

THE HETEROGENEOUS PAIN PERSONALITY: DIVERSE COPING STYLES AMONG SUFFERERS OF CHRONIC PAIN

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The utility of personality assessment in chronic pain populations can be greatly enhanced with the understanding of risk assessment and the heterogeneous nature of at-risk personality types. Simplistic, unidimensional notions of risk have not been useful in assessing psychosocial and functional impairment in those with chronic pain syndromes. Previous literature suggests that certain combinations of psychometric scales, as opposed to individual scales, may be more useful in predicting the multiplicity of factors associated with functional disability among chronic pain patients. A hierarchical cluster analysis was performed on the 8 coping scales of the Millon Behavioral Health Inventory. Analyses revealed 3 distinct groups. The first cluster, termed repressors, exhibited high introversive and cooperative scales, and low forceful scales. The second cluster, termed amplifiers, exhibited high inhibited and sensitive scales. The third cluster, termed social copers, exhibited high confident and social scales. Analyses of these 3 clusters with regard to measures of psychopathology (Minnesota Multiphasic Personality Inventory II), depression (Beck Depression Inventory), functional impairment (Chronic Illness Problem Inventory), and other measures (Multidimensional Pain Inventory) resulted in significantly different levels of psychosocial and functional impairment. These clusters identified those patients who are at risk for nondisclosure of psychosocial dysfunction, those who are most emotionally distressed, and those who are most likely to comply with treatment. Consequently, such classifications identify psychosocial variables that will dictate a differential treatment approach and thus have potentially important clinical applications. (Altern Ther Health Med. 2002;8(6):60-69)

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Practitioners in pain management have become increasingly concerned with identifying those patients who respond to multidisciplinary pain management as well as those who do not. Given 2 persons with the same chronic pain condition, why might 1 person improve with treatment, and the other not improve? Some explanations for this phenomenon include individual differences in one's psychological or coping style—in particular, how well the patient psychologically copes with his or her pain condition. The few studies examining the role of coping in one's chronic pain experience have defined coping in cognitive-behavioral terms, such as coping "strategies."¹

While coping strategies are specific behaviors, coping styles are more global and interpersonally oriented. While coping styles have received little attention in the pain literature, being organismic in nature, they are likely to affect the way patients acquire, learn, and practice coping strategies. Coping styles are similar to personality variables in that they are thought to be relatively stable and tend to differentiate the way patients respond to treatment.

Individual differences in coping styles have been increasingly recognized as affecting health outcomes.²⁻⁶ Certain coping styles have been identified as detrimentally affecting biological states such as cancerous growth^{4,7} and decreased monocyte counts,⁸ as well as predicting health-related treatment outcomes in a multitude of settings.^{5,6,9} These coping styles and their sequelae in health-related treatment outcome will be reviewed below.

The repressive coping style is generally defined as the denial of unpleasant emotions and the endorsement of positive self-characteristics such as cooperation, respect, and rule abidance. This style of defensiveness-repression has been associated with greater pain threshold and tolerance among pain-free cohorts.¹⁰ Study participants identified as repressors denied the experience of distress (pain) during a shock trial, and also denied negative affect associated with that experience, compared to their nonrepressor counterparts. This phenomenon, as predicted by dysregulation theory, involves a selective inattention to unpleasant physiological states, which results in psychophysiological "dysregulation," which may actually impede recovery from a major illness or increase risk of psychosomatic illness. For example, the

repressive coping style has been found to affect biological states such as immune functioning. In a study by Esterling and colleagues,¹¹ participants who were repressors and who disclosed little about themselves were found to have the lowest levels of immune functioning. Repressors also have been found to exhibit low levels of monocytes, cells that boost immune functioning.⁸ In 1 of the few studies identifying the repressive coping style among persons with chronic pain, those who were identified as repressors exhibited poorer lifting capacity compared to nonrepressors.¹² (Lifting capacity is defined as lifting an object of indistinguishable weight from floor to waist to shoulders.) However, repressors were identified using only 2 measures (an anxiety scale and the Minnesota Multiphasic Personality Inventory [MMPI] lie scale) with a median split to define groups. This technique generally is disfavored due to the potential for Type I errors involving interactions of the split variables.¹³

In contrast to repressive types, individuals who overexpress their emotionality and their opinions, and who tend to complain without much reservation have been termed sensitizers,^{11,14} hypervigilant copers,¹⁰ or amplifiers.¹⁵ These individuals tend to overreact habitually to perceptions of threat triggered by environmental stressors or to biological symptoms by expressing anger or distress in an attempt to elicit help or protect themselves from the perceived threat. The major distinction between repressors and amplifiers resides in their expression of discomfort, as repressors employ more often a passive, reserved coping style, while amplifiers employ more dysfunctional, expressive means of coping with distress. Amplifiers reported the least amount of pain tolerance during a shock trial, and reported discomfort sooner than their repressor counterparts. According to dysregulation theory, amplifiers are hypervigilant in their coping habits, tending to excessively monitor internal cues and physiological states, resulting in greater affective reactivity and lower pain thresholds.

USING THE MILLON BEHAVIORAL HEALTH INVENTORY TO ASSESS COPING STYLES

The Millon Behavioral Health Inventory (MBHI),¹⁶ is commonly used to assess interpersonally oriented coping styles. This instrument was designed to measure people's response to medical evaluation and treatment. The MBHI consists of 20 scales divided into 4 groups. The first 8 scales are concerned with coping styles, while the other 12 assess psychogenic attitudes, somatization, and prognoses.

The MBHI was compared with the MMPI-2 in predicting treatment outcome in an outpatient pain management program.⁵ All 20 of the MBHI scales were compared to the MMPI-2 clinical and validity scales to determine which instrument is more effective in predicting behavioral treatment outcomes, such as posttreatment sitting, standing, stair-climbing, walking, and hand-gripping abilities. Discriminant analyses revealed that both instruments were successful in predicting such outcomes, with the MBHI being a better predictor of the more exercise-oriented outcomes. The authors cited some

advantages and disadvantages to each, claiming that while the MBHI has a narrower research base than the MMPI-2, the MBHI was normed on a medical population, takes 20 minutes to complete, and has good reliability. Other evaluators of the MBHI also support these findings, advocating the use of the MBHI in the chronic pain population.¹⁷ Moreover, the MBHI is different from more "pain-specific" measures such as the Multidimensional Pain Inventory,¹⁸ which does not attempt to assess personality-oriented characteristics. Because up to 60% of chronic pain patients seen in tertiary pain clinics meet criteria for at least 1 personality disorder,¹⁹⁻²¹ pain and pain-related instruments alone may give incomplete assessments of chronic pain dysfunction.

The authors of the MBHI reported cluster analytic findings of the 8 coping scales, comprising 5 coping style groups.^{22(p30)} The groups were labeled passive-conforming (high on the introversive, cooperative, or respectful scales), anxious-moody (high on the inhibited and sensitive scales), confident-narcissistic (high on the sociable and confident or forceful scales), dependent-sociable (high on the cooperative and sociable scales), and aggressive-negativistic (high on the forceful and sensitive scales). However, no data or statistics were included in their report, nor was their decision to extract 5 clusters explained or substantiated. Thus, replication of these findings among other samples is warranted.

Certain groupings of the MBHI coping styles have been found to yield differences in immune functioning among study participants.¹¹ More specifically, participants with high introversive, cooperative, and respectful scales (deemed repressors) exhibited the poorest levels of immune functioning. Participants with high forceful and sensitive scales (deemed sensitizers or amplifiers) exhibited better immune levels. Likewise, study patients with high forceful and sensitive scales reported more incidences of epileptic seizures among medically refractory epileptic patients,²³ and more somatic symptoms among military recruits.²⁴ Another study using MBHI groupings found that cardiac transplant recipients who fell within an MBHI grouping labeled "high distress" were more at risk for mortality than those recipients who were in the "low distress" grouping.²⁵ These findings suggest that MBHI coping scales, when analyzed individually, may not be as predictive as coping scales that are grouped together. Moreover, such groupings have not yet been investigated with a chronic pain population.

In summary, the utility of the MBHI in personality assessment of chronic pain populations can be greatly enhanced with the understanding of risk assessment and the heterogeneous nature of at-risk coping styles. Certain groupings of the MBHI yield different coping styles that may be useful in determining risk of functional disability.^{11,23-25} The authors of the MBHI reported some preliminary cluster analytic findings and speculated on the presence of such coping styles.

The purpose of this study was 3-fold: (1) to replicate such coping style groupings using the 8 coping scales of the MBHI; (2) to compare and contrast the groupings across

other measures, including the MMPI, Beck Depression Inventory (BDI), Chronic Illness Problem Inventory (CIPI), and the Multidimensional Pain Inventory (MPI), to compare and contrast the potential groupings on psychopathology, emotional distress, and functional impairment; and (3) to compare and contrast the potential groupings on treatment compliance and treatment outcome (improvement in functional capacity) in a pain management setting.

METHODS

Participants

Data were collected from 329 outpatients who had been referred to a multidisciplinary pain management center in Dallas, Tex, for evaluation by a team of healthcare professionals, including an anesthesiologist, a physiatrist, and a licensed psychologist. All patients had been previously diagnosed with some sort of chronic pain syndrome of which medical etiologies had been identified. This clinic was a tertiary setting, meaning that the patients in this sample had experienced recurrent intractable pain for more than 6 months, had limited success with traditional medical approaches, and were referred to this pain management center for multidisciplinary evaluation and (potentially) treatment. Patients reported experiencing pain most commonly in the lower back, followed by midback, head, shoulder, and neck. Eighty-seven percent of the participants reported experiencing pain in more than 1 site. Eighty-two percent reported experiencing pain for more than 1 year, and 33% of those patients reported experiencing pain for more than 5 years. Patients' average age was 45, with 120 males and 209 females. The sample included 4 Asian-Americans, 10 Hispanic-Americans, 30 African-Americans, and 285 Caucasian-Americans.

Procedures

During their evaluation at the pain center, all patients completed an informed consent form, the MBHI, MMPI-2, MPI, CIPI, and BDI. Of these patients, we tracked 53 who remained at the pain center and matriculated through the multidisciplinary treatment program. These patients were recruited for participation in a dissertation study conducted by 1 of the authors, and thus were selected from the pool of patients receiving treatment who agreed to participate in a pre-post study of treatment compliance and outcome that was occurring within a 1-year period. The multidisciplinary pain management program included pharmacotherapy as well as cognitive-behavioral therapy with an emphasis on biofeedback and relaxation training. Pharmacotherapy, provided monthly by attending anesthesiologists, involved medication monitoring, analgesic prescription, and (when necessary) pain-relieving injections. Cognitive-behavioral therapy was provided by licensed psychologists. Within 1 month of treatment completion, the attending psychologist completed a treatment-compliance rating scale, and the patient completed an MPI.

Measures

Millon Behavioral Health Inventory (MBHI)

The MBHI¹⁶ was designed to measure people's response to medical evaluation and treatment. The MBHI consists of 8 scales that assess coping styles in the medical setting as well as 14 other scales. Empirical scales include allergic inclination, gastrointestinal susceptibility, cardiovascular tendency, pain-treatment responsiveness, life-threat reactivity, and emotional vulnerability. The psychogenic attitude scales include chronic tension, recent stress, and somatic anxiety. The 8 coping styles on which this study focused included introversive, inhibited, cooperative, sociable, confident, forceful, respectful, and sensitive (Table 1). Examples of MBHI items include "A quiet hobby is more fun for me than a party" and "If I were very sick, I'm sure that everything would work out well." Items are answered with "true" or "false." The MBHI appears to be a valid and reliable instrument,²³ with published reliabilities for the coping scales ranging from .77 to .88.

Multidimensional Pain Inventory (MPI)

The West Haven-Yale Multidimensional Pain Inventory (MPI)¹⁸ is a comprehensive, psychometrically sound instrument composed of 3 sections with a total of 13 empirically derived scales.¹⁸ This study included 8 of the 13 scales: pain severity, life interference, life control, affective distress, support, punishing responses, solicitous responses, and distracting responses. The life interference scale was used as an indicator of treatment outcome. A residualized improvement score was generated for each patient by regressing the pretreatment interference score on the posttreatment interference score. Thus, negative scores indicate improvement from pretreatment to posttreatment. The MPI is a reliable and valid instrument,²⁶ with published subscale reliabilities ranging from .62 to .91.

Beck Depression Inventory (BDI)

The BDI²⁷ contains 21 items assessing levels of depression experienced in the past week. Sample items are "I blame myself for everything bad that happens" and "I have lost all of my interest in other people." Responses are made on a 4-point response scale, which includes strong agreement, moderate agreement, mild agreement, or disagreement with the given item. Possible scores range from 0 to 63. The mean and standard deviations were found to be 13.41 and 8.10, respectively, among a sample of chronic pain patients.²⁸ Coefficient alphas²⁹ for the BDI have been found to range from .76 to .95.

Treatment Compliance and Collaboration Rating Scales

The Treatment Compliance and Collaboration Rating Scales³⁰ were developed to measure the level of treatment compliance, interpersonal rapport, alliance, and collaboration between therapist and patient in a multidisciplinary pain treatment setting. No similar instruments have yet been developed. Domains of the treatment compliance and collaboration rating are pain management, relaxation, emotional management, activ-

ity management, social functional restoration, recreational functional restoration, vocational functional restoration, substance and medication management, weight management, and autonomic nervous system management and neuromuscular re-education. Domains of compliance and collaboration are rated by the patient's attending psychologist on a 5-point scale ranging from "needs improvement" to "self-directed." Treatment compliance ratings were recorded at the end of treatment for each patient who completed multidisciplinary treatment. An overall compliance score was computed by adding the 10 ratings and dividing by the number of domains rated (eg, excluding "not applicable"). For a sample of 31 patients, the median interrater reliability for the overall compliance score was found to be .87 among 3 raters who were licensed psychologists.

Chronic Illness Problem Inventory (CIPI)

The Chronic Illness Problem Inventory (CIPI)³¹ consists of 18 scales that assess functional impairment in 5 domains. Higher scores indicate greater impairment. The activity domain assesses the extent to which the patient experiences physical deconditioning, sexual dysfunction, impairment in daily activity, and social dysfunction. The medical domain assesses the extent to which the patient experiences difficulty interacting with physicians, cognitive deterioration, problems with medication intake, and difficulty attending to the illness or pain problem. The interpersonal domain assesses the extent to which the patient experiences difficulty with physical self-image, family and friend interactions, assertiveness, and significant-other relationships. The work domain assesses the extent to which the patient experiences problems with employment and finances. The sleeping-and-eating domain assesses the extent to which the patient experiences difficulty sleeping and eating.

Reliabilities of these scales³¹ range from .78 to .98. In a study comparing the reliability and validity of measures relating to chronic pain syndromes, including physical, cognitive and behavioral, emotional, functional, and economic measures, the CIPI was rated as one of the most reliable and valid measures of functional impairment in the field of chronic pain.³²

Minnesota Multiphasic Personality Inventory II (MMPI-2)

The validity, basic, and content scales of the MMPI-2 were compared between the 3 clusters.³³ The validity scales include the L, F, and K scales, which assess levels of honesty about one's flaws, psychopathology, and defensiveness, respectively. Published reliabilities³⁴ range from .57 to .74. The basic scales assess levels of Hs (hypochondriacal symptomatology), D (depression), Hy (somatic symptomatology and denial of stress), Pd (antisocial tendencies), Mf (masculinity and femininity), Pa (paranoia), Pt (anxiety), Sc (psychotic or schizoid symptomatology), Ma (manic symptomatology), and Si (social introversion) scales. Published reliabilities³³ range from .34 to .82. The content scales include the ANX (anxiety), FRS (fears), OBS (obsessiveness), DEP (depression), HEA (health concerns), BIZ (bizarreness), ANG (anger), CYN (cynicism), ASP (antisocial prac-

tices), TPA (Type A behavior), LSE (low self-esteem), SOD (social discomfort), FAM (family problems), WRK (work interference), and TRT (negative treatment indicators) scales. Published reliabilities³⁵ range from .68 to .86.

Data Analysis

A hierarchical cluster analysis (Ward's method)³⁵ was performed on the 8 selected MBHI coping scales. Hierarchical cluster analysis groups points of a data set into clusters whose values are close to each other relative to those of other clusters. Ward's method was chosen because (1) it considers all possible combinations of clusters and combines clusters to minimize the error in the sum of squares, and (2) its efficacy has been demonstrated in recovery of cluster structure.³⁶ Because there are no definitive rules for determining the appropriate number of clusters in the data set, we examined several indicators that could inform us about the extent to which we identified clusters that maximized between-cluster heterogeneity and within-cluster homogeneity (eg, the distance between the centroids of the clusters, error mean squares within the cluster). These analyses suggested a 3-cluster solution (see Figure).

RESULTS

Analyses revealed 3 distinct groups as shown in Table 1 (note 1). The first cluster, termed repressors, exhibited high introversive and cooperative and low forceful scales. The second cluster, termed amplifiers, exhibited high inhibited and sensitive scales. The third cluster, termed social copers, exhibited high confident and social scales. Analyses of these 3 clusters with regard to the MBHI psychogenic scales, MMPI-2, CIPI, and MPI resulted in significantly different levels of biopsychosocial and functional impairment.

Cluster Differences on MBHI, MMPI-2, CIPI, MPI, and BDI

Amplifiers reported significantly higher levels of functional

TABLE 1 Mean values for clusters on the MBHI coping scales*

Scale	Repressors (n = 116)	Amplifiers (n = 98)	Social copers (n = 115)	F value
	Mean (SD)	Mean (SD)	Mean (SD)	
Introversive	70.87 (23.31)	41.09 (23.57)	59.98 (21.30)	46.39***
Inhibited	46.62 (24.95)	85.15 (18.12)	29.40 (20.45)	183.01***
Cooperative	66.11 (19.12)	29.54 (21.76)	28.41 (20.67)	124.63***
Sociable	39.97 (23.37)	12.01 (9.95)	61.82 (17.98)	195.58***
Confident	35.80 (19.25)	30.88 (20.50)	68.00 (13.63)	140.51***
Forceful	21.94 (17.34)	57.92 (22.32)	59.86 (18.97)	136.54***
Respectful	57.77 (21.44)	54.78 (21.30)	52.12 (20.71)	2.07
Sensitive	32.59 (24.60)	82.92 (18.97)	33.85 (25.14)	157.17***

*MBHI indicates Millon Behavioral Health Inventory.

*** $p < .001$

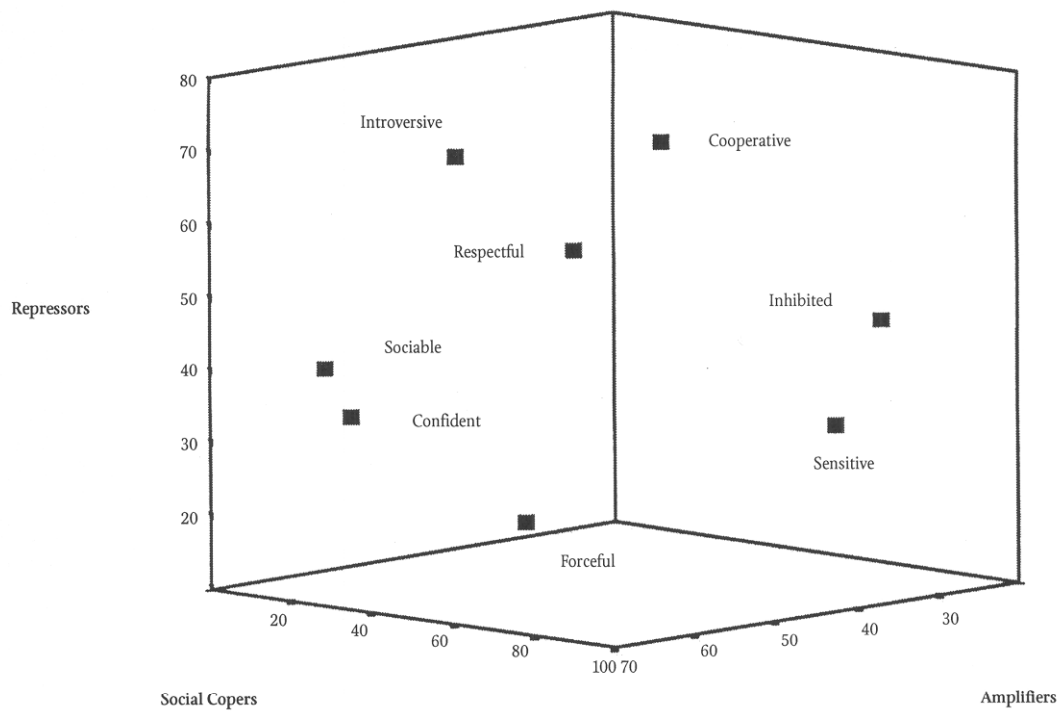


FIGURE 1 Three-dimensional graph of MBHI coping style clusters

impairment as measured by the CIPI and the life interference scale of the MPI (Tables 2 and 3). Amplifiers also reported the highest levels of depression on the BDI (Table 3), and depression, anxiety, hostility, and low self-esteem on the MMPI-2 content scales (Table 4) compared to the normal population, repressors, and social copers (note 2). Amplifiers scored higher than the other 2 groups on every scale of the MBHI empirical and psychogenic attitude scales (Tables 5 and 6).

TABLE 2 Mean values for clusters on the CIPI*

Scale	Repressors (n=116) Mean (SD)	Amplifiers (n=98) Mean (SD)	Social Copers (n=115) Mean (SD)	F value
Activity	1.66 (.82)	1.89 (.79)	1.37 (.75)	11.33***
Medical	1.12 (.59)	1.60 (.67)	1.11 (.62)	20.57***
Interpersonal	1.03 (.58)	1.5 (.6)	.93 (.62)	27.33***
Work	1.65 (1.13)	1.97 (1.06)	1.38 (1.01)	8.14**
Sleep/Eat	1.96 (.85)	2.25 (.9)	1.82 (.98)	6.05**

*CIPI indicates Chronic Illness Problem Inventory.
** $P < .01$
*** $P < .001$

TABLE 3 Mean values for clusters on the MPI and BDI

Scale	Repressors (n=116) Mean (SD)	Amplifiers (n=98) Mean (SD)	Social copers (n=115) Mean (SD)	F value
Pain severity	4.29 (1.22)	4.41 (1.16)	4.02 (1.16)	3.13*
Interference	4.41 (1.37)	4.84 (1.03)	4.06 (1.39)	9.87***
Life control	3.75 (1.5)	2.99 (1.51)	4.05 (1.38)	14.33***
Affective distress	3.45 (1.43)	4.57 (1.18)	3.1 (1.59)	30.47***
Social support	4.62 (1.39)	4.67 (1.25)	4.6 (1.28)	.07
Punishing responses	1.14 (1.28)	1.83 (1.61)	1.09 (1.23)	9.34***
Solicitous responses	3.65 (1.59)	3.65 (1.59)	3.55 (1.48)	.16
Distracting responses	1.99 (1.39)	2.05 (1.33)	1.91 (1.39)	.27
BDI†	12.49 (7.6)	18.76 (9.19)	10.05 (5.71)	36.68***

* $P < .05$

*** $P < .001$

†MPI indicates Multidimensional Pain Inventory; BDI, Beck Depression Inventory.

TABLE 4 Mean values for clusters on the MMPI-2 content scales*

Scale	Repressors (n=116)	Amplifiers (n=98)	Social copers (n=115)	F value
	Mean (SD)	Mean (SD)	Mean (SD)	
ANX	53.89 (10.48)	66.67 (11.05)	51.98 (9.14)	60.02***
FRS	50.63 (9.97)	56.26 (10.26)	49.51 (9.47)	13.15***
OBS	46.41 (9.09)	57.12 (10.93)	45.35 (8.24)	47.00***
DEP	53.79 (10.05)	66.03 (11.99)	49.70 (7.45)	73.23***
HEA	68.95 (11.93)	74.85 (10.76)	64.32 (10.94)	22.14***
BIZ	47.78 (8.01)	54.98 (10.86)	46.52 (7.57)	26.36***
ANG	45.38 (8.28)	58.60 (10.05)	46.93 (9.32)	60.27***
CYN	46.55 (8.32)	57.90 (10.34)	47.06 (8.60)	48.97***
ASP	44.45 (7.68)	53.68 (7.74)	46.04 (9.21)	34.76***
TPA	43.61 (7.73)	55.99 (10.33)	47.48 (9.1)	48.37***
LSE	49.30 (10.08)	58.98 (11.89)	44.76 (6.86)	55.77***
SOD	51.95 (10.20)	59.13 (11.46)	46.80 (8.51)	38.16***
FAM	47.56 (9.73)	58.11 (10.25)	46.37 (7.75)	47.83***
WRK	51.32 (8.44)	62.39 (10.79)	47.76 (7.16)	74.19***
TRT	50.49 (8.87)	62.87 (12.59)	46.09 (7.18)	80.92***

*MMPI-2 indicates Minnesota Multiphasic Personality Inventory II; ANX, anxiety; FRS, fears; OBS, obsessiveness; DEP, depression; HEA, health concerns; BIZ, bizarre mentation; ANG, anger; CYN, cynicism; ASP, antisocial practices; TPA, Type A behavior; LSE, low self-esteem; SOD, social discomfort; FAM, family problems; WRK, work interference; TRT, negative treatment indicators.
****P* < .001

TABLE 5 Mean values for clusters on the MBHI Empirical Scales*

Scale	Repressors (n=116)	Amplifiers (n=98)	Social copers (n=115)	F value
	Mean (SD)	Mean (SD)	Mean (SD)	
Allergic inclination	55.62 (23.31)	84.55 (10.62)	51.08 (18.57)	98.39***
Gastro-intestinal susceptibility	65.57 (19.24)	83.97 (12.54)	60.89 (14.20)	62.12***
Cardio-vascular tendency	55.37 (18.36)	85.94 (10.95)	52.48 (17.59)	135.07***
Pain treatment responsiveness	47.79 (25.19)	86.02 (19.58)	42.58 (19.89)	121.99***
Life threat reactivity	56.20 (21.24)	86.09 (14.85)	44.63 (18.51)	137.99***
Emotional vulnerability	24.97 (26.45)	59.52 (23.24)	17.19 (22.78)	89.20***

*MBHI indicates Millon Behavioral Health Inventory.
***P* < .001

Amplifiers were more socially dissatisfied (MBHI social alienation scale, Table 6; and MMPI-2—SOD content scale, Table 4), less psychologically defensive (lower L and K scores on the MMPI-2, Table 7) and tended to endorse more items suggesting severe psychological distress (MMPI-2 F and Fb scales, Table 7). In general, amplifiers reported significantly higher levels of emotional and physical suffering and higher levels of functional disability.

Repressors, on the other hand, tended to complain primarily of their pain and associated physical problems and to deny negative emotions and associated psychophysiological states. Repressors reported average levels of depression and anxiety compared to general medical patients, and higher levels of somatic suffering and functional impairment compared to social copers (measured by the CIPI and MPI, Tables 2 and 3). Repressors also reported higher levels of somatic distress, and psychological defensiveness on MMPI-2 scales compared to the normal population (HEA, L and K scales, Tables 4 and 7). Interestingly, while repressors exhibited high average levels of anxiety and depression, they reported low average levels of anger, cynicism, Type A behavior, and obsessiveness (MMPI-2 Content scales ANG, CYN, TPA, and OBS, Table 4). Typically, repressors were able to report emotional distress associated with their illness, but seemed to be unaware of normal levels of negative interpersonal affect, and tended to over-control interpersonal hostility (MMPI-2 Oh scale).¹ Amplifiers tended to report more negative affect, while repressors and social copers report lower levels of negative affect on the MMPI-2 content scales when compared to normal populations. Both amplifiers and repressors reported higher levels of social dissatisfaction and social withdrawal on the MMPI-2 clinical and content scales compared to social copers (Tables 4 and 7).

TABLE 6 Mean values for clusters on the MBHI psychogenic attitude scales*

Scale	Repressors (n=116)	Amplifiers (n=98)	Social copers (n=115)	F value
	Mean (SD)	Mean (SD)	Mean (SD)	
Chronic tension	27.40 (22.60)	63.51 (20.63)	48.57 (24.19)	69.58**
Recent stress	48.44 (24.94)	63.62 (18.24)	47.99 (22.93)	16.27**
Premorbid pessimism	49.56 (23.36)	74.48 (16.03)	39.44 (19.17)	85.01**
Future despair	46.80 (24.01)	71.46 (15.93)	36.87 (19.77)	79.33**
Social alienation	42.76 (24.14)	67.43 (17.85)	31.20 (19.67)	81.87**
Somatic anxiety	49.81 (23.79)	69.08 (20.15)	45.37 (20.05)	35.66**

*MBHI indicates Millon Behavioral Health Inventory.
***P* < .001

TABLE 7 Mean values for clusters on the MMPI-2 validity and clinical scales

Scale	Repressors (n=116) Mean (SD)	Amplifiers (n=98) Mean (SD)	Social copers (n=115) Mean (SD)	F value
L	59.00 (11.10)	52.48 (8.56)	55.26 (9.24)	11.43***
F	52.71 (10.45)	63.11 (14.46)	48.46 (8.21)	45.48***
K	55.70 (9.55)	44.13 (7.77)	55.04 (9.02)	52.29***
Hs	76.32 (11.47)	76.09 (11.00)	70.68 (11.14)	8.78**
D	66.01 (12.21)	73.74 (13.57)	58.46 (10.49)	40.64***
Hy	76.38 (13.97)	73.34 (14.21)	70.55 (12.80)	5.07**
Pd	54.69 (9.83)	61.27 (14.03)	51.62 (9.81)	19.18***
Mf	48.35 (8.58)	50.11 (10.20)	51.39 (9.7)	2.89
Pa	51.72 (10.65)	59.27 (15.51)	49.71 (9.63)	17.43***
Pt	58.67 (9.71)	65.29 (14.57)	53.57 (8.57)	28.60***
Sc	58.73 (10.53)	65.73 (14.43)	52.38 (9.67)	33.86***
Ma	47.46 (8.09)	50.83 (11.18)	49.21 (7.42)	3.60**
Si	52.15 (9.98)	59.55 (10.42)	45.26 (8.30)	56.61***

*MMPI-2 indicates Minnesota Multiphasic Personality Inventory II; L, honesty about one's flaws; F, psychopathology; and K, defensiveness; Hs, hypochondriacal symptomatology; D, depression; Hy, somatic symptomatology and denial of stress; Pd, antisocial tendencies; Mf, masculinity and femininity; Pa, paranoia; Pt, anxiety; Sc, psychotic or schizoid symptomatology; Ma, manic symptomatology; Si, social introversion.

** $P < .05$

*** $P < .001$

Social copers reported the lowest levels of psychosocial distress and psychosocial disability compared to the other 2 MBHI clusters. In fact, social copers appeared to report low average levels of emotional distress even when distressed by physical symptoms and pain (eg, MMPI-2 content scales, Table 4). This seeming emotional hardness is suspect, however, because social copers tended to show high average levels of psychological defensiveness (MMPI-2 L scale, Table 7). In general, social copers may be a more psychometrically heterogeneous group with regard to the way they cope with illness, negative emotions, and psychosocial stress.

Cluster Differences on Demographic and Clinical Variables

Because of the possibility that the clusters might also be differentiated by sociodemographic variables, we investigated potential differences in gender, ethnicity, marital status, and age. With regard to gender, chi-square analyses revealed the amplifiers to be the only cluster with significantly different proportions of men and women ($\chi^2(1)=4.39, P < .05$). Women represented a significantly larger portion of amplifiers than did men. The repressors and social copers did not differ in their proportions of men and women ($\chi^2(2)=1.10, ns; \chi^2(2)=1.27, ns$, respectively). With regard to ethnicity and marital status, there were no differences between the clusters ($\chi^2(8)=8.94, ns; \chi^2(6)=4.42, ns$, respectively). With regard to age, a 1-way ANOVA followed by a Tukey post-hoc test revealed repressors ($\bar{X}=48$ years) to be significantly older than social copers ($\bar{X}=43$

years) but not significantly older than amplifiers ($\bar{X}=44.5$ years; $F_{2,328}=4.5, P < .02$).

The clusters did not differ on the number of bodily locations where pain was experienced ($F_{2,328}=.12, ns$), nor did they differ on the amount of time for which they had endured pain ($\chi^2(12)=9.3, ns$).

Cluster Validation Using Discriminant Analysis on MBHI Coping Scales

To establish predictive utility of the cluster solution, predictive discriminant analysis was applied to the sample, and classification functions were derived for the 3 clusters using the 8 MBHI coping scales as the predictors (note 3). Of the 329 cases, 87.5% were classified correctly, compared to 33% who would be correctly classified by chance alone. Of the 116 repressors, 81% were classified correctly. Of the 115 amplifiers, 89% were classified correctly. Of the 98 social copers, 93% were classified correctly. Consequently, the 8 MBHI coping scales can be used to predict any given chronic pain patient's cluster membership at an 88% average accuracy rate.

The stability of the above classification procedure was checked by crossvalidating the classification functions. Approximately 50% ($n=164$) of the cases were randomly withheld from calculation of the classification functions, which were subsequently tested on the other half of the sample, as recommended and described by Stevens^{37(p281)} and Tabachnick and Fidell.^{38(p544)} For the 50% of cases from whom the functions were derived, 88% were correctly classified. For the crossvalidation cases, classification was virtually the same at 89%. These tests indicate a high degree of consistency in the classification scheme.

Cluster Differences on Treatment Compliance and Outcome

We compared 53 patients' treatment compliance ratings and scores on the MPI life interference scale (functional impairment) by cluster membership because restoration of functional capacity is considered to be one of the most important outcome variables in chronic pain management.³⁹ A 1-way ANOVA revealed amplifiers to be significantly less compliant than

TABLE 8 Mean values for treatment compliance and treatment outcome by cluster

Scale	Repressors (n=116) Mean (SD)	Amplifiers (n=98) Mean (SD)	Social copers (n=115) Mean (SD)	F value
Treatment compliance rating	3.99 (.59)	3.50 (.54)	3.72 (.67)	3.23
Residualized impairment change score	.009 (1.27)	.17 (.93)	.008 (1.10)	ns

*CIPI indicates Chronic Illness Problem Inventory.
** $P < .01$
*** $P < .001$

repressors, with no significant differences between repressors and social copers ($F_{2,52}=3.23, P<.05$; Table 8). No significant differences were found between clusters on functional impairment; $F_{2,52}=.33, ns$). However, compliance was positively related to reductions in functional impairment ($r=-.28, P<.03$).

COMMENT

The clusters identified in the present study strongly resemble those found by the authors of the MBHI. Our repressors resemble the passive-conforming group; amplifiers resemble the anxious-moody and aggressive-negativistic groups; and social copers resemble the confident-narcissistic and dependent-social groups. Our findings support the likelihood that repressors, amplifiers, and social copers can be identified in other chronic pain populations, and possibly other medical populations. Moreover, our clusters differed on their levels of treatment compliance, and compliance, in turn, was related to treatment outcome, suggesting that some groups may have a better treatment prognosis than others.

This study's findings support past research conducted on such classifications as repressors and amplifiers.^{4,12} Our findings indicate that amplifiers have the highest levels of emotional and physical suffering with higher levels of functional disability, and consequently, may have the poorest treatment prognosis. Moreover, the amplifier cluster was associated with the highest levels of anger, cynicism, and aggression. Angry and aggressive chronic pain patients have been proven difficult to work with in general. Fernandez and Turk⁴⁰ stated that anger can be a major complicating factor in the treatment of chronic pain patients, and "if the pain patient is cynical, mistrustful and hostile, then therapeutic alliance will be undermined and the treatment goals will be less readily attainable." Amplifiers rated lowest on treatment compliance ratings, indicating that they are most at risk for deviating from a treatment plan or abandoning treatment altogether.

While the repressors were, overall, less functionally impaired and more emotionally stable than the amplifiers, they were characterized as being defensive about reporting problems. (Repressors scored highest among the 3 groups on the MMPI-2 lie scale). Thus, it appears as if repressors are not "in touch" with stress and have difficulty expressing negativity, as documented in other populations.⁴⁰ However, the present findings on repressors are not intended to suggest that suppressing negative emotion is functional when suffering from chronic illness. While possessing defensive coping traits (eg, being emotionally constrained or stable, Polyannish) can be healthy when one is living a relatively stress-free life, when the nonexpressive person is faced with a severe stressor that does not go away, such as a chronic pain disorder, denying emotional distress and being defensive may become maladaptive.¹⁵ Such a phenomenon was documented in the meta-analysis by Suls and Fletcher,⁴¹ who found that having an avoidant coping style was associated with more positive reactions to stress in initial stages. However, in the long run, having an avoidant coping style was associated with

poorer health outcomes. Likewise, in a study by Esterling et al,¹¹ chronic pain patients who were nonexpressive repressors who disclosed little about themselves were found to have the lowest levels of immune functioning. Defensiveness, which is closely related to avoidance and nondisclosure, also has been found to be related to lower levels of immune functioning.⁸ Consequently, while being nonexpressive (eg, repressor) may appear to be better than being an amplifier, both styles are likely to work against chronic pain patients in the long run.

The group that appears to be most capable and emotionally stable is the social copers group, which reported, on average, the lowest levels of emotional distress and highest levels of functional capacity. Because this group is characterized by its high levels of sociability, narcissism, and interpersonal success, it could be hypothesized that this group might be more successful in treatment programs. Social skills, or the lack thereof, may affect patients' rapport and working alliance with their healthcare professionals. While social skills have not been studied in relation to compliance in the field of chronic pain, this phenomenon has been observed in the study of end-stage renal-disease patients. Social withdrawal and social alienation were found to be significantly related to poor compliance and poor prognosis.³

A noteworthy observation involves the MMPI-2 results from this study. The MMPI has long been criticized for being unhelpful in its assessment of biopsychosocial symptoms of chronic pain.^{42,43} However, past MMPI studies have focused on the chronic pain patient as a unidimensional personality style, while our findings revealed the 3-dimensional model to account for many differences in MMPI-2 scales. The most striking of these findings are that repressors and social copers have quite defensive MMPI-2 profiles, while amplifiers have elevated psychopathology and clinical scales. Thus, past literature investigating an MMPI "pain personality" as one style characterizing all chronic pain patients is not supported by our findings, and furthermore seems to undermine attempts to understand the complexities of the chronic pain experience and clinical presentation.

Cluster analysis is one of several analytic strategies used to identify distinct groups or dimensions of coping styles. In fact, in a previous study, the authors factor-analyzed the same MBHI coping styles to examine coping style dimensions.⁴⁴ These dimensions mirror the results of the cluster analysis but are to be interpreted as continuous dimensions instead of categorical groups. Such dimensions were used to predict mediators of treatment outcome in a path model of outcome in a pain management center.

Study Limitations

A potential limitation associated with this study is the restricted range associated with the treatment compliance ratings. The lowest compliance rating given a patient was a 3 (on a 5-point semantic rating scale). Thus, most patients in this study were rated as having at least satisfactory overall treatment compliance. Since we were not able to follow up with the patients

who dropped out of treatment, we were unable to collect outcome data on these individuals. Consequently, analyses involving treatment compliance may be at risk for a Type II error, that is, underestimating a relationship or yielding nonsignificant results when a relationship may, in fact, exist.

Clinical Implications and Conclusions

These cluster analytic findings substantiate previous research suggesting that the coping and personality styles of chronic pain patients are heterogeneous; yet they can be consistently identified. Three distinct groups were identified in this sample, yielding substantial differences in functional impairment, interpersonal styles, and emotional distress. Such differences were found to be associated with treatment compliance, but not with response to treatment. However, while cluster membership may not have a direct relationship with treatment outcome, treatment compliance was significantly related to outcome, and thus may mediate the cluster-outcome relationship. Therefore, differences in interpersonal styles, emotional distress, and functional impairment should be identified in the early treatment stages so that psychologists and healthcare practitioners can design a treatment plan specifically suited to patients' coping styles. Generally, amplifiers evinced the most difficulty complying with cognitive-behavioral therapy (CBT), but all 3 cluster groups responded equally to CBT if therapeutic adjustments were made to accommodate for their psychophysiological styles. Patients within each group who complied most with CBT, however, experienced the best medical and functional capacity outcomes.

As theorized by Clifford⁴⁵ and Wickramasekera,¹⁵ when working with amplifiers, psychotherapists enhance compliance (and therefore outcomes) when they validate patients' suffering and provide meaningful empathy, practical relaxation, and cognitive interventions that address emotional suffering quickly (eg, individualized relaxation or self-hypnosis tapes). These patients have high levels of emotional distress, psychopathology (eg, psychiatric disorders such as major depression, anxiety disorders, personality disorders), and functional impairment. Psychologists use less biofeedback and behavioral interventions until the provided relaxation techniques provide short-term relief. When amplifiers experience emotional relief, they are more willing to comply with cognitive-behavioral interventions that affect dysfunctional thinking and lifestyles, which in turn facilitate improved long-term functional capacity. Our data indicate that amplifiers' depression scores drop significantly in the first 4 weeks of therapy.⁴⁶ Less emotionally distressed, these patients then learn how to regulate and control their emotions by practicing realistic and rational thinking. They then experience the benefits of being on productive activity schedules, and learn to maximize their quality of life despite their pain and comorbid psychiatric disorder(s). Amplifying patients also appear to have more dysfunctional emotional and interpersonal relationships with significant others, which can complicate compliance with treatment and make behavioral change more difficult.

In contrast to amplifiers, repressors comply with therapy best when they undergo a somewhat different treatment process.^{15,45} Repressors are generally not psychologically minded and many resent having to see a psychologist for their "pain problem." When working with repressors, psychotherapists facilitate treatment compliance when they focus on psychophysiological education (biofeedback), which empirically demonstrates the mind-body connection during relaxation training and behavioral therapy. Although cooperative, repressors tend to be hyposensitive to emotional suffering and can be somewhat alexithymic. Thus, they sometimes need "proof" that relaxation and behavioral interventions work early in the therapeutic process to improve activity levels and psychophysiological symptoms. Biofeedback and scheduled relaxation practice allow them to see that relaxation exercises really do lower psychophysiological symptoms of pain and stress. Once therapeutic rapport is established through biofeedback and behavioral interventions, these patients are more open to exploring cognitive and interpersonal triggers of stress. Concurrent biofeedback during CBT teaches these patients how to identify cognitive stressors and cope with psychophysiological arousal instead of denying it. They learn how to recognize and label emotions instead of transforming them into physiological symptoms (eg, headache, upset stomach).

Finally, social copers present with social skills and social desirability (high MMPI, L or K scales), and these skills can be harnessed as a means for improvement during the treatment process. Social copers probably do best in CBT when psychologists offer them a choice in treatment approaches based on their "special" interests and desires. While socially charming and outgoing at first, these patients may or may not be psychologically sophisticated. Unlike repressors who are emotionally and psychophysiological hyposensitive, social copers may use denial, suppression, and social skills to manipulate doctors and others to give them what "they want" to help relieve their pain. Like repressors, social copers need "proof" that there is a mind-body connection, but they also need a collaborative process, where they contribute to the treatment agenda from the start, even as the psychologist slowly and gently socializes them to cognitive-behavioral techniques to improve their functional capacity.

The practice of methodically tailoring CBT to the patient's psychological profiles has yet to be empirically studied. However, this study supports the presence of vastly different coping styles, and indicates that patients experience chronic pain in many different ways that can be predictably identified. Thus, treatment methods designed to help repressors, amplifiers, and social copers manage their chronic pain, in modalities that are suited to their particular coping group, are likely to maximize their response to treatment. While systematic research of this kind has been initiated in few pain management settings, a preliminary study by the authors suggests that treating patients in modalities suited toward these coping styles will maximize treatment outcome and minimize long-term treatment costs.⁴⁷

Notes

1. Due to the large number of analyses, there is a high probability that some of the F-ratio results were significant by chance. While we do not intend to minimize the serious nature of a Type I error, it should be noted that Type II error is inversely related to Type I error.³⁷ Thus, significance levels were reported for the reader's benefit, as well as to signify our intent to maintain a balance between Type I and Type II error.
2. Complete MMPI results, including Content scales, Harris-Lingoes, and Supplementary scales, are available by request (e-mail, dcipher@hsc.unt.edu).
3. A program (in either SAS or SPSS syntax) that will compute MBHI cluster membership will be provided on request (e-mail, dcipher@hsc.unt.edu).

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