	–					
Volunteering	1.17 ± .76	.135	-.130	-.137*	-.108	–				
Depression	3.37 ± 3.6	-.251 [†]	.380 [†]	.327 [†]	.406 [†]	-.247 [†]	–			
Well-being	428.53 ± 41.2	.218 [†]	-.253 [†]	-.229 [†]	-.256 [†]	.138	-.743 [†]	–		
Life purpose	71.19 ± 8.5	.163*	-.253 [†]	-.233 [†]	-.251 [†]	.171*	-.662 [†]	.866 [†]	–	
Physical activity	22.6 ± 9.7	.069	-.009	-.027	.014	.150*	-.087	.140*	.110	–

*Correlation is significant at the .05 level (2-tailed).

[†]Correlation is significant at the .01 level (2-tailed).