Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

Patient Perspectives on the Effectiveness, Ease of Use, and Satisfaction of Pain Rating Scales for People with Chronic Pain

Student Investigator's Name

Adam Betcher

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Scholarly Projects Curriculum

Co-Investigators *(Names, departments; institution if not OHSU)*

Rachel Sinit, OMS-II, Western University, Clarice Martinez deCastro, OMS-II, Western University, Madeleine Stack, OMS-II, Western University, Danielle Weismann, OMS-II, Western University, Nicholas Scrivens, OMS-II, Western University, Taryn Caroll, OMS-II, Western University, Rebecca Rdesinski, MPH, OHSU, Edie Sperling, DPT, OHSU, Kimberly Mauer MD, OHSU

Mentor's Name

Kimberly Mauer, MD

Mentor's Department

Anesthesia

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Concentration Lead's Name

Peter Mayinger

Project/Research Question

Which pain scales do patients with chronic pain perceive as most satisfying, easy to use, and effective at describing pain?

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*

Research study

Key words *(4-10 words describing key aspects of your project)*

Data quantifying pain scale preferences for patients with chronic pain

Meeting Presentations

If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

Not applicable

Publications *(Abstract, article, other)*

If your project was published, please provide reference(s) below in JAMA style.

Not applicable

Submission to Archive

Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

No restrictions

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Next Steps

What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

Further study with a larger sample size including the collection of demographic data would aid in generalizing the findings of this study to the greater population of patients with chronic pain.

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This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.

X _____
Student's full name

Adam Atkins Betcher/ 3-16-2022

Mentor's Approval *(Signature/date)*

X _____
Mentor Name

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Introduction

Chronic pain is one of the most common reasons adults seek medical care.[1] Since chronic pain is a prevalent reason for utilization of the healthcare system, it is important that the screening tools used to gather pain histories are well understood by patients, easy to use, and effective at characterizing pain. The challenge in creating effective screening tools for chronic pain is that the experience of pain is multidimensional and can be difficult to characterize.[2] Providing patients with tools to describe their pain can enhance the ability of physicians to assess the need for diagnostic studies, intervention, and follow up. A number of studies have aimed to determine the accuracy of different pain scales, but few studies have explored patient perspectives on preferences between different pain scales for describing chronic pain.

Through literature review, five important pain scales with varying levels of sensitivity have been identified for comparison in this study. The five pain scales this study will focus on are the Numerical Pain Scale, Verbal Rating Scale, Brief Pain Inventory, Defense and Veterans Pain Rating Scale, and the Mankoski Pain Scale. In previous literature, the 11-point Numerical Rating Scale has commonly been used as a comparator to other pain scales because it has been shown to have high sensitivity for patient pain and some patient preference for use based on its simplicity.[3] Similar to the Numerical Rating Scale, the Verbal Rating Scale asks patients to characterize their pain with simple descriptors such as mild, moderate, and severe. Both the Numerical Rating Scale and the Verbal Rating Scale can be considered as "unidimensional" rating systems.[4] While they have been validated for their accuracy, they may oversimplify the complex experience of pain in a way that leaves medical providers with relatively impoverished information for medical decision making compared with other multidimensional assessments.

The Brief Pain Inventory, Defense and Veterans Pain Rating Scale, and the Mankoski Pain Scale have all been studied for their validity as reliable tools to assess pain. These scales provide a richer characterization of pain than unidimensional pain scales. The Brief Pain Inventory (BPI) is used to characterize the impact of pain on daily functioning and has been found to be effective at characterizing back pain in cancer patients.[5] The Defense and Veterans Pain Rating Scale (DVPRS) uses word descriptors, color coding, and pictorial facial expressions and has been shown to be favored by patients in a study of 307 active-duty service members.[6] The Mankoski Pain Scale characterizes the 11-point numerical rating scale with word descriptors and correlations of the impact of medication on treating pain. In one study, a majority of participants preferred the Mankoski Pain Scale over unidimensional pain scales.[7] Unfortunately, there is limited head-to-head data comparing the perceived effectiveness of multidimensional pain scales from the perspective of patients with chronic pain.

Methods

A cross-sectional study design was implemented to compare preferences between five pain scales for patients living with chronic pain. A 19-question survey was administered to patients aged 18 years or older with any diagnosis of chronic pain at OHSU's Comprehensive Pain Center. Participants were recruited through a linked description of the study that was included on their After Visit Summary (AVS) and through flyers that were displayed in the waiting room. The survey questionnaire was administered via a digital Qualtrics link. Seventy-five patients participated in the survey and no demographic data or patient identifying information was obtained.

Each of the five pain scales selected for comparison was assessed via the following statements: "This scale helped me effectively describe pain to my doctor", "This scale was easy to use and understand", and "I am satisfied with this pain scale." Participants were asked to rate the pain scales using "yes", "somewhat", "no", or "n/a" in response to each of those three statements. Participants also chose the pain scale that was most effective at describing their quality of pain and were provided space to free text their reasoning.

Kruskal-Wallis tests were run to assess whether there were statistically significant differences between pain scales in terms of perceived effectiveness, ease of use, and satisfaction. Kruskal-Wallis tests were chosen because the data was ordinal in structure and the study was comparing more than two pain scales. The free text responses were analyzed by identifying key code words and grouping those into themes. A pairwise comparison was also run for post hoc analysis to identify statistical significance of survey responses between individual pain scales.

Results

This study included 75 participants aged 18 years or older with any diagnosis of chronic pain recruited at OHSU Comprehensive Pain Center. We have no baseline description of the participants. No demographic data or patient identifying information was collected. Survey responses for each scale were grouped into three separate measures.

The Effectiveness measure was determined from nominal responses "Yes" "Somewhat" "No" and "Not Applicable" to the statement "This scale helped me effectively describe my pain." The number of respondents in the Effectiveness measure for each of the scales was similar ranging from 62 to 73. The results of the Kruskal Wallis test for the Effectiveness measure indicate that there is a statistically significant difference among the five pain scales (chi-square with four degrees of freedom = 60.9, $p < 0.0001$). The highest percentage of respondents rated the Defense and Veterans Pain Scale as effective with 62% answering "Yes" to the survey prompt. The highest number of respondents rated the Verbal Rating scale was ineffective with 42% answering "No" to the survey prompt. Other results for the Effectiveness measure are included in Table 1 and are represented graphically in Figure 1.

Table 1: Effective at Describing Pain by Pain Scale

Response	Pain Scale				
	BPI (n=70)	DVPRS (n=63)	MPS (n=62)	NRS (n=73)	VRS (n=66)
Yes	37%	62%	53%	11%	17%
Somewhat	44%	32%	27%	51%	41%
No	19%	6%	19%	38%	42%

The Ease measure was determined from nominal responses "Yes" "Somewhat" "No" and "Not Applicable" to the statement "This scale was easy to use and understand." The number of respondents in the Ease measure for each of the scales was similar ranging from 67 to 70. The results of the Kruskal Wallis test for the Ease measure indicate that there is a statistically significant difference among the five pain scales (chi-square with four degrees of freedom = 28.4, $p < 0.0001$). The highest percentage of respondents rated the Defense and Veterans Pain Scale (DVPRS) as easy to use and understand with 68% answering "Yes" to the survey prompt. The highest percentage of respondents rated the Numerical Rating Scale (NRS) as difficult to use and understand with 24% answering "No" to the survey prompt. The highest percentage of respondents answered "Somewhat" to the Ease measure prompt when evaluating the Brief Pain Inventory (BPI) with 55% of respondents making this selection. However, when evaluating the brief pain inventory, the fewest number of respondents answered "Yes" with only 22% selecting this response. Other results for the Ease measure are included in Table 2 and are represented graphically in Figure 1.

Table 2: Easy to Understand by Pain Scale

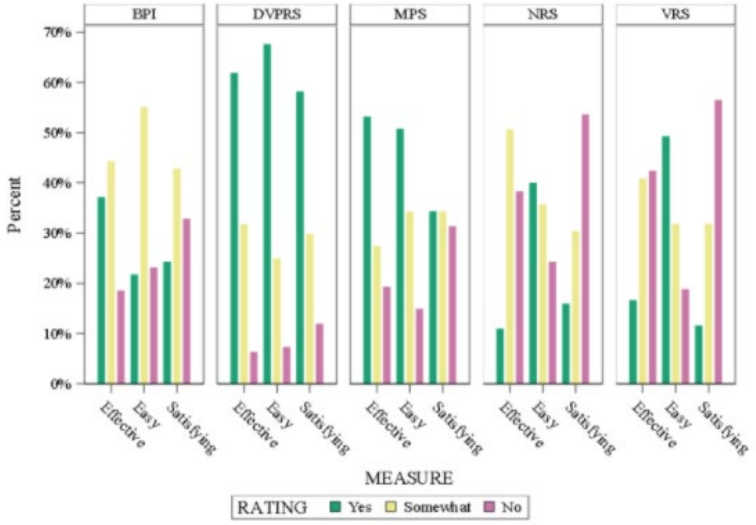
Response	Pain Scale				
	BPI (n=69)	DVPRS (n=68)	MPS (n=67)	NRS (n=70)	VRS (n=69)
Yes	22%	68%	51%	40%	49%
Somewhat	55%	25%	34%	36%	32%
No	23%	7%	15%	24%	19%

The Satisfaction measure was determined from nominal responses "Yes" "Somewhat" "No" and "Not Applicable" to the statement "I am satisfied with this pain scale." The number of respondents in the Satisfaction measure for each of the scales was similar ranging from 67 to 70. The results of the Kruskal Wallis test for the Satisfaction measure indicate that there is a statistically significant difference among the five pain scales (chi-square with four degrees of freedom = 54.5, $p < 0.0001$). The highest percentage of respondents rated the Defense and Veterans Pain Scale (DVPRS) as satisfactory with 58% answering "Yes" to the survey prompt. The highest percentage of respondents rated the Verbal Rating Scale (VRS) as unsatisfying with 57% answering "No" to the survey prompt. The highest percentage of respondents answered "Somewhat" to the Ease measure prompt when evaluating the Brief Pain Inventory (BPI) with 43% of respondents selecting this response. Other results for the Satisfaction measure are included in Table 3 and are represented graphically in Figure 1.

Table 3: Satisfied by Pain Scale

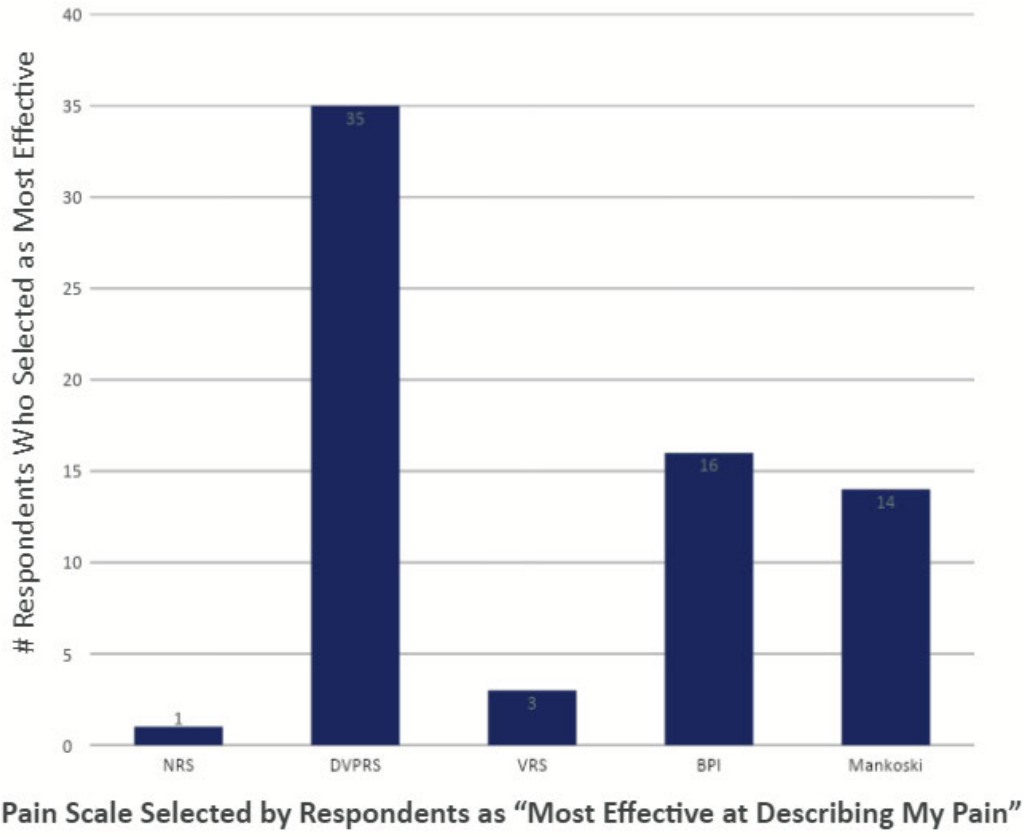
Response	Pain Scale				
	BPI (n=70)	DVPRS (n=67)	MPS (n=67)	NRS (n=69)	VRS (n=69)
Yes	24%	58%	34%	16%	12%
Somewhat	43%	30%	34%	30%	32%
No	33%	12%	31%	54%	57%

Figure 1: **Effectiveness, Ease, and Satisfaction with Pain Scales**



A total of 70 of the 75 survey respondents made a selection for the pain scale that was "most effective" overall at describing their pain. The highest number of respondents chose the Defense and Veterans Pain Scale (DVPRS) as "most effective" overall with 35 respondents making this selection. The fewest number of respondents selected the Numerical Rating Scale (NRS) as most effective with 1 respondent making this selection. A total of 3 respondents selected the Verbal Rating Scale (VRS) as "most effective" overall. A total of 16 respondents selected the Brief Pain Inventory (BPI) as "most effective" overall. A total of 14 respondents selected the Mankoski Pain Scale (MPS) as "most effective" overall. The selections for "most effective" pain scale are displayed graphically in Figure 2.

Figure 2: Scales Selected as "Most Effective" Overall



Participants' free text responses explaining their selection of "most effective overall" pain scale were analyzed by identifying key code words and grouping them into themes. Qualitative analysis of free text responses showed survey participants exhibited preference toward pain scales that included elements of simplicity, comprehensiveness, specificity, and ability to communicate the impact of pain on activities of daily living.

Pairwise comparisons for the Effectiveness, Ease, and Satisfaction measures were run as post-hoc analysis. For the Effectiveness measure, statistically significant differences in survey response were found between DVPRS-BPI, DVPRS-VRS, DVPRS-NRS, MPS-VRS, MPS-NRS, BPI-VRS, BPI-NRS with p values < 0.05. No statistical significance was found for DVPRS-MPS, MPS-BPI, and VRS-NRS in the Effectiveness measure with p values > 0.05.

For the Ease measure, statistically significant differences in survey response were found between DVPRS-MPS, DVPRS-BPI, DVPRS-VRS, DVPRS-NRS, MPS-BPI, VRS-BPI, with p values < 0.05. No statistical

significance was found for MPS-VRS, MPS-NRS, VRS-NRS and NRS-BPI in the effectiveness measure with p values > 0.05.

For the Satisfaction measure, statistically significant differences in survey responses were found between DVPRS-MPS, DVPRS-BPI, DVPRS-NRS, DVPRS-VRS, MPS-NRS, MPS-VRS, BPI-NRS, and BPI-VRS with p values >0.05. No statistical significance was found for MPS-BPI and NRS-VRS with p values >0.05.

Table 4: Pairwise Comparisons of Perceived Effectiveness

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
DVPRS-MPS	-24.916	16.194	-1.539	.124	1.000
DVPRS-BPI	44.090	15.720	2.805	.005	.076
DVPRS-VRS	-95.463	15.944	-5.987	<.001	.000
DVPRS-NRS	-98.155	15.566	-6.306	<.001	.000
MPS-BPI	19.173	15.787	1.215	.225	1.000
MPS-VRS	-70.546	16.010	-4.406	<.001	.000
MPS-NRS	-73.239	15.634	-4.685	<.001	.000
BPI-VRS	-51.373	15.531	-3.308	<.001	.014
BPI-NRS	-54.065	15.143	-3.570	<.001	.005
VRS-NRS	2.692	15.375	.175	.861	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 5: Pairwise Comparisons of Ease of Use

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
DVPRS-MPS	-30.872	15.738	-1.962	.050	.498
DVPRS-VRS	-36.588	15.622	-2.342	.019	.192
DVPRS-NRS	-54.730	15.567	-3.516	<.001	.004
DVPRS-BPI	79.457	15.622	5.086	<.001	.000
MPS-VRS	-5.715	15.681	-.364	.716	1.000
MPS-NRS	-23.857	15.626	-1.527	.127	1.000
MPS-BPI	48.585	15.681	3.098	.002	.019
VRS-NRS	18.142	15.510	1.170	.242	1.000
VRS-BPI	42.870	15.565	2.754	.006	.059
NRS-BPI	24.727	15.510	1.594	.111	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 6: Pairwise Comparisons of Satisfaction

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
DVPRS-MPS	-49.224	16.070	-3.063	.002	.033
DVPRS-BPI	61.816	15.897	3.888	<.001	.002
DVPRS-NRS	-96.079	15.954	-6.022	<.001	.000
DVPRS-VRS	-104.267	15.954	-6.536	<.001	.000
MPS-BPI	12.593	15.897	.792	.428	1.000
MPS-NRS	-46.855	15.954	-2.937	.003	.050
MPS-VRS	-55.043	15.954	-3.450	<.001	.008
BPI-NRS	-34.262	15.779	-2.171	.030	.449
BPI-VRS	-42.451	15.779	-2.690	.007	.107
NRS-VRS	-8.188	15.836	-.517	.605	1.000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same. Asymptotic significances (2-sided tests) are displayed. The significance level is .050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Discussion

There are few current studies comparing patient preferences between multidimensional pain scales such as the Mankoski Pain Scale (MPS), the Brief Pain Inventory (BPI), and the Defense and Veterans Pain Rating Scale (DVPRS). Studies have been completed to validate these multidimensional pain scales as well as other unidimensional pain scales such as the Numerical Rating Scale (NRS) and the Verbal Rating Scale (VRS) for their accuracy. However, more research is needed to better quantify patient perspectives on the effectiveness, ease of use, and satisfaction of pain rating scales for people with chronic pain.

In this study, Kruskal-Wallis tests for the Effectiveness measure, the Ease measure, and the Satisfaction measure indicate there is a significant difference in patient preference among the five pain scales in each of the three categories we evaluated (Effectiveness: $\chi 2= 60.9$, $p < 0.0001$, Ease: $\chi 2=28.4$, $p < 0.0001$, Satisfaction: $\chi 2=54.5$, $p< 0.0001$). DVPRS was most highly rated for efficacy, ease of use, and satisfaction. DVPRS was also selected as the most effective overall pain scale by the highest number of respondents. The NRS and VRS were rated as significantly less effective and less satisfying than the other scales. BPI was rated as the most difficult to use but was found to be somewhat satisfying and somewhat effective at describing pain by the greatest percentage of survey participants. MPS was rated as the second most easy to use and understand and the second most effective at describing pain.

Only one of seventy-five survey participants selected the Numerical Rating Scale as most effective overall. This may indicate that this commonly used scale does not meet the descriptive needs for patients in chronic pain. Similarly, only three patients selected the Verbal Rating Scale as most effective overall. Free text responses giving supportive reasoning for why these unidimensional scales were chosen centered around themes of appreciation for their simplicity. However, free text responses from patients who selected the other multidimensional scales as most effective had overlapping themes centered on the idea that the unidimensional scales are more effective for describing acute pain and do not capture the complexity of how chronic pain influences daily life.

Several other themes emerged from the qualitative data collected from participants' free text descriptions on preferences between the five pain scales. Among these responses, one respondent chose

the BPI because "I can draw where it hurts" suggesting the ability to mark pain location has an impact on satisfaction with pain scales for some people with chronic pain. Another respondent also selected the BPI as most effective based on its ability to mark pain locations but explained that it was the most difficult to use because "It covers multiple timelines, lets you outline areas and covers pain management. However, if I'm in severe pain that's like trying to read quantum physics when you have the flu. Overwhelming." This consideration of pain impacting the ability to interact with longer, more complex pain scales was noted to be a limiting factor for utilization by other survey participants as well.

One patient who selected MPS as most effective overall did so because it has "clear descriptions of what each number was which allows me to communicate with the doctor." However, another patient explained they did not choose the MPS as most effective because "we all treat/relieve our pain differently and that does not make it any less uncomfortable." A number of similar responses describing preferences against MPS included elements that centered on medication response being an inappropriate correlate for pain ratings because the effect of medications can vary over time.

Many of the responses collected about the effectiveness of the Defense and Veterans Pain Rating Scale had common themes that centered around preferences toward the multimodal visual approach the scale incorporates through its use of pictorial facial expressions, specific descriptors, and colors. Overall, qualitative analysis of free text responses showed survey participants exhibited preference toward pain scales that included elements of objectivity, comprehensiveness, specificity, and ability to communicate the impact of pain on activities of daily living.

No demographic data was obtained in this study. The only criteria for participation for patients at OHSU's Comprehensive Pain Clinic was that they be at least eighteen-year-old and have a clinical diagnosis causing chronic pain. In order to better generalize these findings to the greater population of people with chronic pain, this study should be repeated with a larger sample size and demographic data should be obtained.

Conclusions

The Numerical Rating Scale and the Verbal Rating Scale were rated as significantly less effective at describing pain and significantly less satisfying than the multidimensional pain scales included in this study with survey respondents demonstrating a strong preference for the Defense and Veterans Pain Rating Scale. This data suggests the Numerical Rating Scale and the Verbal Rating Scale may not meet the needs of many people living with chronic pain. Further study with a larger sample size that includes demographic data would aid in generalizing these findings to the greater population of patients living with chronic pain.

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