Validation of CARE Scale-7 in treatment-seeking patients with chronic pain: measurement of sex invariance

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Abstract

Objectives: Social and interpersonal factors impact the trajectory of chronic pain. We previously developed and validated a 2-factor, 7-item measure to assess interpersonal factors, including relationship guilt and worry and difficulty prioritizing self-care in chronic pain. Here, we confirm the factor structure and examine the sex invariance of the two-factor structure of the CARE Scale-7.

Methods: Data were collected as part of routine clinical care at a tertiary pain clinic using the Collaborative Health Outcomes Information Registry. Patient participants (67% women) were predominantly middle-aged (M = 50.9 years, SD = 17.8), married (55.2%), and White/non-Hispanic (55.7%). Data included demographics, pain characteristics, CARE Scale-7, pain catastrophizing, and Patient-Reported Outcomes Measurement Information System psychological and physical function measures. Confirmatory factor analysis was conducted to validate the factor structure of the CARE Scale, and a stepwise approach to measurement invariances by sex examined configural, metric, and scalar invariance.

Results: Internal consistency of the scale items ensured suitability for factor analyses. Confirmatory factor analysis findings revealed an overall good fit of the 2-factor model among males and females and that CARE Scale-7 is in fact sex invariant. Finally, CARE Scale-7 showed convergent validity with pain-related outcomes.

Discussion: The CARE Scale is the first validated instrument to assess self-care in both sexes among patients with chronic pain. The subscale of difficulty prioritizing self-care emerged as a potentially unique factor that should be integrated in clinical assessment. CARE Scale may facilitate standardized measurement in research and clinical contexts, which may inform a comprehensive treatment focus that integrates individualized self-care planning.

Keywords: Self-care, Chronic pain, Sex invariance, Relationship guilt, Worry

1. Introduction

Social and interpersonal factors have been shown to impact the trajectory of pain. Among patients with chronic pain conditions,

higher levels of perceived support are inversely related to distress,[29] pain after surgery,[13] severe pain,[20,29,49] depressive symptoms,[23,29] pain catastrophizing,[6] and functional disability.[20] Literature on spousal relationships suggests a complicated dynamic between chronic pain patients and their spouses. For example, in patients with rheumatoid arthritis, those in well-adjusted marriages with strong emotional support report less pain and better functioning.[34,37] Self-reported spousal support in men with chronic pain conditions also mediated the negative impact of pain.[24] At the same time, higher spousal hostility, negative spousal responses, and solicitous support are associated with increases in pain and increased pain catastrophizing in chronic pain conditions.[4,30,34] Importantly, 73% of individuals with chronic pain endorse feeling like a burden to their partners.[25] Higher levels of perceived partners' burden are associated with greater pain intensity, functional disability, depressive symptoms, and reduced pain self-efficacy.[25]

Thus, interpersonal impacts on pain include a dynamic interplay that extends beyond the presence of social support to include the quality of such support and one's emotional experience regarding the impact of pain on loved ones (eg, guilt). Although the literature to date has largely focused on the nature of social support received by the individual with pain, a gap exists in

characterizing how the person with pain experiences those relationships through the lens of chronic pain. Indeed, for people with chronic pain, the relationship contexts and concern for others in their lives may elicit various emotions (eg, feeling like a burden) that shape their daily choices and abdication of self-care behaviors. However, the unique domains of interpersonal relationship worry and ability to prioritize self-care, both of which fit within the psychosocial model of pain,[19,32] have not previously been specifically assessed.

The most common worry among chronic pain patients is general worry about relationships.[18] Anecdotally, patients report concern about how their chronic pain and pain-related functional limitations impact their relationships and roles. We developed a measure to probe this interpersonal construct.[50] Relational contexts are particularly important, given that roughly 53% to 70% of individuals with chronic pain are married or partnered.[7,8,25,43] People with chronic pain who are also caregivers to dependents may have particular challenges in balancing self-care with caregiving roles and responsibilities and with navigating the physical limitations of chronic pain within the context.[48] Thus, relationship worry emerges as a potentially important construct.

Self-care has also been shown to influence the impact of chronic pain. Large clinical trials show that the use of self-care and pain self-management techniques attenuates the negative effects of chronic pain, leading to better outcomes.[2,47] Recent research on pain self-management has focused on racial and sociocontextual factors that impact motivation and engagement in self-care in African Americans with osteoarthritis.[3] The authors concluded that providing patients access to pain self-management is insufficient in the absence of interventions that address key barriers to motivation and behavioral in pain self-management.[3] To date, exploration of the interpersonal factors that stand as barriers to motivation and behavioral engagement in self-care is underappreciated and understudied.

Prioritizing self-care remains a challenge for patients with chronic pain,[33] many of whom may need to navigate the complexities of vocational, family, and social responsibilities within the context of medical and pain comorbidities. Studies cite that 35% to 46% of people with chronic pain are employed, with vocational responsibilities competing for the patients' limited resources.[41,43] For example, among patients with diabetes, those with chronic pain had more difficulty engaging in self-care behaviors important for reducing diabetes-related complications.[27] Similar findings were observed among older patients with chronic pain who reported difficulty performing self-management techniques.[26] It is plausible that chronic pain, with its increased psychological distress and physical disability, presents as a "competing demand" for both diabetic patients and older adults for whom chronic pain is more common.[26,27] These findings underscore the importance of identifying factors that impact and potentially impede self-care for patients with chronic pain.

Toward this end, we developed and validated a measure of interpersonal factors (the CARE Scale-7) to assess one's comfort and ability to *prioritize self-care* within the context of pain.[50] In this previously published work, the scale was tested in 3 discrete chronic pain samples (N = 1,452), and exploratory factor analysis revealed a 7-item, 2-factor solution. All 3 samples were predominantly female (66.9~83.6%), middle-aged (M = 47–51 years), and married (30.7%–58.1%). About 32.5% to 46.5% of participants endorsed having dependents. Factor 1 measures difficulty prioritizing self-care and taps the construct of "externalized" care behaviors (ie, attending to the needs of others rather than self-care). Factor 2 taps the emotional construct of guilt/worry about the impact of one's pain on significant relationships

(ie, I worry a great deal about how my pain impacts my partner and/or family). Extreme difficulty with both factors was also reported by about one-third of the total sample, suggesting that relationship factors significantly impact pain management and self-care.[50] In addition, women endorsed greater difficulty practicing self-care than men, consistent with prior research.[28,31] However, literature on sex differences in self-care in chronic pain is scarce, and inconsistent across medical conditions.[17,28,31,40] As such, with the current study, we aimed to validate the CARE Scale in a large clinical sample with sufficient power to test sex differences (available as supplemental digital content at http://links.lww.com/PR9/A86).

Thus, the goals of this current study were to: (1) validate the factor structure and psychometric properties of the CARE Scale in a sample of patients with chronic pain pursuing treatment at a tertiary pain clinic; (2) compare the internal consistency of CARE-7 between male and female patients; (3) assess whether CARE-7 scale would be sex invariant; and (4) confirm the convergent validity of the CARE Scale by examining its relationship to other measures for pain, pain-related interference, and emotional distress.

2. Methods

2.1. Procedures

Data were collected as part of routine clinical care procedures at the Stanford Pain Management Center using the Collaborative Health Outcomes Information Registry, an open-source registry for assessing patients' general and pain-related health status (https://choir.stanford.edu). Most of the measures administered in the Collaborative Health Outcomes Information Registry remain constant over time, but new measures are occasionally added or deleted to meet research and clinical goals. Study data were collected from 2,096 consecutive patients who presented for initial medical evaluations, provided demographic information, and completed the CARE Scale-7 between February 2019 and October 2019. The current data set included any patient aged 18 years or older with any chronic pain condition(s). To represent the entirety of the clinical population, no exclusion criteria were applied. This research was approved by Stanford's Institutional Review Board.

2.2. Measures

The current study extracted data about demographics and pain history, including age, sex, marital status, education level, employment status, race/ethnicity, pain duration, and perceived cause of pain to understand the sample characteristics. We also extracted responses to a single clinic questionnaire item, "*Please describe your activities in an average day*" for the response options of "*laying in bed all day*," "*going to school*," "*going to work*," and "*taking care of family*." The last item was used for the known group validity analysis, which assesses the ability of an instrument to discriminate among distinct groups.[11] In our case, the CARE-7 total scores are expected to be higher in people who care for family members. Data for the following measures were also extracted to examine validity of CARE-7 scale and its measurement invariance across sex.

2.2.1. CARE Scale-7

The CARE Scale-7 assesses interpersonal factors impacting self-care behaviors (Cronbach α = 0.81).[50] The CARE Scale-7 has been validated in patients with mixed etiology of chronic pain, as

well as in both paper-and-pencil and online survey formats. The CARE Scale-7 consists of 4 items of difficulty prioritizing self-care and 3 items of relationship guilt/worry. Each item is rated on a 0 (*not at all* or *not applicable*) to 4 (*to an extreme degree*) scale. The total scores range from 0 to 28, with higher scores indicating greater difficulty prioritizing self-care relative to others, or greater concern or emotional difficulty regarding how their pain impacts important relationships.

2.2.2. Patient-reported outcomes measurement information system

The Patient-Reported Outcomes Measurement Information System (PROMIS) measures are well-validated and widely used to assess physical and psychosocial health status in patients with chronic illnesses, including chronic pain.[1,5,9,10,15,38] Detailed information about the measures' development and validation is available at http://www.healthmeasures.net. All PROMIS measures in the current study were administered using computerized adaptive testing. T-scores were calculated for each patient. Patient-Reported Outcomes Measurement Information System instrument item banks for PROMIS Depression, Anxiety, Anger, Physical Function, Social Isolation, Fatigue, Pain Behaviors, and Sleep Impairment were administered. Higher scores on each PROMIS measure generally indicate greater severity of each symptom domain. However, higher scores on PROMIS Physical Function indicate better physical functioning.

2.2.3. Patient-reported outcomes measurement information system pain intensity

Pain intensity was assessed on a numerical rating scale using the PROMIS Pain Intensity scale.[21] Respondents were asked to rate their average pain intensity over the previous 7 days on a scale of 0 to 10. Assessment of pain intensity using a numerical rating scale has been supported in prior studies.[14]

2.2.4. Pain catastrophizing scale

The 13-item pain catastrophizing scale (PCS) was administered to assess distress regarding the cognition and emotion associated with actual or anticipated pain.[44] Previously, we observed a direct association between the PCS and CARE-7 total scores (Spearman rho = 0.40, $P < 0.05$).[50]

2.3. Analysis plan and missing data

Cronbach αs were computed to examine the internal consistency of the CARE-7 for male and female patients. Next, confirmatory factor analysis (CFA) was conducted with AMOS 25. All the other analyses were conducted with SPSS 26. Weight least square model was used to examine the two-factor model of the nonnormally distributed CARE-7 total scores. Model fit was evaluated for male and female patients, separately, using the χ^2 statistics with degrees of freedom, Tucker–Lewis Index (TLI), Comparative Fit Index (CFI), and root-mean-square error of approximation (RMSEA). A good model fit was defined as P values of >0.05 for the χ^2 test, TLI and CFI value of >0.95, and RMSEA of <0.05. An acceptable fit was defined as TLI and CFI value of >0.90, and RMSEA of < 0.08.[39,45,46]

The following 3 types of measurement invariances by sex were examined: configural, metric, and scalar invariance by calculating changes in χ^2, CFI, and RMSEA. When comparing the successive model fits between less and more constrained models, Δ CFI < 0.01 and Δ RMSEA < 0.015[12] were used to determine measurement invariance because χ^2 test is sensitive to sample size and the current study has a large sample size.[36]

Once measurement invariances were verified, convergent validity was examined by computing spearman correlations between CARE-7 scores, pain intensity ratings, the PROMIS measures T-scores, and PCS scores. For the known group analysis, univariate analysis of variance was conducted to compare CARE-7 total scores based on sex, caregiving status, and their interaction effect.

Data were extracted and analyzed for 2,096 patients who completed the CARE Scale. Our sample size was sufficient to conduct CFA for male (n = 677) and female (n = 1,419), both of which were more than 10 people per parameter estimate.[45] Missing values were observed mainly in demographics, and one patient did not complete all PROMIS measures. Therefore, pairwise deletion was used and n was noted if any variables had missing values.

3. Results

3.1. Sample characteristics

Demographics are summarized in **Table 1**. The sample was predominantly middle-aged (M = 50.9 years, SD = 17.8), married (55.2%), and White/non-Hispanic (55.7%). In addition, the majority of the study sample had at least a college degree (56.1%) and reported their employment status as "not currently working" (56.2%). About one-third of the sample (35.8%) reported daily care taking of family members. The mean pain duration was 7.8 years (SD = 10.6), and the average pain intensity was 5.4 (SD = 2.3) on a 0 to 10 numeric rating scale. The most common reported causes or types of pain were nerve-related (n = 965, 46.0%), followed by muscle (n = 619, 29.5%) and undiagnosed/unknown (n = 613, 29.2%). Detailed information about common chronic pain diagnoses of our patients are available elsewhere,[42,43] with the most common pain diagnoses being thoracolumbar pain (21%), musculoskeletal pain (12%), and fibromyalgia or myofascial pain (9%).

Significant sex difference was found for age, average pain intensity, marital status, education, work status, and daily caretaker role. Compared to female patients, male patients were older by 2.5 years, $t(2094) = -2.99$, $P = 0.003$, and reported lower levels of average pain of 0.2 points on a 0 to 10 scale, $t(2094) = 2.23$, $P = 0.026$. In addition, more male patients were married (61.4%), currently working (48.7%), and not having a daily caregiving role (71.6%).

3.2. Internal consistency

Cronbach αs of the current samples were 0.86 for female patients and 0.83 for male patients, suggesting good internal consistency for both groups. No bad items were identified because αs remained at 0.83 to 0.85 for female patients and 0.81 to 0.83 for male patients when items were deleted one at a time.

3.3. Confirmatory factor analysis for male and female patients

To ensure the model fit for the whole sample (n = 2,096), we first examined the CFA fit of the **Figure 1** model. With errors correlated, we found TLI was 0.976, CFI was 0.987, and RMSEA was 0.046 (95% CI 0.034–0.057), suggesting a good fit.

Table 1

Patient demographics.

	Total sample (n = 2,096)	Female patients (n = 1,419)	Male patients (n = 677)	Mean difference	t	P
Age	50.9 (17.9)	50.1 (17.8)	52.6 (18.1)	−2.5	−2.99	0.003
Years in pain	7.8 (10.6)	8.1 (10.9)	7.2 (10.0)	0.9	1.80	0.073
Average pain	5.4 (2.3)	5.5 (2.3)	5.2 (2.3)	0.2	2.23	0.026
	Total sample, n (%)	Female patients, n (%)	Male patients, n (%)	Mean difference, X^2	df	P
Marital status*				35.99	4	<0.001
Single	400 (19.3)	260 (18.5)	140 (21.0)			
Married	1,143 (55.2)	733 (52.3)	410 (61.4)			
Domestic partnership	126 (6.1)	90 (6.4)	36 (5.4)			
Widowed	102 (4.9)	86 (6.1)	16 (2.4)			
Divorced or separated	299 (14.4)	233 (16.6)	66 (9.9)			
Race/ethnicity†				4.45	4	0.349
White/non-Hispanic	1,098 (55.7)	736 (54.4)	362 (58.4)			
Hispanic/Latino	204 (10.3)	151 (11.2)	53 (8.5)			
Asian	188 (9.5)	130 (9.6)	58 (9.4)			
African American	101 (5.1)	72 (5.3)	29 (4.7)			
Others	382 (19.4)	264 (19.5)	118 (19.0)			
Education‡				6.22	2	0.045
High school or less	265 (12.8)	176 (12.6)	89 (13.3)			
Some college	642 (31.1)	459 (32.8)	183 (27.4)			
College or higher	1,160 (56.1)	764 (54.6)	396 (59.3)			
Currently working	917 (43.8)	587 (41.4)	330 (48.7)	10.14	1	0.001
Taking care of family members daily	750 (35.8)	558 (39.3)	192 (28.4)	23.97	1	<0.001

* Total n = 2,070 for the total, 1,402 for female patients, 668 male patients.
† Total n = 1,973 for the total, 1,353 for female patients, 620 male patients.
‡ Total n = 2,067 for the total, 1,399 for female patients, 668 male patients.

Subsequently, the **Figure 1** model was used to examine the model fit for each sex and measurement invariances across sex.

The result of CFA for male patients (n = 677) showed TLI of 0.962, CFI of 0.980, and RMSEA of 0.054, suggesting an overall good fit of the two-factor model. A good fit was also observed in female patients (n = 1,420) as evidenced by TLI of 0.977, CFI of 0.988, and RMSEA of 0.046.

3.4. Multigroup confirmatory factor analysis to examine measurement invariance

We examined measurement invariances stepwise (**Table 2**). As the first step, configural invariance was examined by investigating a baseline model with no constrained parameters across the 2 groups (M1). The model fit indices were TLI of 0.972, CFI of 0.986, and RMSEA of 0.035, suggesting a good fit and that the overall two-factor structure holds up similarly for the male and female patient groups.

Then, metric invariance was examined by constraining the factor loadings to be equivalent across the 2 groups (M2). Tucker–Lewis Index of 0.991, CFI of 0.994, and RMSEA of 0.032 suggested a good fit. To compare between the baseline model and metric invariance model, the change scores of CFI and RMSEA were computed. The results suggested that factor loadings were similar across the male and female patient groups, ΔCFI = 0.000 and ΔRMSEA = −0.005.

Finally, scalar invariance was examined by further constraining items' intercepts on the latent construct to be invariant across sex (M3). This constrained model showed a good fit as evidenced by TLI of 0.983, CFI of 0.986, and RMSEA of 0.044. To compare between the metric invariance (M2) and scalar invariance models (M3), change scores of CFI and RMSEA were computed. The results suggested that the relationship between latent and

observed scores were similar across the male and female patient groups, ΔCFI = −0.008 and ΔRMSEA = 0.012.

3.5. Validity of Care Scale-7

To assess conversion validity, Spearman rhos were computed between CARE-7 scores and scores on other measures (**Table 3**). Higher CARE-7 total scores were significantly associated with higher scores on the PROMIS-Depression, Anxiety, and Anger, and Social Isolation measures (rs = 0.44–0.47), as well as on PCS scores (rs = 0.35–0.41). Higher CARE-7 total scores were also significantly associated with reduced physical function (r = −0.20) and more fatigue, pain behaviors, sleep impairment, and pain interference (rs = 0.35–0.40). Therefore, more difficulty in self-care activities was associated with more distress in psychosocial as well as physical health domains. Among the 2 subscales, difficulty prioritizing self-care subscale scores had a weak relationship with PROMIS-measure T-scores (rs = −0.04–0.30), whereas worry/guilt subscale scores had a small to moderate relationship with
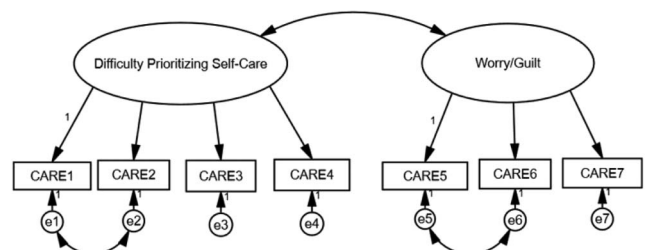
Figure 1. Path diagram for the 2-factor model of the confirmatory factor analysis.

Measurement invariances.

Model	X² (df)	TLI	CFI	RMSEA (95% CI)	Comparison	ΔX² (Δdf)	ΔCFI	ΔRMSEA	Decision
CFA for males	33.05 (11)	0.962	0.980	0.054 (0.034–0.076)	—	—	—	—	
CFA for females	44.09 (11)	0.977	0.988	0.046 (0.032–0.061)	—	—	—	—	
M1: Configural invariance	77.15 (22)	0.972	0.986	0.035 (0.026–0.043)	—	—	—	—	
M2: Metric invariance	85.37 (27)	0.991	0.994	0.032 (0.025–0.040)	M1	8.22 (5)	0.000	−0.005	Equivalent
M3: Scalar invariance	171.49 (34)	0.983	0.986	0.044 (0.038–0.051)	M2	86.12 (7)	−0.008	0.012	Equivalent

CFA, confirmatory factor analysis; CFI, Comparative Fit Index; RMSEA, root-mean-square error of approximation; TLI, Tucker–Lewis Index.

PROMIS-measure T-scores and PCS scores ($rs = -0.31$–0.53). This suggests that among the 2 subscales, difficulty prioritizing self-care is a more unique factor of the CARE Scale-7. These patterns of Spearman coefficients were similar to those previously observed in the initial validation sample that was recruited online.[50]

Finally, because invariance of CARE Scale-7 factor structure across sex is not the same as quantitative sex differences on CARE-7 Scale or subscale scores, a 2 (sex) × 2 (daily caregiver status) univariate analysis of variance was conducted for the known group analysis. The results revealed a significant main effect of sex, $F(1, 2092) = 11.28$, $P = 0.001$ and daily caregiver status, $F(1, 2092) = 48.54$, $P < 0.001$, but no significant interaction effect, $F(1, 2092) = 2.72$, $P = 0.099$. CARE-7 scores were significantly higher in female patients (M = 13.5, SD = 6.9) than male patients (M = 11.7, SD = 7.1) and higher in those with daily caregiving tasks (M = 13.0, SD = 6.9) than those with no daily caregiving (M = 10.0, SD = 6.1), suggesting that more self-care difficulty was endorsed by women and persons with daily caregiving tasks and that sex and daily caregiving tasks were independently associated with self-care difficulty.

4. Discussion

The goals of this study were to: (1) validate the factor structure and psychometric properties of the CARE Scale-7 in a sample of chronic pain pursuing treatment at a tertiary pain clinic; (2) compare the internal consistency of CARE-7 between male and female patients; (3) describe sex invariance for the CARE-7; and (4) confirm convergent validly of the CARE Scale-7. We followed a rigorous protocol to accomplish these goals.

Overall findings showed that internal consistency of the scale items ensured suitability for subsequent factor analyses. Confirmatory factor analysis findings revealed a good overall model fit, and a good model fit for males and females separately. In examining sex invariance, multigroup stepwise CFA approach was conducted and found that across the 2 groups, the two-factor structure of self-care difficulty fits equally well, each item of CARE Scale-7 contributes to the latent construct to a similar degree, and the same construct is measured in a similar way. This means that male and female patients consider the 2 self-care constructs similarly and respond to the items in the similar way. Individuals who have the same score on the latent variable will have the same scores on the observed variables across the groups. Therefore, there is no systematic bias in the responses of male and female patients to an item. Therefore, the CARE Scale-7 shows configural, metric, and scalar invariance across sex and can be used in male and female patients with chronic pain. These findings are consistent with previous findings of sex differences using the same analytical approach of different instruments.[35] Notably, findings of no sex differences in factor structure do not

Convergent validity: correlations of the CARE Scale scores with other measures.

	Whole sample (n = 2,096)			Female patients (n = 1,419)			Male patients (n = 677)		
	Total scores	Subscale 1 scores	Subscale 2 scores	Total scores	Subscale 1 scores	Subscale 2 scores	Total scores	Subscale 1 scores	Subscale 2 scores
Average pain	0.11	0.02 (0.265)	0.17	0.12	0.04 (0.143)	0.17	0.09 (0.021)	−0.02 (0.527)	0.17
PROMIS*									
Depression	0.47	0.25	0.53	0.47	0.26	0.54	0.45	0.23	0.52
Anxiety	0.46	0.28	0.51	0.47	0.28	0.52	0.45	0.26	0.50
Anger	0.44	0.27	0.47	0.44	0.27	0.46	0.46	0.27	0.49
Social isolation	0.46	0.30	0.48	0.48	0.30	0.51	0.41	0.28	0.40
Fatigue	0.40	0.22	0.46	0.42	0.23	0.48	0.34	0.16	0.41
Pain behaviors	0.39	0.18	0.49	0.38	0.17	0.48	0.39	0.14	0.49
Sleep impairment	0.38	0.23	0.41	0.40	0.26	0.42	0.35	0.17	0.40
Pain interference	0.35	0.12	0.48	0.36	0.14	0.48	0.34	0.09	0.49
Physical function	−0.20	−0.04 (0.109)	−0.31	−0.20	−0.04 (0.169)	−0.32	−0.20	−0.01 (0.714)	−0.31
PCS									
Total	0.41	0.18	0.52	0.40	0.17	0.51	0.45	0.20	0.54
Rumination	0.35	0.13	0.46	0.33	0.13	0.44	0.39	0.15	0.50
Magnification	0.40	0.23	0.44	0.38	0.21	0.44	0.43	0.26	0.45
Helplessness	0.40	0.17	0.51	0.39	0.16	0.50	0.42	0.18	0.52

Spearman rhos were used, all $Ps < 0.001$ with exceptions being noted in parenthesis.
* n = 2095, Subscale 1 = Difficulty Prioritizing Self-care, Subscale 2: Worry/Guilt.
PCS, pain catastrophizing scale; PROMIS, patient-reported outcomes measurement information system.

prove that no sex differences in structure of personal self-care exist. Findings are always limited to the specific instrument used and to sample size. Perhaps, larger sample sizes that would allow comparison of structure across sex and different age bands would uncover more subtle sex differences. This examination may be pursued in future research.

Overall, the integrity of the factor structure of the CARE Scale-7 was invariant across sex. Comparison across sex indicates that there are no significant differences between males and females in the pattern of subscale loadings on both factors. The two-factor model fit for both males and females. The implication of this finding for use of the CARE Scale-7 is that the instrument may be used in its current configuration for males and females older than 18 years of age.

Invariance of CARE Scale-7 factor structure across sex is not the same as quantitative sex differences on CARE Scale-7 or subscale scores. CARE-7 total scores were significantly higher in female patients than male patients, consistent with previous findings[50] and findings in other chronic conditions such as diabetes and heart failure, where women report greater difficulty than men in engaging in self-care techniques.[28,31] In light of inconsistent findings on sex differences in self-care among individuals with chronic pain, our results provide preliminary evidence that women with chronic pain endorse greater difficulty engaging in self-care than men. This finding is inconsistent with research showing no sex differences in self-care behavior, such as stretching or massage, among men and women with fibromyalgia.[16]

As expected, patients endorsing daily caregiving tasks scored significantly higher on the CARE-7 than those who did not endorse daily caregiving tasks in our sample. Our results also revealed that women are more likely than men to have caregiver roles and are more likely to report self-care difficulty. However, among women with caregiver roles, CARE-7 scores were not notably higher. This finding was inconsistent with research suggesting that social variables are more predictive for pain outcomes in women than in men.[22] Notably, our caregiving status variable did not objectively capture the extent of caregiving responsibility among patients, and may suggest that being female is a primary driver for increased self-care difficulty.

Findings revealed convergent validity with pain-related outcomes, consistent with our prior research.[50] Higher endorsement of difficulty prioritizing self-care activities within the context of relationships was associated with greater distress in psychosocial and physical health domains. Among the 2 subscales, the difficulty prioritizing self-care subscale had weaker relationships with PROMIS-measure T-scores than the worry/guilt subscale. Accordingly, the difficulty prioritizing self-care subscale, which is rooted in behavior and action, seems to offer greater distinct explanatory contribution for physical and emotional health. Hence, this factor emerges as a potentially unique factor for identifying important cognitive, emotional, and behavioral therapeutic targets. Results of the current study confirm prior findings that difficulty in prioritizing self-care with the context of relationships and daily caregiving may significantly impact pain self-management and daily self-care behaviors. The CARE Scale-7 may provide a useful screening tool for identifying people who are more likely to tend to the needs of others, potentially at the expense of themselves. Future studies may examine the impact of abdication of self-care on pain-related outcomes, as well as interventions that help patients navigate the complex challenges of self-care while serving as caregivers. We highlight that although the CARE Scale-7 is sex invariant, sex differences were found, such that caregiving and relationship factors seem to be more influential for women and stand as barriers to engagement in self-care. This is consistent with some of the sex effects found in the medical literature[28,31] and might be in part due to more caregiving roles among women while being a patient, greater emotional and relationship distress, and greater pain prevalence among women. Future research may explore these factors in greater detail, as well as the concept of sex-specific interventions.

The results of this study should be viewed in light of several limitations. First, the study sample was derived from a tertiary pain clinic, which limits generalizability of findings to settings involving acute pain, and specific validation is needed for research involving such populations. Second, the self-report design introduces potential selection bias. Third, our sample had smaller cell sizes for men (n = 677) vs women (n = 1,419) because overall fewer men participated in the study and fewer reported a caregiving role.

Overall findings showed that internal consistency of the scale items ensured suitability for subsequent factor analyses. Confirmatory factor analysis findings revealed an overall good fit of the two-factor model among males and females, and that CARE Scale-7 is in fact sex invariant. Finally, CARE Scale-7 showed convergent validity with pain-related outcomes, and difficulty prioritizing self-care emerged as a potentially unique factor that might be integrated in clinical assessment, particularly in patients who provide care for others in their families. The CARE Scale is the first validated instrument to assess relationship barriers to self-care among patients with chronic pain and may help identify individualized care planning with a clear focus on negotiating relationship and caregiving roles.

Disclosures

The authors have no conflicts of interest to declare.

Acknowledgements

Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at http://links.lww.com/PR9/A86.

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