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Research paper

Treatment outcome varies with coping style in chronic pain management

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summary Coping styles are generally recognized as impacting health-related outcomes among persons with chronic illnesses. The current study examined the differential treatment outcomes of three coping style groups undergoing pain management treatment in a multidisciplinary pain center. A total of 66 patients suffering from chronic pain disorders were assessed with the Multidimensional Pain Inventory and the Beck Depression Inventory before, during, and after multidisciplinary pain management treatment. Coping style groups derived from the Millon Behavioral Health Inventory consisting of Amplifiers, Repressors, and Social Copers were compared with regard to reductions in pain, functional impairment, and depression levels. Repeated measures ANOVA revealed that all three of the coping style groups reported significant reductions in pain and functional impairment. However, only Amplifiers and Social Copers reported significant reductions in depression levels. Hierarchical linear modeling analyses revealed the coping style groups to have significantly different depression change curves from pre- to post-treatment. These preliminary results support the value of tailoring treatments in pain management programs toward patients' coping styles. Patients who are high on Repression qualities do not appear to respond to therapies focused on alleviating depression. Thus, treatment methods that utilize modalities specifically suited to help Repressors, Amplifiers, and Social Copers manage their chronic pain are likely to maximize their response to treatment.

Key words: Coping style; treatment outcome; chronic pain; Millon behavioral health inventory.

introduction

Previous research indicates that persons suffering from chronic pain disorders are quite heterogeneous in their symptom presentation, psychopathology, personality style, and social milieu.[1,2] While the goals of most pain management treatment programs are to reduce the patient's emotional distress and increase functional capacity, the methods by which these goals are accomplished vary widely due to the complex biopsychosocial nature of the chronic pain experience. There has been much speculation on the contribution that psychological/interpersonal profiles make to treatment responses in pain management programs. Individual differences in coping style — that is, how patients' personality styles affect how they cope with their pain condition — have been found to affect outcomes in similar health settings.[3–6]

The concept of coping *styles* should be differentiated from coping *strategies*. There has been much research on the strategies that persons suffering from chronic pain use to help cope with their pain. Turk and Rudy[7,8] identified a classification system of coping strategies with chronic pain patients using the Multidimensional Pain Inventory (MPI).[19] The authors found that

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the MPI could identify three different profiles of chronic pain patients: patients that lack social support, patients that report high levels of pain, and patients who report high levels of activity and a good social network. While the MPI taxonomy assesses behaviors that are indicative of specific coping *strategies*, 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. Certain coping styles have been identified as detrimentally affecting biological states such as cancerous growth[4,9] and decreased monocyte counts,[10] as well as predicting health-related treatment outcomes in a multitude of settings.[5,6,11] The existing literature on coping styles is outlined 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.[13] Those 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 non-repressor counterparts. This phenomenon, as predicted by disregulation theory, involves a selective inattention to unpleasant physiological states, which results in psychophysiological 'disregulation', which may actually impede recovery from a major illness and/or increase risk of psychosomatic illness.[13] For example, the repressive coping style has been found to affect biological states such as immune functioning. In a study by Esterling and colleagues, those participants who were repressors and who disclosed little about themselves were found to have the lowest levels of immune functioning.[14] Repressors have also been found to exhibit low levels of monocytes, or cells which boost immune functioning.[10]

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',[14,15] 'hypervigilant' copers,[12] or 'amplifiers'.[24] These individuals tend to habitually overreact 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 disregulation theory, amplifiers are hypervigilant in their coping habits, tending to excessively monitor internal cues and physiologically states, resulting in greater affective reactivity and lower pain thresholds.[13]

Cipher, Clifford, and Schumacker[1] have identified distinct coping style groups within the chronic pain population using the Millon Behavioral Health Inventory (MBHI).[16] These coping style groups were derived from a hierarchical cluster analysis of the eight MBHI coping scales followed with cluster comparisons on the MMPI-2, MPI, Beck Depression Inventory (BDI), and Chronic Illness Problem Inventory. As shown in Figs 1 and 2, the cluster analysis revealed three distinct clusters that differed substantially in levels of personality styles, psychopathology and emotional distress (see Note 2).

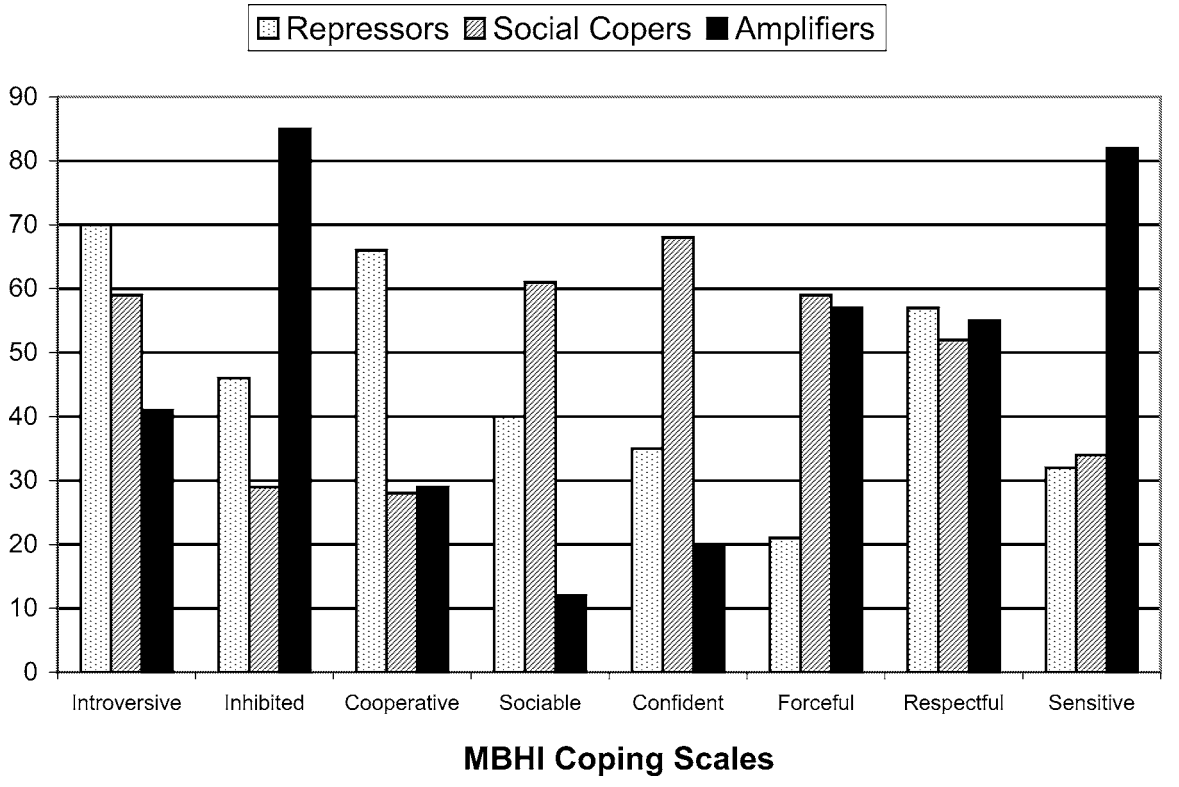

Figure 1. Coping style groups on the eight MBHI coping style scales. MBHI: Millon Behavioral Health Inventory.

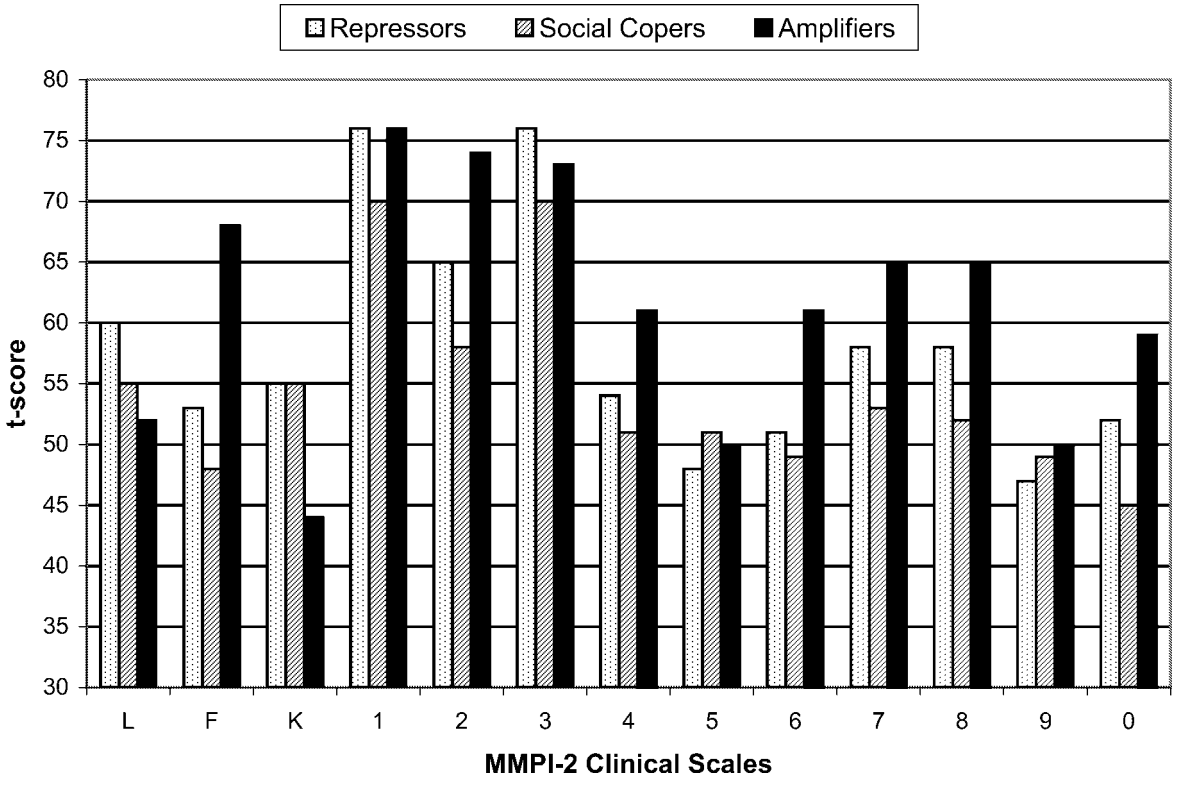

Figure 2. Coping style groups in the MMPI-2 clinical scales.

The first group, deemed 'Amplifiers', reported the highest overall levels of psychopathology and emotional distress, and the lowest levels of perceived control over their life situation, levels of social satisfaction, and treatment compliance. The second group, deemed 'Repressors,' were more emotionally

stable than the Amplifiers. However, they tended to be psychologically defensive and scored highest on scales measuring 'repression' (MMPI K and L scales), indicating a risk of underreporting psychosocial problems. The third group, deemed 'Social Copers,' reported the highest levels of functional capacity, but above-average levels of emotional distress. This group reported higher levels of sociability, forcefulness, narcissism, and interpersonal success. These coping style groups look virtually the same in terms of demographics such as ethnicity, gender, age, and marital status, as well as pain duration and pain condition.[1] In addition, these coping groups do not differentiate between the MPI taxonometric groups of Turk and Rudy;[8] that is, the coping style groups generated from the MBHI are distinctly different from those generated from the MPI taxonomy.[17]

While Amplifiers, Repressors, and Social Copers present differently at a pain center evaluation in terms of their psychopathology and emotional distress, we do not know if they respond to treatment differently. For instance, in more than a hundred studies of treatment outcome in pain centers, none to date has delineated response to treatment by the patient's coping style, such as those coping styles described above. The purpose of this study was to examine the differential treatment outcomes, including pain, functional impairment, and depression levels, among Amplifiers, Repressors, and Social Copers receiving multidisciplinary treatment at a pain center.

method

Subjects

Participants were 66 consecutive outpatients who completed multidisciplinary treatment at a University pain clinic. All patients had been previously diagnosed with some sort of chronic pain syndrome of which medical etiologies had been identified. The most common pain disorders were myofascial pain associated with injuries (27%) and surgery (17%), followed by nerve entrapment (12%), headache/migraine (12%), fibromyalgia (12%), myofascial pain not associated with injury (6%), followed by neuropathy, TMJ disorders, and arthritis (14.5%, collectively). 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 treatment. Patients reported experiencing pain most commonly in the low back, followed by mid back, head, shoulder, and neck. Eighty-seven percent of the participants reported experiencing pain in more than one site. Eighty-two percent of the sample reported experiencing pain for over one year, and 33% of those patients reported experiencing pain for over 5 years. Patients' average age was 45, with 19 males and 47 females. Exclusionary criteria were that participants should not be suffering from a terminal illness, nor would they be suffering from any severe neurological disorder (dementia, aphasia) that would preclude them from participating in the cognitive-behavioral treatment.

The classification function generated by our previous study[1] was applied to the MBHI coping scale scores (see Note 1). The sample consisted of 18 Amplifiers, 24 Repressors, and 24 Social Copers. This distribution is consistent with the distribution of coping groups within our larger sample.[1] There were no significant differences between the coping groups on gender ($\chi^2(2) = 3.75$, ns) or number of treatment sessions received ($F(2, 59) = 2.46$, ns). Moreover, there were no significant differences on other variables that might have affected response to treatment, such as whether they were receiving compensation for their pain ($\chi^2(2) = 1.32$, ns), whether they were

suing because of their pain ($\chi^2(2) = 3.55$, ns), or whether they had a history of surgery for their pain ($\chi^2(2) = 2.17$, ns).

Procedures

During their evaluation at the pain center, all patients completed an informed consent form, a questionnaire with items asking about their pain complaints (location, duration, origin, etc), the MBHI, the MPI, and BDI. The MPI and BDI were administered again at one month into treatment, and again at treatment completion. The clinic's multidisciplinary pain management approach involved pharmacotherapy as well as individual cognitive-behavioral therapy, which included biofeedback and relaxation training. Pharmacotherapy, provided on a monthly basis by attending anesthesiologists, involved medication-monitoring, analgesic prescription, and (when necessary) pain-relieving injections. Cognitive-behavioral therapy was provided by licensed psychologists. If the patients were taking psychotropic medications upon entering the treatment program, those medications were not altered for the duration of the program. Moreover, no psychotropic medications were prescribed by the staff of the pain center.

Measures

Millon Behavioral Health Inventory (MBHI). The MBHI[16] was designed to measure people's attitudes and response to medical evaluation and treatment. The eight MBHI coping style scales (Introversive, Inhibited, Cooperative, Sociable, Confident, Forceful, Respectful, and Sensitive) were used to identify the patients as either Amplifiers, Repressors, or Social Copers using the classification formulas from Cipher, Clifford, and Schumacker.[1] When the coping style classification procedure was tested for reliability, on average, the procedure misclassified cases less than 8% of the time. The MBHI appears to be a valid and reliable instrument, with published reliabilities for the coping scales ranging from 0.77 to 0.88.[18]

West Haven–Yale

Multidimensional Pain Inventory (MPI). The MPI[19] is a comprehensive, psychometrically sound instrument which is composed of three sections with a total of 12 empirically derived scales. This study focused on two of the 12 scales: Pain Severity and Life Interference. The Pain Severity scale was used as an indicator of overall pain levels, and the Life Interference scale was used as indicator of functional impairment. The MPI is a reliable and valid instrument, with published subscale reliabilities ranging from 0.62 to 0.91[27] (Jamison, Rudy, Penzien & Mosley, 1994).

Beck Depression Inventory (BDI). The BDI[20] 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." Coefficient alphas for the BDI have been found to range from 0.76 to 0.95.[21]

results

Repeated measures ANOVA on functional impairment (MPI Interference scale) within each coping style group revealed each group to have significantly improved from pre to post-treatment (Amplifiers, $F(1, 17) = 11.83$, $p < 0.001$; Repressors, $F(1, 22) = 13.32$, $p < 0.001$; Social Copers, $F(1, 24) = 8.68$, $p < 0.01$). Repeated measures ANOVA on pain levels (MPI Pain Severity scale) within each coping style group revealed each group to have significantly improved from pre- to post-treatment (Amplifiers,

Table I.
BDI and MPI treatment outcomes by coping style group

	Amplifiers ($N = 18$)		Repressors ($N = 24$)		Social copers ($N = 24$)	
	Pre-Tx $\overline{X}$ (SD)	Post-Tx $\overline{X}$ (SD)	Pre-Tx $\overline{X}$ (SD)	Post-Tx $\overline{X}$ (SD)	Pre-Tx $\overline{X}$ (SD)	Post-Tx $\overline{X}$ (SD)
BDI	21.06	13.06**	13	10.88	14.12	9.72**
	(7.94)	(7.67)	(7.31)	(6.99)	(5.76)	(7.96)
MPI pain severity	4.55	3.57*	4.61	3.60**	4.32	3.19**
	(0.88)	(1.68)	(0.86)	(1.19)	(1.07)	(1.15)
MPI interference	4.37	3.43**	3.93	3.17**	3.76	2.73**
	(1.2)	(1.35)	(1.45)	(1.42)	(1.31)	(1.64)
MPI life control	2.81	3.11	3.96	4.33	4.00	3.88
	(0.8)	(0.85)	(1.12)	(1.00)	(1.13)	(1.42)
MPI affective distress	4.1	3.64	2.92	2.18*	3.11	2.81
	(1.13)	(1.17)	(1.17)	(1.37)	(1.08)	(1.23)
MPI support	2.85	2.41	4.28	4.31	3.70	3.20
	(1.94)	(1.8)	(1.38)	(2.36)	(1.50)	(1.72)
MPI punishing responses	2.35	2.42	1.31	1.41	1.84	2.06
	(1.77)	(1.82)	(1.26)	(1.44)	(1.60)	(1.46)
MPI solicitous responses	2.42	1.73*	3.69	3.10*	2.79	2.64
	(1.71)	(1.34)	(1.49)	(1.63)	(1.50)	(1.72)
MPI distracting responses	1.21	1.53	2.11	2.55	2.04	2.38
	(1.26)	(1.28)	(1.39)	(1.69)	(1.42)	(1.43)

*F value comparing pre-Tx score with post-Tx score is significant at $\alpha = 0.05$. **F value comparing pre-Tx score with post-Tx score is significant at $\alpha = 0.01$. BDI: Beck Depression Inventory. MPI: Multidimensional Pain Inventory.

$F(1, 17) = 5.68$, $p < 0.05$; Repressors, $F(1, 22) = 21.44$, $p < 0.0001$; Social Copers, $F(1, 22) = 18.57$, $p < 0.0001$). As shown in Table I, means and standard deviations for the BDI and eight of the MPI scales have been divided into the three coping style groups, along with indications of significant differences between pre-treatment scores and post-treatment scores.

Repeated measures ANOVA on depression (BDI) revealed that Amplifiers and Social Copers reported significantly lower levels of depression from pre- to post-treatment ($F(1, 16) = 13.31$, $p < 0.01$; $F(1, 23) = 9.05$, $p < 0.01$, respectively). Repressors, however, did not report significantly lower levels of depression ($F(1, 22) = 3.24$, ns). It should be noted that the coping style groups did not significantly differ in pain levels or functional impairment at pre-treatment ($F(2, 64) = 1.45$, ns; $F(2, 64) = 1.71$, ns, respectively). Moreover, the number of treatment sessions received was not significantly correlated with improvement in depression, $r(55) = -0.19$, ns. However, the coping style groups did report significantly different levels of depression at pre-treatment ($F(2, 63) = 7.51$, $p < 0.001$).

In light of these findings, an intra-class correlation was computed for patients' depression across time, revealing significant subject variation ($\rho = 0.57$). Thus, 57% of the total variance in depression was due to subject differences, indicating the need for modeling changes in depression at the 'subject' level. Subsequently, multilevel modeling for repeated measures using HLM-5[22] was performed to test effects for depression variability at evaluation (pre-treatment), time, and coping style group. We tested the intercept, (depression at evaluation), linear, and quadratic coefficients for statistical significance and for group (coping style) differences in the depression change curves. Put simply, multilevel modeling for repeated measures conveniently combines regression and ANOVA procedures in order to assess the extent to which the patients have different patterns of change in depression over time.

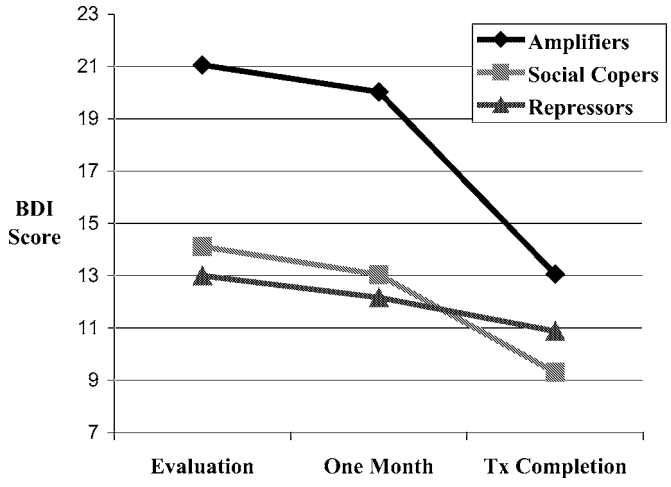

Figure 3. Change in depression over course of MPC treatment. BDI: Beck Depression Inventory.

At Level 1, results revealed that the coefficient for the intercept was significant ($t = 12.81$, $p < 0.00001$), revealing significant variability in depression at evaluation. The linear slope coefficient was also significant ($t = -5.34$, $p < 0.00001$), meaning that there were significant changes in depression over time. At Level 2, when coping style group was added to the equation as a covariate, the model significantly improved ($\chi^2(1) = 188.58$, $p < 0.00001$). Both coefficients for the coping style intercepts were significant ($t = 2.54$, $p < 0.02$; $t = -2.06$, $p < 0.05$), and there was a significant group X slope interaction ($t = -2.101$, $p < 0.05$; see Fig. 3).

discussion

Results from the analyses of variance revealed that Repressors, Amplifiers, and Social Copers reported significant reductions in pain and functional impairment from pre- to post-treatment. However, the multilevel analyses revealed the coping groups to have reported varied reductions in depression levels. Amplifiers started treatment with the highest levels of depression, and revealed the largest changes as treatment progressed. Repressors and Social Copers, on the other hand, started with moderate levels of depression, but the Social Copers' surpassed the Repressors' post-depression levels to reveal the lowest levels of depression among the three coping style groups.

These preliminary findings imply that Amplifiers engage in a different treatment response pattern than do other coping style groups. They may be most responsive to treatments designed to alleviate depression, such as the cognitive-behavioral therapies incorporated in this study. On the other hand, Repressors did not respond to depression-focused therapy. Since persons in this group are most likely to be defensive in self-reporting and introversive in their interpersonal styles, they may respond positively to other modes of multidisciplinary treatment such as biofeedback. In a previous study by the authors, we found that chronic pain patients with 'Repressor' characteristics were most compliant with multidisciplinary treatment.[23] Therefore, it is not likely that Repressors did not show improvements in depression levels due to lack of cooperation or rapport with their doctors. According to Wickramasekera,[24] Repressors *are* cooperative, but need to master psychophysiological regulation prior to exploring cognitive and interpersonal triggers of stress.

Results indicated that Amplifiers began treatment with moderate to high depression levels that were indicative of clinical depression, and ended treatment with mild levels (consistent with dysthymia). Social Copers

began treatment with moderate to mild levels (dysthymia) and ended with normal levels.[25] However, Amplifiers did not significantly improve in the MPI Affective Distress (MPI-AD) scale from pre-treatment to post-treatment. The MPI-AD scale consists of three items: overall mood, irritability, and tension/anxiety. Therefore, Amplifiers improved in functional capacity and the BDI, but *not* mood, irritability, and anxiety. Even though we do not have the specific item information from the BDI, we can postulate that the Amplifiers improved on the cognitive items and physical items from the Beck, but not the mood-oriented items. If this is indeed the case, then we can infer that the cognitive-behavioral therapy resulted in a reduction of dysfunctional cognitions associated with depression, which is one of the standard goals of CBT.

Thus, individualized treatment methods designed to help Repressors, Amplifiers, and Social Copers manage their chronic pain, in modalities that are suited to their particular coping style, are likely to maximize patients' response to treatment. While systematic research of this kind has only been initiated in few pain management settings, one preliminary study suggests that treating patients in modalities suited toward these coping styles will maximize treatment outcome and minimize long-term treatment costs.[26]

notes

1. A program (provided in either SAS or SPSS syntax) that will compute MBHI coping style group membership will be provided upon request. Request by e-mail to: dcipher@hsc.unt.edu or by fax to: 817.735.3214.
2. Graphs of the coping style groups on the MBHI Empirical scales, MBHI Psychogenic Attitude scales, MMPI-2 Content scales, MMPI-2 Harris-Lingoes scales, Chronic Illness Problem Inventory, and Multidimensional Pain Inventory, analyzed from the larger sample ($N = 330$) from Cipher, Clifford & Schumacker (2002) are available upon request.

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