BRIEF COMMUNICATION

A Rasch analysis of the Current Opioid Misuse Measure for patients with chronic pain

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ABSTRACT

Objective: *Pilot study to assess psychometric indices of the Current Opioid Misuse Measure (COMM).*
Design: *Correlational.*
Setting: *Patients with varied chronic pain from a family healthcare center.*
Patients: *Inclusion criteria were over 21 years of age and prescribed opioids for any-origin noncancer pain; 46 patients were enrolled.*
Outcome measure(s): *The COMM, the Pain Self-Efficacy Questionnaire (PSE-Q), and the Patient Health Questionnaire-9 (PHQ-9) and a demographic questionnaire.*
Results: *Preliminary analysis indicated issues with dimensionality and scale use. Analysis after remedial procedures yielded unidimensionality and appropriate scale use, with the measure showing invariance across sex and low significant correlation with the PHQ-9 but not the PSE-Q.*
Conclusions: *The COMM had adequate reliability, measured a distinct construct, and no significant differential item function was found. However, scale use for this sample was questionable, and three items misfit the Rasch model. Replication with a larger sample is needed to ensure the measure's psychometric quality for diagnostic use.*

Roughly 100 million Americans are affected by chronic pain, with annual direct and indirect healthcare and productivity costs, accompanied by high social costs, exceeding $600 billion dollars.[1-4] About 9.4 million of the probable 100 million Americans diagnosed with chronic pain take opioids,[5-7] and more than 46 Americans die from opioid overdoses daily, with opioid use called "the worst addiction crisis an American has ever seen."[8] Opioid use has become a national healthcare problem, thus measures to identify the potential for misuse of opioids are increasingly important. The Current Opioid Misuse Measure (COMM)[9] assesses the risk of aberrant medication-related behavior among patients with chronic pain. Though developed to be a diagnostic tool providing a total score, the structure and response scale use for the COMM has not been empirically evaluated and additional evaluation of its psychometric properties has been called for.[10] This pilot study investigated the COMM dimensionality and scale use with Rasch analysis.[11] Reliability and correlation with two conceptually distinct measures are also reported.

Rasch modeling is the subject of an increasingly extensive literature in psychology and the health sciences and readers are referred to these sources for a thorough description of the indices provided in analyses.[12] Rasch fit indices determine whether each item meaningfully contributes to the measurement of a single construct by assessing the extent to which an item or person performs as expected. A principal components analysis of residuals explores the existence of a second factor in the data. An instrument is likely to be unidimensional if variance explained by the first dimension is substantial, the eigenvalue for the first contrast is less than or equal to 3.0, and the

variance explained by the first contrast is low.[13,14] Item and person reliability indices estimate the replicability of item placement and person ordering. Rasch analysis can also be used to identify gaps in the construct continuum by addressing targeting; eg, an item is "targeted" when there is a sufficient number of persons at an ability level comparable to the item's difficulty level to accurately estimate the item's difficulty. Where items or persons are not well targeted, there are gaps in the item set or sample. These gaps provide insight into the instrument's ability to measure what it is supposed to measure and ideas for future improvement.

The following questions were addressed:

1. Is the COMM unidimensional?
2. Is the use of the rating scale appropriate?
3. What measurement gaps and redundancies exist along the COMM continuum, indicating the need for adding or deleting items?
4. Are there differences in COMM item position by sex (differential item functioning)?
5. Is COMM person logit position related to scores on the PSE-Q and PHQ-9?

METHOD

Participants

Forty-six patients, at least 18 years old, experiencing chronic noncancer pain, currently on prescribed opioid medication, and undergoing treatment at a family healthcare center in the Denver metro area participated in the study. Sixteen of the participants identified as male and thirty as female; patients had undergone pain treatment from 6 months to more than 21 years, with modal categories of 6-10 and 11-15 years. Participants diagnosed with any form of chronic pain were included in this study. Participants diagnosed with chronic pain syndrome may have had one site, such as chronic low back pain, or a combination of multiple sites such as knees, shoulders, back, and/or neck. In addition, some participants were diagnosed with fibromyalgia and in conjunction may have been diagnosed with a localized chronic pain site such as chronic knee pain. Participants who were prescribed and taking any opioid pain medication were included in this study. Most participants were prescribed hydrocodone, oxycodone, fentanyl, or tramadol. Other demographic information included marital status of participants, the locus of pain, employment, education, and ethnicity (Table 1).

Instruments

Three measures; the COMM, the Pain Self-Efficacy Questionnaire (PSE-Q),[15] and the Patient Health Questionnaire-9 (PHQ-9)[16] were administered to the patients along with a demographic questionnaire.

The COMM[9] is a 17-item self-report measure with a 5-point rating scale (0 = Never to 4 = Very often). The measure is mainly intended to monitor drug use and misuse among opioid therapy patients with chronic pain. Content and expert reviews, a pilot and a validation study preceded by rigorous measure development steps guided by literature on related measures [the Prescription Drug Use Questionnaire,[17] the Pain Assessment and Documentation Tool[18] and the Pain Medication Questionnaire[19] informed the development of the COMM. Psychometric properties reported include: Cronbach's alpha (0.86), test-retest reliability (0.86), and sensitivity reported as 0.74 to 0.77 and specificity as 0.66 to 0.77.[9,11,20,21]

The PSE-Q[15] is a 10-item self-report measure utilizing a 7-point rating (0 = not at all confident to 6 = completely confident). It was designed to assess the level of confidence of chronic pain patients in performing a particular behavior or task despite their pain. Cronbach's alpha is estimated as 0.92, and test-retest reliability at three months as 0.73.[22]

The PHQ-9[16] is a 9-item depression scale adapted from the Personal Health Questionnaire, with a Cronbach's alpha estimated at 0.89. The overall score for the PHQ-9 ranges from 0 to 27 with scores ranging from 0 = "not at all" to 3 = "nearly every day" for each item. The items are used to diagnose depression symptoms within two weeks of a patient's treatment.

Procedure

All patients were approached in the lobby area while waiting to be seen by physicians for scheduled appointments. Patients were screened to corroborate the inclusion criteria for age and opioid use for noncancer pain prior to invitation to participate.

Table 1. Patient background		
Variable	**N**	**Percentage**
Age Category		
18-35	8	17.4
36-45	11	23.9
46-55	16	34.8
56+	11	23.9
Gender		
Male	16	34.8
Female	30	65.2
Marital Status		
Married/partnered	8	17.4
Separated	9	19.6
Divorced	9	19.6
Widowed	4	8.7
Single	16	34.8
Pain		
Back	16	34.8
Fibromyalgia	6	13.0
Multiple locations (eg, knee, neck, back)	24	52.2
Employment		
Part-time	5	10.9
Supplemental Security	28	60.9
Income Services		
Other	13	28.2
Education		
≤12 years/GED	33	71.7
13+years	12	26.1
Ethnicity		
African American	2	4.3
Hispanic	10	21.7
Caucasian	29	63.0
Other (not specified, multiracial)	5	10.9

The purpose of the study was explained to patients, and informed consent forms obtained for study participation. A packet with a demographic questionnaire and the self-report measures (PHQ-9, PSE-Q, and the COMM) was then given to participants for return prior to leaving.

RESULTS

Initial analysis showed multidimensionality in the scale so item fit, person fit, and scale use were examined. Problems were identified in scale use, with disordering in the observed average and step structure. Use of categories three and four was low. The scale categories (0 1 2 3 4) were collapsed to form a three-category scale (0 1 1 2 2) with never, sometimes, and often. Data from two misfitting patients and three misfitting items (items 4, 5, and 16) were deleted. The deleted items addressed failure to adhere to directions on prescribed medication, thoughts of hurting oneself, and using prescribed medication for issues other than pain. The following results reflect analyses of the revised measure keyed to the five research questions.

1. Unidimensionality was reasonable with 40.1 percent variance due to the measure and 11.4 percent due to the first contrast, and a first contrast eigenvalue of 2.7. Item infit mean squares ranged from 0.75 to 1.32 with outfit mean squares from 0.57 to 1.26 and all standardized fit values less than 2.0. Contrasts between positive and negative standardized residual loadings suggested the potential for two factors, the first related to anger and distractibility and the second related directly to medication use. Cronbach's alpha for the measure was 0.80 (0.81 if all items were retained).

2. The three-category rating scale use was appropriate. Observed average and structure calibration increased from low to high, with the highest category having infrequent use (7 percent of responses), as might be anticipated with this measure.

3. Figure 1 (the item-person map) suggests good coverage in the upper "misuse" portion of the scale with little construct coverage at the lower end of the scale. The person mean was −1.93. This suggests

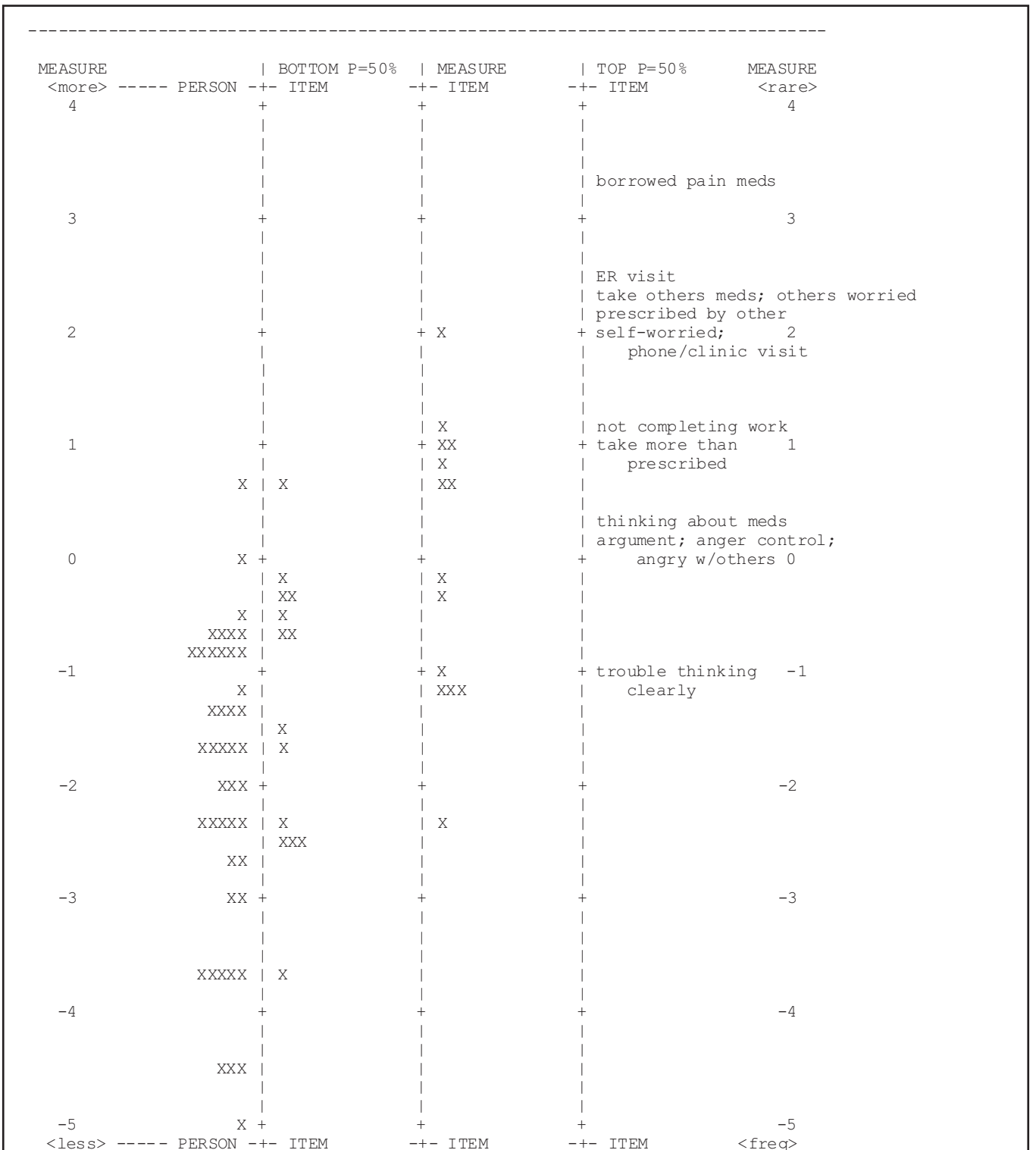

Figure 1. Item-Person Map.

items were difficult for most of the sample to answer with a higher category response. Given the intent for the COMM to identify patients at risk for opioid misuse, extending coverage to the lower range of the scale is less important than identifying patients at the upper end of the scale.

4. No differential item functioning (DIF) by sex was undetected based on statistical significance at $p<0.01$ using the Mantel-Haenszel statistic. However, the logit differences for five items (6, 11, 12, 15, and 17) between males and females were above 0.5 logits, a value considered substantial.

5. Correlation of the two validation measures with the COMM revealed a statistically significant positive relationship ($r = 0.28$, $p = 0.05$) with the PHQ-9, but a statistically nonsignificant relationship with the PSE-Q ($r = 0.06$, $p = 0.67$).

DISCUSSION AND RECOMMENDATIONS

This pilot study provides some insight into the psychometric properties of the COMM. Problems were identified with scale use and three items misfit. Future studies should consider COMM revision with consideration given to collapsing the response scale. Moreover, despite having no statistically significant differential Item functioning for sex, five of the items had differences above 0.5 logits so DIF should be examined further. While data in this study fit a unidimensional model reasonably well, there was some indication of two substantively interpretable factors. These concerns should be investigated with a larger-scale study.

The sample for this study was predominantly female with lower education levels with a fairly long-term history of pain treatment. It is important that a larger-scale study examines results for a more diverse sample and investigate differential item functioning by variables other than sex (eg, ethnicity, education level, and pain history). In addition to confirming the item order and scale use, calibration of items with a diverse sample can yield a scoring system for the measure usable by clinicians. Raw scores can be translated to a standard scoring system with, in-future, benchmarks for risk levels.

The correlation between the COMM and the PHQ-9 was statistically significant but small in magnitude; and, the COMM was not significantly correlated with the PSE-Q. These results suggest the COMM is measuring a construct distinct from either general depression or confidence in performing a task despite pain. These results are supportive of the COMM as a measure of a unique construct; however, validation of the COMM using a second measure of opioid risk assessment should be considered.

A large-scale study is recommended to confirm the COMM structure and item function. Such a study would include sufficient numbers of participants who vary by sex, ethnicity, locus of pain, and prescribed medication. It is further recommended that scales such as the Prescription Opioid Therapy Questionnaire[23] and the Pain Catastrophizing Scale[24] be administered along with the COMM as additional validation measures.

Ideally, the results of the COMM can serve as an educational tool for patients and providers. As described by the measure developers, the COMM "could be used in a pain practice or general medical setting to help document ongoing patient compliance. Patients who score higher on the COMM could be seen on a more frequent basis, with regular pill counts and urine toxicology screens."[9] The results of this measure may have the added benefit of reducing physicians' burden related to prescribing opioids and may keep patients more cognizant of their need to be responsible with these medications. However, additional work is needed before the COMM is used routinely in clinical settings. While questions regarding psychometric indices remain, support was found for the measure structure and use.

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