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The Pain Behavior Check List (PBCL): Factor Structure and Psychometric Properties

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The construct of "pain behaviors" as observable and measurable manifestations of pain occupies a central role in Fordyce's operant model of pain. The present study was designed to evaluate the multidimensional nature of the construct and to explore the psychometric properties of a newly developed self-report instrument called the Pain Behavior Check List (PBCL). Subjects were 126 chronic pain patients who completed an initial version of the PBCL and other standardized questionnaires as part of their evaluation by the West Haven VAMC. Factor analysis identified four factors labeled Distorted Ambulation, Affective Distress, Facial/Audible Expressions, and Seeking Help. Substantial reliability and stability estimates for the total PBCL and the subscales support the potential clinical and theoretical utility of the instrument.

KEY WORDS: Chronic pain; pain behaviors; pain assessment; self-report.

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INTRODUCTION

The construct of "pain behaviors" as observable and measurable manifestations of pain occupies a central role in Fordyce's (1976) operant model of pain as well as in a broad array of more recent clinical and research efforts. Fordyce (1979) defined pain behaviors as those methods by which pain or illness is communicated to others and as operants that are subject to the influence of systematic consequent conditions. Fordyce and many others have strongly encouraged the development of reliable methods for evaluating pain behaviors which can then be used to aid in diagnosis, in establishing primary targets in pain treatment and rehabilitation programs, and in assessing treatment outcomes. Pain behavior measures may also serve as important tools in studies of the etiology and maintenance of the chronic pain experience. Although Turk and Flor (1987) have cautioned against overgeneralization and have cited limitations in the conceptualization of pain behaviors, they also continue to support the heuristic and clinical importance of the construct and efforts aimed at its reliable measurement.

There have been multiple efforts to outline the domain of pain behaviors or to categorize them. According to Fordyce (1976), pain behaviors include (a) verbal complaints of pain and suffering, (b) nonlanguage sounds (e.g., moans, sighs), (c) body posturing and gesturing (e.g., limping, rubbing, grimacing), (d) display of functional limitations or impairment, and (e) behaviors designed to reduce pain (e.g., visiting doctors, taking medications). A variety of means has been developed to quantify the occurrence of these behaviors. Perhaps most consistent with the operant model of pain are strategies that rely on direct observation of pain behaviors (e.g., Keefe and Block, 1982; Richards *et al.,* 1982) or electromechanical recording devices (e.g., Follick *et al.,* 1982; Sanders, 1980). However, self-report measures have been used more frequently (e.g., Follick *et al.,* 1984; Fordyce *et al.,* 1984; Kerns *et al.,* 1985).

Turk *et al.* (1985) noted that one limitation of the existing strategies for measuring pain behaviors is a failure to assess the full range of pain behaviors. Particularly deficient are procedures that rely on direct observation of only a few behaviors. In an attempt to address this concern, Turk and his colleagues asked health-care providers working directly with pain patients to identify empirically the underlying characteristics and domain of the pain behavior construct. First, a list of 63 hypothesized "pain behaviors" was generated from the literature and eight staff members of the West Haven VAMC Pain Management Program used a 5-point Likert scale to indicate the degree to which each behavior was a pain behavior. Second, the 20 items with the highest ratings were scrutinized by 35 physicians and

psychologists randomly selected from the membership directory of the International Association for the Study of Pain. They were instructed to cluster the 20 behaviors "into categories based on whatever criteria that you believe are relevant" (Turk *et al.,* 1985, p. 123). Using multidimensional scaling and hierarchical clustering techniques, four groups of pain behaviors were identified and labeled: distorted ambulation or posture, negative affect, facial/audible expressions of distress, and avoidance of activity. The ratings of the physician group (N = 17) and the psychologist group (N = 18) produced essentially the same results and strongly suggested that the pain behavior construct is multidimensional and similarly perceived by physicians and psychologists.

The present study was designed with two goals. First, the study examined the reliability of the pain behavior clusters identified by Turk *et al.* (1985). Second, it examined the initial psychometric properties and clinical utility of a self-report measure of pain behaviors, the Pain Behavior Check List (PBCL). This report describes the factor structure of the PBCL, reliability indices of the total scale and subscales, and indices of criterion-related, concurrent, and discriminant validity of the subscales. The clinical utility of the PBCL is also discussed.

METHOD

Subjects

Subjects were 126 chronic pain patients referred for evaluation to the West Haven VAMC Comprehensive Pain Management Center. This patient population is largely physician referred and considered treatment refractory. Participants were consecutive referrals except for patients who did not undergo evaluation because they did not accept the referral or because they were not eligible for the program. Patients were ineligible for the program when a medical intervention was planned or because of active substance abuse or active psychosis. All subjects completed the research instruments as part of their comprehensive evaluation.

Subjects were 84.1% male, with a mean age of 51.0 (SD = 13.2). Mean education was 12.0 years (SD = 2.5). Married patients comprised 53.2% of the sample, with 27.8% single and the rest divorced or widowed. Mean duration of the pain was 9.5 years (SD = 9.1). Subjects were mixed with regard to type of pain; the two largest categories were back pain (47.5%) and other musculoskeletal pain (15.6%). Eighty-two percent of the sample had documented physical findings indicating moderate to severe structural pathology. Prescription pain medications were in use by 63.2%

of the sample, and 43.7% had had at least one pain-related surgery. Thirty-nine percent were receiving pain-related compensation (e.g. Social Security Disability or VA pensions), and 29.4% were employed at the time of evaluation.

Construction of the PBCL

The item pool for the PBCL included the 20 pain behaviors evaluated in the Turk *et al.* (1985) investigation of the pain behavior construct discussed earlier. Two items from that study which appeared to overlap considerably were combined into a single item ("walk with a limp or distorted gait"). An additional six items were added to the preliminary PBCL item pool to round out three of the four domains identified by Turk *et al.* (1985). Each of the 25 behaviors in the final list was derived from clinical and empirical descriptions of pain behaviors.

Instructions for the PBCL simply asked "How often do you do each of the following?" Each item was followed by a 0-to-6 scale anchored with the terms "never" and "very often."

Procedure

The PBCL was administered to the total sample as part of a comprehensive pain assessment protocol prior to participation in a treatment and rehabilitation program. Included in the protocol was a semistructured pain interview from which the demographic, medical history, and medication data used in the present study were obtained. Interviews were conducted by predoctoral psychology interns and master's-level psychology technicians who had been trained to administer and code the interviews according to a detailed coding manual. Also included was a battery of standardized questionnaires that included the West Haven–Yale Multidimensional Pain Inventory (WHYMPI; Kerns *et al.,* 1985), the McGill Pain Questionnaire (MPQ; Melzack, 1975), the Beck Depression Inventory (BDI; Beck *et al.,* 1961), and the State-Trait Anxiety Inventory (STAI; Spielberger *et al.,* 1970).

A subset of 34 patients was observed during a structured pain behavior observation similar to that described by Keefe and Block (1982). Patients completed a set of five activities (standing, walking, bending, sitting, and side-to-side twists) twice. Each activity was performed for 1 min, with the order of activities constant across subjects. Videotapes of the activities were scored by trained raters for the presence or absence of each of four pain behaviors (guarding, bracing, rubbing, and grimacing) accord-

ing to the instructions of Keefe and Block (1982). An interval sampling procedure was used. Coding occurred during sixty 10-sec periods. Briefly, the pain behaviors were defined as follows: guarding was obviously distorted ambulation or protective posturing while moving; bracing involved use of the support of a chair or wall while stationary; rubbing involved touching the affected body site for at least three seconds; and grimacing included obvious facial distortions communicating pain and suffering. Kappas were computed to assess the interrater reliability for each of the observed pain behaviors and were .75 for guarding, .88 for bracing, .80 for rubbing, and .82 for grimacing.

A different subsample of 55 patients had previously completed the PBCL as part of the pain program's application and screening process. Typically, the interval between the first and the second administrations of the PBCL was 2 to 3 weeks. Data from the two administrations were used to evaluate the stability of the measure.

Factor Structure and Reliability

The correlation matrix for the 25-item scale was submitted to principal-components factor analysis. The scree criterion suggested a four-factor solution with all factors having eigenvalues greater than one. These factors were then rotated using a promax oblique rotation setting the number of factors at four. Items were considered to have good convergent validity if they had a statistically significant factor loading (set at .45 or above) and good discriminant validity if the loadings on all other factors were minimally .15 lower than the highest factor loading. Factor or subscale scores are means.

The reliability and stability of the PBCL and of the four subscales were also assessed. Internal consistency was evaluated for the total PBCL and each subscale with coefficient alpha (Cronbach, 1951). Pearson product–moment correlations were used to evaluate the stability of the scales.

Scale Validity

The PBCL and its subscales were correlated with a number of pain-relevant variables in order to evaluate their criterion-related validity. Two measures of particular interest were the Pain Rating Index from the MPQ and the Pain Severity Scale from the WHYMPI. Both of these scales are standardized self-report measures of pain. Additionally, the PBCL scales were correlated with the pain behavior observation data. It was reasoned that the criterion-related validity of the PBCL would be supported by a

significant correlation between the total PBCL and the total observed pain behavior frequency, as well as by significant correlations between specific observed pain behaviors and the corresponding PBCL scale which includes the pain behavior as one of the items. Additional validity indices included correlations between the PBCL scales and the following measures: current pain medication use (on a 0 = never to 3 = daily scale), surgical history (on a 0 = never to 2 = two or more surgeries scale), and disability compensation (percentage disabled) from the semistructured interview; the Interference and Activity Scales from the WHYMPI; the BDI; and the STAI.

RESULTS

Scale Construction

Ratings on the 25 items of the PBCL were analyzed using principal-components factor analysis using promax oblique rotation. All items met the criteria for convergent validity, but eight items were dropped because of poor discriminant validity. The factor analysis was then recomputed using the remaining 17 items. Again, a four-factor solution emerged using the scree criterion. Each item in the final factors met the criteria for discriminant as well as convergent validity, with all factors having eigenvalues greater than 1. Table I presents the factor loadings for the final four-factor solution that includes a total of 17 items. The content of the six items in Factor 1 suggests that this scale reflects Distorted Ambulation. The content of the other factors indicates that these scales characterize Affective Distress, Facial/Audible Expressions, and Seeking Help. The amount of variance accounted for by the four factors is 31, 14, 9, and 7%, respectively.

Reliability, Stability, and Scale Intercorrelations

Table II presents the reliability and stability (test–retest) coefficients and intercorrelations among the PBCL subscales. Reliability estimates for the subscales range from .63 to .83. Coefficient alpha for the total PBCL is .85. Stability coefficients for the four subscales are in the .70 to .87 range, and the stability coefficient for the total PBCL is .80, indicating that the PBCL is stable over time.

Table II also contains the intercorrelations among the total PBCL and the subscale scores. Correlations among the four subscales are all positive, ranging from .15 to .46. Although all the correlations but one are significant,

Table I. Factors Derived from the Pain Behavior Check List

Loading	Item
	Factor 1: Distorted Ambulation
.859	Walk in a protective fashion
.850	Walk with a limp or distorted gait
.812	Move extremely slowly
.656	Use a cane or some other prosthesis
.648	Ask for help when walking or changing position
.549	Stoop while walking
	Factor 2: Affective Distress
.876	Become irritable
.864	Become angry
.775	Appear upset or sad
.743	Tell others not to bother me
.567	Ask myself, "Why did this happen to me?"
	Factor 3: Facial/Audible Expressions
.896	Grimace
.836	Clench my teeth
.829	Moan
	Factor 4: Seeking Help
.841	Ask someone to do something to help my pain
.720	Take pain medication
.671	Talk about my pain problem

Table II. Summary Information for the PBCL Scales*

PBCL scale	k[a]	Reliability[b]	Stability[c]	Scale intercorrelation 1	2	3	4
PBCL Total	17	.85	.80	.77	.73	.74	.50
1. Distorted Ambulation	6	.82	.87		.27	.46	.15
2. Affective Distress	5	.82	.79			.43	.30
3. Facial/Audible Expressions	3	.83	.70				.25
4. Seeking Help	3	.63	.76				

[a]Number of items in the scale.
[b]Internal consistency reliabilities estimated using Cronbach's alpha.
[c]Pearson product–moment correlations between scores obtained 2 to 3 weeks apart ($N = 55$).
*All r values are significant at $p < .05$ or less except the intercorrelation between subscale 1 and subscale 4.

Table III. Validity Coefficients for the PBCL Scales[a]

	Distorted Ambulation	Affective Distress	Facial/Audible Expressions	Seeking Help	Total PBCL
Age	.08	−.24**	−.10	−.14	.12
Duration	.11	.09	.02	.06	.12
Education	.10	−.04	−.02	.06	.02
Surgical history	.19*	.17	−.04	.05	.16
Pain medication use	−.01	−.07	.02	.26**	.04
Compensation (%)	.15	.13	.11	.30**	.23*
Pain Rating Index	.19*	.29**	.35***	.12	.35***
Severity	.16	.28**	.19*	.21*	.30**
Interference	.34***	.53***	.36***	.17	.53***
Activity	−.09	−.14	−.14	−.15	−.18
BDI	.26**	.60***	.38***	.14	.52***
STAI	.12	.58***	.28**	.06	.39***

[a] $N = 116$ due to missing data.
*$p < .05$.
**$p < .01$.
***$p < .001$.

their absolute magnitudes are substantially lower than their reliability coefficients, which indicates that each scale contains unique, reliable variance. These analyses support the discriminant distinctiveness of each subscale. Correlations of each subscale with the total score range from .50 to .77 indicating that each scale contributes significantly to the total PBCL score.

Validity Assessment

Table III presents the correlations of the PBCL scales with demographic data and additional standardized measures relevant to an evaluation of chronic pain and associated problems. Total pain behavior frequency is not significantly related to age, duration of pain, or education. *T* tests showed that sex and marital status (married vs. not married) are also not related to the total PBCL score.

Correlations between the PBCL scale scores and the Pain Rating Index of the MPQ and the WHYMPI Pain Severity scale range from .12 to .35. More specifically, total PBCL is significantly related to both measures, as are the Affective Distress and Facial/Audible Expressions subscales. Seeking Help is significantly related only to the WHYMPI Pain Severity scale, while Distorted Ambulation is significantly related only to the MPQ Pain Rating Index.

Correlations between the PBCL scales and other pain-specific measures, that is, pain medication use, surgical history, and disability compensation, are generally low and nonsignificant. Exceptions are significant relationships between Seeking Help and the measures of pain medication use and compen-

Table IV. Pearson Correlation Coefficients for the Relationships Between PBCL and Observed Pain Behavior Frequency[a]

Observed behavior	Distorted Ambulation	Affective Distress	Facial/Audible Expressions	Seeking Help	Total PBCL
Guarding	.53**	.07	.27	.10	.38*
Bracing	.48**	.24	.25	.17	.44**
Rubbing	.24	.15	.51**	−.02	.31
Grimacing	−.03	.06	.33*	−.06	.10
Total	.45**	.16	.45**	.07	.43*

[a]$N = 34$.
*$p < .05$.
**$p < .01$.

sation and between Distorted Ambulation and the number of pain related surgeries. Total pain behavior frequency is significantly related to compensation.

Relationships with measures of affective distress, activity level, and perceived interference were investigated as possible indices of concurrent and discriminant validity. Total PBCL and the Affective Distress and Facial/Audible Expressions subscales are significantly positively related to the BDI and STAI. There is also a significant positive relationship between the Distorted Ambulation subscale and the BDI. None of the scales are significantly related to Activity Level, but all except Seeking Help are strongly positively related to perceived Interference.

Table IV presents the simple correlations between the PBCL scales and the pain behavior observation data. Total PBCL and the Distorted Ambulation subscale are both strongly positively related to the total observed pain behavior frequency as well as to the frequencies of guarding and bracing behaviors. The Facial/Audible Expressions subscale is also significantly related to the total observed pain behavior frequency and with the frequencies of both rubbing and grimacing. Neither the Affective Distress nor the Seeking Help subscales are related to any of the observed pain behavior frequencies.

DISCUSSION

Pain behaviors have been consistently conceptualized within a multidimensional framework that includes verbalizations, movements and gestures, and affective distress (Fordyce, 1976; Turk *et al.,* 1985). Turk and his colleagues (1985) provided empirical support for the multidimensional nature of the pain behavior construct by identifying four reliable clusters of behaviors. The list of behaviors from which they worked was

expanded for the present study and presented to a heterogeneous sample of chronic pain patients who were asked to report the relative frequency with which they exhibited each of the behaviors. Factor analytic techniques revealed four factors that closely replicated the Turk *et al.* (1985) findings. The four factors were labeled Distorted Ambulation, Affective Distress, Facial/Audible Expressions, and Seeking Help. The results of the present study extend previous findings and support a multifactorial conceptualization of the pain behavior construct.

Further contributing to the theoretical importance of these findings are analyses that evaluate the reliability, stability, and initial validity of the factor solution. Each item loads highly on only one factor. Review of the items comprising each factor contributes to the strong intuitive appeal of the factor solution. For example, each of the items loading on the first factor clearly suggests trouble with ambulation or movement. Each of the other factors appears to be similarly "face valid" and consistent. Indeed, statistical estimates of internal consistency and stability (test–retest) for the four factors and for a composite score are all in the good to excellent range.

Correlations between the PBCL scales and the pain severity measures are significant and generally positive but do not suggest a high degree of common variance between the constructs. These findings should not be viewed as a challenge to the PBCL or to the pain behavior construct. Indeed, Fordyce (1976) specifically proposed that there should be little correlation between self-reports of pain and pain behaviors and he and others have provided empirical support for his claim (Fordyce *et al.,* 1984; Richards *et al.,* 1982; Teshe *et al.,* 1983). Others, notably Keefe and Block (1982), have reported quite substantial correlations between pain reports and observed pain behaviors.

Examination of the simple relationships between the PBCL scales and the direct observation data lend strong support for the scales' criterion-related and discriminant validity. Total PBCL is significantly related to the total observed pain behavior frequency and to two of the four categories of observed pain behaviors. As predicted, the frequencies of specific observed behaviors were particularly related to the conceptually related PBCL subscale. For example, both guarding and bracing, behaviors that occur during standing and movement, were found to be selectively related to the Distorted Ambulation subscale of the PBCL. Similarly, observed grimacing was significantly related to the Facial/Audible Expressions subscale. Equally important conceptually is the absence of any significant relationship between both the Affective Distress and the Seeking Help subscales of the PBCL and the observed behavior categories. These findings underscore the limited nature of

most available direct observation systems for the assessment of the broad domain of the pain behavior construct.

Further support for the validity of the PBCL and its subscales comes from examination of the relationships of the scales with three additional pain-relevant measures. Total PBCL was found to be positively related to percentage of pain-related disability compensation. Surgical history, as might be expected, was significantly positively related to Distorted Ambulation. Finally, Seeking Help was selectively related to both reported frequency of pain medication use and percentage of disability compensation.

WHYMPI measures of reported activity and perceived interference with instrumental activity due to pain were included as potentially useful validity criteria. Supporting the validity of the pain behavior scales were generally strong positive correlations with the Interference scale. In contrast, the Activity scale was unrelated to any of the pain behavior scales. These analyses suggest that pain behaviors are not on the low end of a single "activity" dimension. Perhaps these data reflect an intuitively obvious, yet theoretically and empirically valuable observation: the constructs "pain behaviors" and "well behaviors" are relatively orthogonal, and both are categories of instrumental behaviors or operants.

The finding that total pain behavior frequency is positively related to measures of depression and anxiety is consistent with previous reports (e.g., Feuerstein *et al.,* 1985). Fordyce (1976) and Loeser (1980), among others, have argued that depression and anxiety states may affect pain behavior. A particular threat to the discriminant validity of this and other efforts to measure pain behaviors is the possibility that a substantial proportion of the variance in pain behavior frequency is a direct reflection of more general affective distress, rather than pain. In this regard, early work by Keefe and Block (1982) demonstrated the ability of their pain behavior observation methodology to discriminate pain patients from depressed patients. Nevertheless, it may well be that the presence of depression and anxiety disorders among a substantial proportion of pain patients contributes significantly to at least certain categories of pain behaviors. In this study, for example, the BDI was highly correlated with the Distorted Ambulation and Facial/Audible Expressions scales. Future research is necessary to evaluate this possible theoretical and empirical confound.

It is somewhat paradoxical that many of the tools available to measure pain behaviors rely on patients' self-reports despite the construct's roots in applied behavior analysis with its emphasis on observable behavior. Besides advantages in terms of low cost and ease and simplicity of administration, self-report allows assessment of low-frequency (e.g., medication intake) and

"private" (e.g., pain related cognitions) behaviors. Additionally, behavior observation systems developed thus far have generally failed to sample the full domain of the pain behavior construct (Turk and Flor, 1987; Turk *et al.,* 1985).

The PBCL appears to have strong heuristic and clinical utility, particularly because of its apparent ability to discriminate reliably between categories of pain behaviors. Of conceptual interest is continued investigation of differential contributors (e.g., structural pathology versus depression versus solicitous social relationships) to the prediction of the pain behavior factors. Clinically, the PBCL may add significantly to a comprehensive pain assessment protocol. Indeed, Turner and Clancy (1988) used a version of the PBCL derived from the Turk *et al.* (1985) report and demonstrated the sensitivity of the scale to change as a function of a cognitive-behavioral treatment protocol. In that study, the PBCL was used to make clinical ratings of pain behavior frequency. The factor analytic work described in this paper may aid research efforts that examine the reliability of clinician rated pain behavior frequency.

It should be noted that the generalizability of these findings is tempered by the sample used in the present study. Further work is needed to explore the usefulness of the PBCL with other chronic pain samples, for example, those more homogeneous with respect to location of pain, nonveteran samples, and samples with a larger proportion of women.

In summary, the factor structure and psychometric properties of a self-report Pain Behavior Check List are reported. Results confirm and extend previous work by Turk *et al.* (1985) by generally replicating the multidimensional nature of the pain behavior construct using a heterogeneous sample of chronic pain patients. Substantial reliability and stability estimates for the total PBCL and four subscales support the potential clinical and theoretical utility of the instrument. Replication of the factor structure and continued investigation of the reliability and validity of the PBCL with other pain patient samples are encouraged.

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