



## Research Article

# Development of a Pain Quality of Life Measure

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### Abstract

**Purpose:** A chronic pain quality of life (CPQL) measure was developed to assess the primary life quality domains (PLQD): Physical Health, Social Support, Psychological Health, and Vocational/Economic Status. Valid evaluation of chronic pain patients is essential to assess treatment outcome. Unfortunately, many studies use the VAS to assess CPQL which yields invalid results, other studies utilize measures that evaluate a general CPQL domain. **Method:** 273 chronic pain patients recruited from pain clinics responded to the Pain Quality of Life Measure (PQLM), along with seven validating questionnaires. Healthy individuals completed the PQLM twice, one month apart, to assess test-retest reliability. **Results:** Factor analysis yielded seven (CPQL) domains: General Health/Pain, Empathetic Social Support, Housing/Transportation, Psychological Status, Ill Health, Financial/Legal Difficulties, and General Social Support. These factors demonstrated a good conceptual fit with the four PLQD. The PQLM demonstrated a high coefficient Alpha (.957), excellent validity (-.227 to -.842), and good test-retest correlations (.514 to .908), indicating the PQLM has excellent parametric features. **Conclusion:** The PQLM provided seven CPQL factors congruent with the primary life quality domains. Future CPQL research for chronic pain individuals should utilize the PQLM or similar multiple domain questionnaires to validly assess (PLQD).

**Keywords:** Pain Quality of Life Measure; Chronic Pain; Life Satisfaction; Chronic Pain Assessment

### Introduction

Quality of life has received much attention during the last few decades due to the increasing number of Americans living with chronic medical conditions such as heart disease, arthritis, diabetes, asthma, chronic pain, and obesity [1]. It is therefore important to evaluate health quality for individuals with chronic illness who receive medical and/or psychological treatments to more effectively identify which treatments result in the largest improvement in the individual's quality of life.

According to the literature, quality of life consists of four primary life quality domains (e.g., Physical Health, Social Support, Psychological Health, and Vocational/Economic Status) [1,2] to as many as 10 secondary quality of life domains (e.g., Relationships/Social Support, Work/Vocational Activities, Money/Finances; General Health; Leisure/Recreation; Mindfulness/Self-awareness; Self-Esteem; Major Life Events &/or Life Change; Mental Health/

Coping; Life Management/Goal Setting) depending on the patient population studied and specificity of the research [2-6].

Primary life quality instruments are useful to estimate a population's four primary quality of live domains [3,8,9]. The EQ-5D-3L [5] has been utilized to measure life quality for various medical and psychological disorders [10]. It is purported to assess five quality of life domains (i.e., mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), however several factor analysis studies of this measure yielded only one general life quality factor [11-13], rather than five factors described in the measure's manual. Hence, the EQ-5D-3L provides only one general quality of life, therefore it limits the utility of the measure as well as does not provide assessments of the four primary life quality of life. Another life quality instrument was developed to measure individuals with chronic pain life quality. The Quality-of-Life Scale (QOLS) [14] was designed to specifically assess the degree of satisfaction people with chronic pain experienced with their level of functioning. The QOLS was reported to measure seven broad areas of life quality (e.g., social, family, recreation,

intellectual development, daily living, romantic experiences, and hope), however it did not include three primary areas of life quality such as physical health, psychological health, vocational/economic status which are important primary dimensions of life quality necessary to support the instrument's ecological validity [3,15-17]. This measure also suffered from some normative and sub factor parametric deficiencies. The QOLS sub factors' reliabilities and stability are questionable due to the number of items assessing each sub factor (i.e., the QOLS uses only one question per sub factor) [18,19]. Additionally, the seven factors were not adequately validated against other quality of life measures. Although there is no commonly accepted quality of life standard measure [20,21], the Sickness Impact Profile [22] has been widely used to validate other quality of life measures [3]. Another fundamental criticism of the QOLS arises from the authors' normative sample. Chibnall and Tait [14] provided norms for a mixed chronic pain group, but did not develop norms for other common pain diagnostic groups or provide data for a healthy control group. Without such comparison groups, the individual with chronic pain responses to the QOLS cannot be evaluated with regard to variations from the norm for their own or other diagnostic groups. Finally, Fitzgerald et al. [23] conducted a factor analysis on the QOLS. These researchers reported the measure's solution yielded just one factor, general quality of life, rather than the seven life quality domains reported by Chibnall and Tait's [14]. Similar to the EQ-5D-3L measure, the QOLS lacks assessment of the four life quality domains.

Although the area of chronic pain lends itself to quality-of-life measurement due to the chronicity of symptoms and the negative effects on the patient's life quality, as indicated above, the authors could find only two quality of life measures, QOLS [14] and the EQ-5D-3L [5] which assess the individual with chronic pain life quality. Furthermore, these two measures have a number of serious normative deficiencies discussed above. Furthermore, the two measures evaluate only one general quality of life factor, rather than the five (EQ-5D-3L) and seven (QOLS) revealed from factor analysis studies [11,13,23] which threatens their utility in chronic pain research.

Despite the availability of the EQ-5D-3L and QOLS, the majority of published studies have evaluated life quality for individuals with chronic pain by using a single Visual Analogue Scale (VAS) [24], such as, Turner et al. [25] and Page et al. [26] studies. Using a single VAS factor to measure life quality is an inappropriate way to evaluate the four primary life quality domains, which results in invalid research findings. Such findings lead to negative life consequences for individuals such as denying long-term opioid treatment, as well as seriously threatening the valid assessment of medical/psychological treatments [27].

This investigation was designed to develop a Pain Quality of Life Measure (PQLM) which measures the four life quality domains [3,15,16]. The research will evaluate the validity and reliability of the measure as well as provide a factor analysis of the PQLM to determine if the measure assesses the primary life quality domains. Further, the study provides normative data for various chronic pain diagnostic groups, as well as healthy individuals, in order for the investigator and/or clinician to compare an individual's life quality with similar and other chronic pain disorders, as well as to individuals without chronic pain.

## Materials and Methods

### Participants

Participants were recruited from regular chronic pain clinic visits. Individuals with chronic pain were either asked to participate in the study during their clinic visit, or telephoned by the first author and asked to participate. Healthy patients were identified by their primary physician as a possible study participant. The first author then phoned the individual, and asked him/her to participate in the study. Written informed consent was obtained from all individuals involved in the study.

A total of 381 (286 women; 96 men) individuals were approached to take part in the study. Of the 75 healthy individuals asked to participate, 46 agreed (61.3%), whereas 227 of the 306 individuals with chronic pain were successfully recruited (74.2%). The 273 participants were grouped into six major classifications using their medical specialist and/or primary care provider diagnoses: 52 participants with chronic tension, migraine, or mixed headaches (Headache), 46 individuals with upper extremity and cervical pain (Upper Extremity), 52 participants with low back pain (Low Back Pain), 61 individuals with multiple pain complaints of upper extremities and low back (Mixed Pain), 16 patients with temporomandibular joint pain (TMJ), and 46 healthy individuals who did not report any type of pain.

Mean age, education level, and sexual identity for each group and total sample are shown in Table 1. Significantly more women were found in each group except in the Low Back Pain group. The TMJ and Upper Extremity pain groups contained the highest proportion of women to men. A MANOVA was conducted on Age and Education, revealing a significant Hotelling  $T = 0.130$ ,  $F(10, 530) = 3.448$ ,  $p = .0001$ . Univariate analysis yielded a significant difference for Age,  $F(5, 267) = 4.395$ ,  $p = .001$ , and Education,  $F(5, 267) = 2.538$ ,  $p = .029$ , among the groups. Tukey HSD post hoc pairwise comparisons illustrated significant differences between participant groups. The Mixed Pain participants were significantly older than either Upper Extremity individuals with chronic pain or TMJ pain participants. Individuals with chronic Low Back Pain reported significantly less education than Healthy individuals.

	Diagnostic Pain Group						
	Headache	Upper Extremity	Low Back Pain	Mixed Pain	TMJ	Healthy	Total
Sample Size	52	46	52	61	16	46	273
<b>Sex</b>							
M	10	7	25	16	1	12	71
F	42	39	27	45	15	34	202
Age	40.94 (9.22)	36.37 (8.49)	41.46 (10.06)	43.72 (10.25)	33.50 (8.34)	41.19 (13.03)	40.49 (10.50)
Education	13.06 (2.29)	12.96 (1.74)	11.98 (1.79)	12.71 (2.40)	13.50 (2.48)	13.26 (2.14)	12.82 (2.16)
<b>Sex Differences Within Group</b>							
	19.69*	22.26*	1.08*	13.78*	12.25*	10.52*	62.86*
<b>Note 1:</b> Chi-Squared df = 1 <b>Note 2:</b> *p<.005 <b>Note 3:</b> (): Standard Deviation							

**Table 1:** Mean age, sex, and educational level and sample for each diagnostic groups.

## Procedure

The study was approved by Gesinger Medical Center Institutional Research Board, project #90C-189, prior to commencement of the research. Questionnaires were mailed to participants to complete and return. Participants with chronic pain were paid five dollars for completing the questionnaires. Healthy individuals completed two sets of questionnaires one month apart to provide test-retest information. These participants were paid five dollars for each set of completed questionnaires, for a total of 10 dollars. Noncompliance of questionnaire completion instituted a phone call by the first author to remind participants to complete the measures. The participant was dropped from the study following noncompliance after two telephone requests.

## Measures

### Pain Quality of Life Measure (PQLM)

The PQLM, was developed by the authors exclusively for use with chronic pain patients. Items for the PQLM were adapted from the QOLS [14], the Sickness Impact Questionnaire (SIP) [22,28], the EQ-5D-3L [5], and SF-36 [29]. The initial pool of 45 items was reviewed by the authors and predoctoral clinical psychology interns for conceptual fit of the items with the four life quality domains: Physical Health, Social Support, Psychological Health, and Vocational/Economic Status. From this review, 36 items (nine items per life quality domain) were selected by consensus. The final 36 item PQLM was then rated by study the participants on a six-point Likert factor, from “1” (strongly disagree) to “6” (strongly agree) as to how well the item described their life quality during the last month. The PQLM total scores ranged from 36 to 216.

## Validity Measures

In order to validate the PQLM, standardized measures were used to confirm the four life quality domains. The McGill Pain Questionnaire’s Pain Rating Index (PRI) [30], VAS (Visual Analogue Factor) [31], and the Psychosomatic Check list (PSC) [32] were utilized to authenticate the Physical Health Status domain. Psychological Health domain was measured by the Profile of Mood States (POMS) [33], whereas the Social Support domain was confirmed by the Duke-UNC Functional Social Support Questionnaire (SST) [34]. Finally, the Sickness Impact Profile (SIP) [22,28] validated the Global Quality of Life and Vocational/Economic Status domain.

### Physical Health Status

Physical Health Status over the previous month was by confirmed by the PRI index30 and a 100mm visual analog factor VAS [31]. The PRI index was calculated by summing the highest racked score for each PRI pain adjective group the patient endorsed on the McGill. The VAS score was measured in millimeters from the left end of the 100-millimeter line (‘No Pain’) to the patient’s mark on the line at the right end (‘Extreme Pain’). The PSC [32] consists of 17 common physical symptoms, which the individual rated according to frequency of symptom occurrence (from “0”, not a problem, to “4”, occurs daily) and how bothersome (i.e., intensity) these symptoms are (from “0”, not a problem, to “4” extremely bothersome) on a Likert scale. The PSC was scored by multiplying frequency by intensity ratings for each symptom and then summing these across all 17 symptoms.

### Psychological Health

The Psychological Health domain was validated by the total score of the POMS [33]. The POMS is a 65 adjective self-report questionnaire which yielded six mood factors: Tension-Anxiety (TA), Depression- Dejection (DD), Anger-Hostility (AH), Vigor-Activity (VA), Fatigue-Inertia (FI), and Confusion-Bewilderment (CB). The Total Mood Disturbance (TMD) score was computed by subtracting the VA factor from the sum of the other five factors.

### Social Support

The social support domain was authenticated by the SST [34] total score. This questionnaire is an 11-item, six-point Likert scale which assesses Confidant Support (CS), Quantity Support (QS), Affective Support (AS), and Instrumental Support (IS).

### Global Quality of Life and Vocational/Economic Status

This life quality domain was validated by the SIP [22,28] which is a 136-item measure that assesses sickness-related dysfunction. The items are divided into two indexes: The Physical Index (SIPP) derived from Ambulation (A), Mobility (M), and Body care & Movement (BM) subscales; and the Psychosocial

Index (SIPPS) comprised of Social (SI), Communication (C), Alertness Behavior (AB), and Emotional Behavior (EB) subscales. A total score (SIP) was computed from the sum of SIPP, SIPPS, plus the miscellaneous subscales of the SIP: Sleep and Rest (SR), Eating (E), Work (W), Home Management (HM), and Recreational/Pastime (RP). The SIP was utilized to broadly confirm the PQLM, as well as to provide additional measures to validate the four life quality domains. In particular, the SIP’s miscellaneous subscales were used to authenticate the Vocational/Economic Status domain.

### Results

The PQLM was subjected to a principal component factor analysis with varimax rotation to determine the number of unique life quality domains assessed by the PQLM (Table 2). All factors with eigenvalues less than one were eliminated from the analysis [18], which resulted in a seven-factor solution that explained 64.42% of the questionnaire’s variance. These factors were labeled: General Health and Pain (HM), Ill Health (IH) Psychological Status (PS), Empathetic Social Support (ES), Friendships (FR), Housing and Transportation (HT), and Financial and Legal Concerns (FL), Questions for each PQLM domain are listed in Table 3.

Question	Factors						
	HM	ES	HT	PS	IH	FL	FR
Q1	<b>0.572</b>	0.285	-0.032	0.223	0.435	0.172	0.196
Q4	<b>0.582</b>	0.307	-0.102	0.263	0.326	0.213	0.134
Q8	<b>0.546</b>	0.219	-0.038	0.186	0.083	0.22	0.421
Q13	<b>0.679</b>	0.132	-0.039	0.386	0.173	0.174	0.211
Q16	<b>0.798</b>	0.104	0.182	0.17	-0.014	0.133	0.023
Q19	<b>0.536</b>	0.217	0.18	0.151	0.337	0.202	0.164
Q22	<b>0.489</b>	0.16	0.157	0.154	0.315	0.063	0.298
Q23	<b>0.79</b>	0.048	0.278	0.183	-0.035	0.101	0.101
Q24	<b>0.566</b>	-0.029	-0.024	0.18	0.1	-0.005	0.527
Q29	<b>0.67</b>	0.148	0.026	0.166	0.109	0.209	0.282
Q34	<b>0.689</b>	0.3	0.115	0.215	0.17	0.154	-0.01
Q36	<b>0.691</b>	0.191	0.082	0.194	0.191	0.194	-0.007
Q2	0.252	<b>0.632</b>	-0.085	0.212	0.183	0.268	0.107
Q6	0.151	<b>0.668</b>	0.177	0.046	0.094	-0.084	0.323
Q31	0.247	<b>0.643</b>	0.235	0.234	0.172	0.041	0.323
Q33	0.204	<b>0.752</b>	-0.017	0.246	0.026	0.186	0.032
Q20	0.023	0.064	<b>0.792</b>	0.029	0.122	0.207	0.103
Q26	0.258	0.077	<b>0.719</b>	0.161	-0.013	0.076	0.087
Q11	0.281	0.225	0.078	<b>0.558</b>	0.263	0.225	0.318
Q15	0.256	0.275	0.165	<b>0.682</b>	0.016	0.123	0.134

Q21	0.336	0.213	0.156	<b>0.48</b>	0.302	0.045	0.207
Q25	0.365	0.05	0.011	<b>0.686</b>	0.043	0.083	0.103
Q28	0.11	0.101	0.069	<b>0.777</b>	0.219	0.154	0.121
Q30	0.271	0.213	0.057	<b>0.679</b>	0.25	0.235	0.081
Q5	0.438	0.08	0.06	0.146	<b>0.461</b>	-0.141	-0.157
Q7	0.442	0.268	0	0.442	<b>0.447</b>	0.14	0.074
Q9	0.044	0.156	0.042	0.142	<b>0.749</b>	0.142	0.163
Q27	0.106	0.029	0.001	0.367	<b>0.535</b>	0.134	0.233
Q32	0.394	0.039	0.346	0.081	<b>0.485</b>	0.161	0.179
Q3	0.248	0.182	0.178	0.152	0.092	<b>0.746</b>	0.283
Q12	0.22	0.09	0.146	0.283	0.172	<b>0.761</b>	0.152
Q18	0.402	0.111	0.165	0.179	0.112	<b>0.631</b>	-0.079
Q10	0.143	0.382	0.132	0.084	0.19	0.098	<b>0.611</b>
Q14	0.196	0.217	0.209	0.372	0.156	0.027	<b>0.545</b>
Q17	0.472	0.054	0.129	0.239	-0.017	0.329	<b>0.461</b>
Q35	-0.043	0.291	0.072	0.153	0.155	0.2	<b>0.458</b>
% Variance	18.82	8.28	4.99	11.19	7.29	6.79	7.06
Eigenvalues	14.68	2.02	1.63	1.47	1.22	1.13	1.04

**Note 1:** Health & Mobility (HM); Empathetic Social Support (ES); Housing & Transportation (HT); Psychological Status (PS); Ill Health (IH); Financial/Legal Concerns (FL); Friendships (FR)  
**Note 2:** Principal component factor analysis with varimax rotation. Factors with eigenvalues < 1.0 were dropped from the analysis. Total explained variance=64.42%

**Table 2:** Factor analysis of the PQLM which determined life quality domains.

<b>Physical status and functional abilities</b>	
<b>General Health and Pain (HM)</b>	
1	I suffer from a good deal of body &/or head pain
4	I have enough energy to do the things I want to do
8	I am able to work towards my vocational/educational goals
13	I am in good health
16	I have trouble walking
19	My sleep is sound and restful
22	My sex drive is adequate
23	I have trouble getting up from a chair
24	I engage in physical recreation; such as, swimming, bowling, bike riding, running, tennis, etc.
29	I am able to work full-time at my job or house duties
34	I am often stiff and sore in the morning
36	I often experience muscle spasms

	<b>III Health (IH)</b>
5	I need to take medication prescribed by a physician
7	I generally feel tired or fatigued
9	I am troubled by severe headaches
27	I frequently suffer from nausea or stomach upset
32	My appetite is adequate
	<b>Psychological status and well-being</b>
	<b>PSYCHOLOGICAL STATUS (PS)</b>
11	I am irritable much of the time
15	I experience periods of intense anger
21	I have trouble concentrating
25	I often worry about my health
28	I generally feel anxious or nervous
30	I often feel sad or depressed
	<b>Social interaction</b>
	<b>Empathetic Social Support (ES)</b>
2	People generally understand my medical problems
6	I have people whom I can talk with about my problems
31	I have a number of people I can turn to for help
33	Other people understand how severe my pain is
	<b>Friendships (FR)</b>
10	I talk frequently with friends &/or co-workers
14	I joke frequently with other people
17	I often attend recreational activities; such as going to the movies, sports events, eating out shopping, etc.
35	I know other people with similar problems as me
	<b>Economic status and factors</b>
	<b>HOUSING &amp; TRANSPORTATION (HT)</b>
20	I have adequate housing
26	I have adequate means of transportation
	<b>FINANCIAL/LEGAL CONCERNS (FL)</b>
3	I have enough money to meet everyday expenses
12	I have grave financial concerns &/or difficulties
18	I have legal concerns &/or difficulties

**Table 3:** Pain Quality of Life Measure (PQLM).

Each PQLM factor score, assessing a particular life quality domain, was calculated by summing the total items for all questions in each factor (see Table 3 for question/factor inclusion). The seven quality of life factors were grouped into the four primary life quality domains, according to how well each fit with are particular primary domains, based on their contextual basis. The physical status and functional ability domain contained the HM and IH factors. Psychological status and well-being quality of life domain consisted of one factor, PS. Social interaction domain contained two factors, ES and FR. The last quality of life domain, vocational/economic status, consisted of two factors, HT and FL.

In order to obtain a life domain score, the questions in the particular domain were summed together. For example, the ES domain total score was calculated by summing items on questions 2, 6, 31, & 33. The total PQLM score was computed by summing

the items for all 36 questions. The PQLM items were written in the positive form, therefore high PQLM scores indicate high perceived life quality.

Internal reliability of the total PQLM was very high (Alpha coefficient = .957). Alpha coefficients for the seven-factors ranged from .683 (Factor 3, HT) to .934 (Factor 1, HM), see Table 4. All PQLM questions had significant internal consistency with individual item reliability ranging from a low of .322 (Question 20) to a high of .792 (Question 13). All factor correlations were significant (see Table IV), indicating that the seven PQLM quality of life domains are conceptually related. Significant PQLM inter-factor correlations ranged from .285 to .710. The HM and PS factors demonstrated the highest association, whereas the ES and HT factors illustrated the lowest association.

	Alpha Coefficient	Test-retest r (N=41)	Inter-factor Correlations (N=273)						
			HM	ES	HT	PS	IM	FL	FR
HM	0.934	0.908	----	0.608	0.374	0.71	0.686	0.623	0.639
ES	0.802	0.812	----	----	0.285	0.595	0.521	0.463	0.633
HT	0.683	0.514	----	----	----	0.334	0.293	0.388	0.367
PS	0.877	0.837	----	----	----	----	0.677	0.58	0.638
IM	0.732	0.814	----	----	----	----	----	0.499	0.54
FL	0.755	0.741	----	----	----	----	----	----	0.547
FR	0.698	0.618	----	----	----	----	----	----	----
Total	0.957	0.87	----	----	----	----	----	----	----

**Note 1:** Health & Mobility (HM); Empathetic Social Support (ES); Housing & Transportation (HT); Psychological Status (PS); Ill Health (IH); Financial/Legal Concerns (FL); Friendships (FR)  
**Note 2:** All Test-retest correlations are significant to at least  $p < .005$   
**Note 3:** All inter-scale correlations are significant to at least  $p < .0001$  (Bonferroni probabilities), Bartlett Chi-Square (21)=971.24,  $p < .0001$ .

**Table 4:** Alpha-coefficients, test-retest reliability, and inter-factor correlations of the PQLM.

Forty-one healthy participants responded to the PQLM one-month later to assess test-retest reliability for the questionnaire. Test-retest healthy control individuals' responses yielded an 89.1% compliance value (41/46). All PQLM factors and total score demonstrated significant test-retest correlations, ranging from .514 to .908 (see Table IV). Hence, the PQLM is very stable over a one-month time period for healthy individuals.

To determine the validity of the PQLM factors and total score, correlation coefficients were computed among the PQLM factors and standardized measures (Table 5). All validity coefficients were significant to at least the  $p < .002$  level and ranged from -.227 to -.842.

The HM and IH factors were significantly associated to physical symptoms and pain intensity (PSC, VAS, SIPP, & SIP). The social support factors (ES & FR) were significantly correlated to the two social support measures (SST & SI) empathetic social support (ES) was highly associated with confident support (CS) and affective support (AS), while friendship (FR) was highly correlated with quality support (QS) and CS. Although no standardized measure directly assessed the constructs evaluated by the HT factor, a number of significant correlations were found (Table 5). HT was strongly associated to physical symptoms (PSC & SIP), pain (VAS & PRI), social support (SST), emotional behavior (EB), and Home Maintenance (HM). As expected, the psychological (PS) factor

was correlated with psychological measures (TMD, EB, & SIPPS). Conceptually, the FL factor was significantly correlated to the Work factor of the SIP. Other strong associations to the FL factor were PSC and SIP. Finally, the total PQLM score validity correlations ranged from .503 (AS) to -.845 (PSC) when compared to the other study measures.

Measure	HM	ES	HT	PS	IH	FL	FR	Total
PSC	-0.808	-0.569	-0.415	-0.675	-0.754	-0.669	-0.57	-0.845
VAS	-0.844	-0.49	-0.347	-0.583	-0.69	-0.512	-0.551	-0.798
PRI	-0.73	-0.475	-0.392	-0.558	-0.697	-0.577	-0.444	-0.739
SIPP	-0.731	-0.422	-0.325	-0.507	-0.498	-0.552	-0.494	-0.692
CS	0.526	0.65	0.318	0.51	0.455	0.508	0.56	0.627
QS	0.402	0.464	0.315	0.442	0.357	0.51	0.522	0.516
AS	0.374	0.649	0.315	0.429	0.351	0.377	0.481	0.503
SST	0.484	0.68	0.344	0.498	0.407	0.474	0.573	0.593
SI	-0.629	-0.553	-0.227	-0.651	-0.57	-0.516	-0.564	-0.703
HOM	-0.716	-0.456	-0.344	-0.531	-0.536	-0.588	-0.51	-0.704
TMD	-0.653	-0.588	-0.342	-0.787	-0.61	-0.571	-0.562	-0.763
EB	-0.687	-0.503	-0.358	-0.68	-0.569	-0.557	-0.556	-0.738
SIPPS	-0.712	-0.542	-0.304	-0.709	-0.622	-0.578	-0.597	-0.773
W	-0.702	-0.396	-0.268	-0.54	-0.51	-0.475	-0.523	-0.676
SIP	-0.824	-0.559	-0.361	-0.703	-0.659	-0.642	-0.627	-0.842

**Note 1:** Health & Mobility (HM); Empathetic Social Support (ES); Housing & Transportation (HT); Psychological Status (PS); Ill Health (IH); Financial/Legal Concerns (FL); Friendships (FR)

**Note 2:** Psychosomatic Checklist (PSC); Pain Visual Analog Scale (VAS); McGill Pain Rating Index (PRI); Physical Index (SIPP); Confidant Support (CS); Quantity Support (QS); Affective Support (AS); Social Support Total (SST); Social Index (SI); Home Management (HOM); Total Mood Disturbance (TMD); Emotional Behavior (EB); Psychosocial Index (SIPP); Work (W); Sickness Impact Total (SIP)

**Note 3:** N=273; df=271

**Note 4:** All correlations are significant to at least  $p < .002$ .

**Table 5:** Validity correlations for the PQLM.

Means and standard deviations for the PQLM are presented in Table 6. As can be seen from the Table 6, the Mixed Pain group illustrated the lowest total quality of life, whereas the healthy patients demonstrated the highest life quality. To further evaluate differences among the six PQLM diagnostic groups, a MANOVA was conducted on the PQLM factors, which revealed a significant Multivariate Hotelling  $T = 2.215$ ,  $F(35,1297) = 16.417$ ,  $p < .0001$ . Univariate ANOVAs were then calculated on each factor and the total score. All analyses were significant: HM,  $F(5,267) = 86.68$ ,  $p < .0001$ ; Soc1,  $F(5,267) = 12.74$ ,  $p < .0001$ ; HT,  $F(5,267) = 4.71$ ,  $p < .0001$ ; PS,  $F(5,267) = 16.81$ ,  $p < .0001$ ; IH,  $F(5,267) = 23.35$ ,  $p < .0001$ ; FL,  $F(5,267) = 15.52$ ,  $p < .0001$ ; FR,  $F(5,267) = 14.44$ ,  $p < .0001$ ; and Total,  $F(5,267) = 48.44$ ,  $p < .0001$ . Post hoc Tukey HSD multiple pairwise comparisons among PQLM factors and

total scores for the participant groups were then calculated (Table 7). In general, the HM factor and PQLM total score were the most sensitive measures which differentiated among diagnostic groups. The HT factor was the least sensitive factor. The two social support factors (ES and FR) were equally sensitive in differentiating pain groups from healthy individuals. As expected, Low Back Pain and Mixed Pain participants illustrated the worst HM. The Mixed Pain and Headache individuals reported the highest level of IH quality of life. Mixed Pain, Low Back Pain, and Upper Extremity study members reported the lowest PS life quality, as well as the lowest Financial and Legal quality of life. Finally, significant differences in HT life quality were found between healthy individuals and participants experiencing pain in the Upper Extremity, Low Back, and Mixed body areas.



PQLM Factor	Pain Diagnostic Group					
	Headache N=52	Upper Extremity N=46	Low Back Pain N=52	Mixed Pain N=61	TMJ N=16	Healthy N=46
HM	44.14 (11.39)	32.91 (11.79)	24.77 (10.21)	25.05 (11.52)	48.5 (10.63)	61.46 (7.64)
ES	14.35 (4.76)	13.78 (4.55)	13.88 (4.92)	12.23 (4.89)	15.81 (5.24)	19.13 (3.6)
HT	10.92 (1.86)	10.28 (2.13)	10.15 (2.2)	10.47 (1.8)	11 (2.19)	11.76 (0.95)
PS	20.15 (6.71)	17.22 (7.21)	16.37 (6.87)	16.02 (6.81)	22.31 (6.36)	26.85 (7.63)
IH	15.39 (5.33)	16 (5.97)	16.37 (5.13)	14.61 (4.8)	16.56 (3.72)	24.13 (3.76)
FL	12.42 (4.53)	10.01 (4.24)	8.85 (4.46)	10.39 (4.81)	13.75 (3.51)	15.54 (2.86)
FR	16.06 (4.35)	14.15 (4.24)	13.92 (4.65)	14.21 (4.81)	16.94 (3.73)	20.11 (3.21)
TOTAL	133.42 (29.36)	114.41 (30.18)	104.31 (29.81)	102.98 (30.79)	144.88 (28.22)	178.98 (22.14)

**Note 1:** Health & Mobility (HM); Empathetic Social Support (ES); Housing & Transportation (HT); Psychological Status (PS); Ill Health (IH); Financial/Legal Concerns (FL); Friendships (FR).  
**Note 2:** Total N=273.  
**Note 3:** ( ) Standard Deviation.

**Table 6:** Pain quality of life measure means and standard deviations.

HM	1-2; 1-3; 1-4; 1-6; 2-3; 2-4; 2-5; 2-6; 3-5; 3-6; 4-5; 4-6; 5-6
ES	1-6; 2-6; 3-6; 4-6
HT	2-6; 3-6; 4-6
PS	1-4; 1-6; 2-6; 3-5; 3-6; 4-5; 4-6
IH	1-6; 2-6; 3-6; 4-6; 5-6
FL	1-3; 1-6; 2-5; 2-6; 3-5; 3-6; 4-5; 4-6
FR	1-6; 2-6; 3-6; 4-6
Total	1-2; 1-3; 1-4; 1-6; 2-5; 2-6; 3-5; 3-6; 4-5; 4-6; 5-6

**Note 1:** Health & Mobility (HM); Empathetic Social Support (ES); Housing & Transportation (HT); Psychological Status (PS); Ill Health (IH); Financial/Legal Concerns (FL); Friendships (FR)  
**Note 2:** 1 = Headache; 2 = Upper Extremity Pain; 3 = Low Back Pain; 4 = Mixed Pain; 5 = TMJ Pain; 6 = Healthy Control

**Table 7:** Significant Tukey HSD multiple pairwise comparisons among PQLM pain groups and total score.

## Discussion

The PQLM is a valid and reliable quality of life questionnaire for individuals with severe, continuous, chronic pain. Factor analysis of the questionnaire was not consistent with the four primary life quality domains (Physical Health, Social Support, Psychological Health, and Vocational/Economic Status); instead, the analysis yielded seven quality of life domains assessing: General Health and Pain, Ill Health, Psychological Status, Empathetic Social Support, Friendships, Housing & Transportation, Financial & Legal Concerns. However, these seven domains could be

conceptually group into the four primary life quality domains. In general, participants with Upper Extremity pain, Low Back pain, and Mixed pain participants reported lower overall life quality than the Headache, TMJ, or Healthy study individuals. Specifically, the former groups acknowledged consistently poor quality of life in the following domains: HM, ES, FL, and PS quality of life. Individuals with chronic Headaches reported lower IH quality of life than either Upper Extremity or Low Back Pain participants. Individuals with chronic TMJ pain demonstrated consistently better life quality across all domains, when compared to the other

chronic pain diagnostic groups. Taken together, our results suggest that people experiencing chronic pain have significantly poorer quality of life than healthy individuals. Furthermore, general life quality varied among different chronic pain diagnostic groups. The specific life quality domain most affected by the participant chronic pain varied with the nature and location of the individual's pain.

This is the first quality of life scale that yielded seven life quality domains demonstrated by factor analysis. The PQLM provides a more valid and reliable quality of life measure when compared to the EQ-5D-3L [5] or QOLS [14]. Additionally, the PQLM's factor of analysis yielded seven life quality factors which were conceptually comparative to the four primary quality of life domains, whereas the former two measures yielded only one general life quality domain based on factor analyses [11-13]. Hence, the PQLM provides more useful and specific information concerning individuals with chronic pain quality of life than the EQ-5D-3L [5] or QOLS [14]. The PQLM measure is superior to the VAS, EQ-5D-3L, or QOLS in evaluating an individual with chronic pain quality of life.

## Conclusions

Investigators reviewing past and future chronic pain quality of life research which does not use measures similar to the PQLM should view this literature with extreme caution. As stated above, the use of a VAS scale of life quality is an invalid assessment of the construct, consequentially, research using the VAS is not valid and should be excluded for the chronic pain research.

This study provides researchers and clinicians with an accurate, reliable, and valid method to measure chronic pain patients' quality of life. Future research should be directed at expanding the normative sample of the PQLM to include more specific chronic pain diagnostic groups, as well as more closely examining specific differences among pain groups. Additional research should examine the PQLM factor structure with a larger participant sample to confirm the measure's factor stability. Finally, more questions should be developed for the PQLM's HT and FL factors, since these two factors contain only two and three questions, respectively. Developing more questions for these factors would lead to increased stability of the HT & FL factors.

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## Ethical Guidelines

This study was conducted according to the American Psychological Association's ethical guidelines for human research.

Additionally, the research was approved by Geisinger Medical Center's Institutional Research Board.

**Conflict of Interest:** David Longo, Ph.D. has no conflicts of interest to declare. Ashley Tarrant, PsyD has no conflicts of interest to declare.

## References

1. Chronic Disease Fact Sheets (2022) National Center for Chronic Disease Prevention and Health Promotion.
2. Olsen JA, Misajon RA (2020) A conceptual map of health-related quality of life dimensions: key lessons for a new instrument. *Qual Life Res* 29: 733-743.
3. Spilker B (1990) *Quality of Life Assessments in Clinical Trials*. New York City, NY: Raven Press.
4. Darabos K, Tucker C, Brumley L, King-Dowling S, Butler E, et al. (2023) Development and Validation of a Measure of Adolescent and Young Adult Goal-Based Quality of Life (MAYA-GQOL). *Qual Life Res* 32: 2307-2317.
5. Neesweg M (1990) EuroQol Research Foundation. Rotterdam. The Netherlands Publishing.
6. Jones P, Drummond PD (2021) A Summary of Current Findings of Quality-of-Life Domains and a Proposal for Their Inclusion in Clinical Interventions. *Front Psychol* 12: 747435.
7. Sintonen H (2001) The 15D instrument of health-related quality of life: properties and applications. *Ann Med* 33: 328-336.
8. Liu P, Wu Y, Xiao Z, Gold LS, Heagerty P, et al. (2023) Estimating individualized treatment effects using a risk-modeling approach: an application to epidural steroid injections for lumbar spinal stenosis. *Pain* 164: 811-819.
9. Arnold R, Ranchor A, Sanderman R, Kempen G, Ormel J (2004) The relative contribution of domains of quality of life to overall quality of life for different chronic diseases. *Qual Life Res* 13: 883-896.
10. Sterling M, Andersen T, Carroll L, Connelly L, Côté P, et al. (2023) Recommendations for a core outcome measurement set for clinical trials in whiplash associated disorders. *Pain* 164: 2265-2272.
11. Bilbao A, Martín-Fernández J, García-Pérez L, Mendezona JI, Arrasate M, et al. (2022) Psychometric Properties of the EQ-5D-5L in Patients with Major Depression: Factor Analysis and Rasch Analysis. *J Ment Health* 4: 506-516.
12. Feng Y, Kohlmann T, Janssen M, Buchholz I (2021) Psychometric properties of the EQ-5D-5L: a systematic review of the literature. *Qual Life Res* 30: 647-673.
13. Wahlber M, Zingmark M, Stenberg G, Munkholm M (2021) Rasch Analysis of the EQ-5D-3L and the EQ-5D-5L In Persons with Back and Neck Pain Receiving Physiotherapy in a Primary Care Context. *European Journal of Physiotherapy* 23: 102-109.
14. Chibnall J, Tait R (1990) The Quality-Of-Life Factor: A Preliminary Study with Chronic Pain Patients. *Psychology & Health* 4: 283-292.
15. Peterman AH, Cella D (2000) Quality of Life. In *Encyclopedia of Psychology*, Vol 6. Kazdin A, Ed, American Psychology Association Press: Washington, DC, pp: 491-495.
16. Power M (2003) Quality of Life. In *Positive Psychological Assessment: A Handbook of Models and Measures*. Lopez S, Snyder C, Eds. American Psychology Association Press: Washington, DC, pp: 427-441.

17. Wilson IB, Cleary P (1995) Linking clinical variables with health-related quality of life: A conceptual model of patient outcomes. *JAMA* 273: 59-65.
18. Dillon W, Goldstein M (1984) *Multivariate Analysis: Methods and Applications*. NYC: Wiley & Sons.
19. Keppel G (1973) *Design and Analysis: A Researcher's Handbook*. Englewood Cliffs, NJ: Prentice-Hall.
20. Guyatt GH, Feeny DH, Patrick DL (1993) Measuring Health-Related Quality of Life. *Ann Intern Med* 118: 622-629.
21. McGee H (2004) Quality of Life. In *Health Psychology*. Kaptein A, Weinman J (Eds.) Malden, MA: Blackswell Publishing. pp 234-257.
22. Bergner M, Bobbitt R, Pollard W, Martin D, Gilson B (1976) The sickness impact profile: validation of a health status measure. *Med Care* 14: 57-67.
23. Fitzgerald S, Li J, Rumrill P, Bishop L, Merchant R (2015) Examining the Factor Structure and Psychometric Properties of the Quality-of-Life Factor among People with Multiple Sclerosis. *Rehabilitation Research, Policy, and Education* 29: 165-182.
24. Hayes M, Patterson D (1921) Experimental Development of the Graphic Rating Method. *Psychological Bulletin* 18: 98-99.
25. Turner JA, Shortreed S, Saunders K, LeResche L, Von Korff M (2016) Association of levels of opioid use with pain and activity interference among patients initiating chronic opioid therapy: a longitudinal study. *Pain* 157: 849-857.
26. Page MG, Gauvin L, Sylvestre M, Nitulescu R, Dyachenko A, et al. (2022) An Ecological Momentary Assessment Study of Pain Intensity Variability: Ascertaining Extent, Predictors, and Associations With Quality of Life, Interference and Health Care Utilization Among Individuals Living With Chronic Low Back Pain. *J Pain* 23: 1151-1166.
27. Dowell D, Ragan KR, Jones C, Baldwin G, Chou RC (2022) CDC Clinical Practice Guideline for Prescribing Opioids for Pain – United States, 2022. *MMWR Recomm Rep* 71: 1-95.
28. Bergmer M (1985) Measurement of health status. *Med Care* 23: 696-704.
29. Ware J, Sherbourne C (1992) The MOS 36-Item Short-Form Health Survey (SF-36: Conceptual Framework and Item Selection. *Med Care* 30: 473-483.
30. Melzack R (1975) The McGill Pain Questionnaire: major properties and scoring methods. *Pain* 1: 277-299.
31. Scott J, Huskisson E (1976) Graphic representation of pain. *Pain* 2: 175-184.
32. Attanasio V, Andrasik F, Blanchard E, Arena J (1984). Psychometric Properties of the SUNYA Revision of the Psychosomatic Symptom Checklist. *J Behav Med* 7: 247-257.
33. McNair D, Lorr M, Droppleman L (1981) *EITS Manual for the Profile of Mood States*. San Diego, CA: Educational and Industrial Testing Service.
34. Broadhead WE, Gehlbach SH, de Gruy FV, Kaplan BH (1988) The Duke-UNC Functional Social Support Questionnaire. Measurement of social support in family medicine patients. *Med Care* 26: 709-723.