Exploration of Anger Constructs in Acute and Chronic Pain Patients vs. Community Patients


* Miller School of Medicine, † University of Miami, ‡ Departments of Psychiatry, § Neurological Surgery; ¶ Anesthesiology, Department of Psychiatry, †† Miami Veterans Administration Hospital, ** Rosomoff Comprehensive Pain & Rehabilitation Center, ††† Douglas Gardens, §§ Health Psychology Associates, Greeley, Colorado; ¶¶ Integrated Therapies, Lakewood, Colorado; *** Authors of the BHI 2 Test; ‡‡‡ State Farm Insurance, Bloomington, Illinois; ‡‡‡ Univ. Denver Department. Psychology, U.S.A.

Abstract

Objectives: (1) Determine and compare prevalence of forms of anger (FOA; anger, hostility, aggression, anger-in, anger-out, chronic anger) in community nonpatients (n = 478), community patients (n = 158), acute pain patients (APPs; n = 326), chronic pain patients (CPPs; n = 341); and (2) develop FOA predictor models in APPs and CPPs.

Design: A large set of items containing the FOA items was administered to the above groups, who were compared statistically for FOA endorsement. APPs and CPPs affirming the anger and chronic anger items were compared with those not affirming on all available variables including the Battery for Health Improvement (BHI-2) with significant variables (P < 0.001) utilized in predictor models for anger and chronic anger in APPs and CPPs.

Results: FOA affirmation ranged from 8.28% for chronic anger in nonpatients to 37.54% for anger in CPPs. Only CPPs were more likely to affirm anger (P ≤ 0.04) and chronic anger (P ≤ 0.01) at a significantly higher rate than community patients. In both APPs and CPPs, all FOA items except anger management-in were significantly correlated with other FOA items. For anger and chronic anger for CPPs and APPs, hostility was the strongest predictor. All models predicted anger and chronic anger significantly better than the base rate prediction.

Conclusion: According to the results of this study anger and chronic anger are more frequently found in CPPs vs.
community patients supporting the clinical perception that many CPPs are angry. As such, clinicians should actively screen CPPs for the presence of anger in order to engage these CPPs in anger management treatment.

Key Words: anger, hostility, aggression, anger-in, anger-out, chronic anger, Battery of Health Improvement (BHI 2), chronic pain

INTRODUCTION

Anger, hostility, aggression, anger out, anger-in, and chronic anger are six forms of anger (FOA) that have previously been discussed in the pain literature.1,2 These FOA are defined as follows. The term anger refers to an emotion, defined as a subjective feeling of unpleasantness originating from attributions of wrongdoing and accompanied by tendencies toward retaliation.1 Hostility refers to a cognitive process, and an enduring tendency toward making cognitive appraisals of malicious intent on others as anticipation of aggression from others.2 Persons who have a hostile attributional style are more likely to experience anger.2 Aggression refers to the behavioral aspect of anger and to punitive or destructive behaviors aimed at persons or objects.2 There are different ways of coping with anger, and the tendency to engage in aggressive behaviors, either verbal or physical, when experiencing the emotion of anger is called anger-out.2 Alternatively, a coping style that involves inhibiting the expression of angry thoughts and feelings (anger suppression or internalization) is termed anger-in.2 Finally, chronic anger is the tendency to experience angry feelings consistently over the course of time.

Although the various editions of the Diagnostic Statistical Manual (DSM) sometimes refer to anger as a symptom, there is no diagnostic category for anger. As such, little is known about the prevalence of anger in the community and the pain population.1,3 There is only one study of anger in patients with chronic pain that utilized the psychiatric diagnostic criteria of the DSM. Here, it was reported that the prevalence of Intermittent Explosive Disorder (which may be a form of aggression or anger-out), in chronic pain patients (CPPs) was 10%.4 However, there is a general perception in the pain literature that CPPs are commonly angry.2,5 This is supported by two reports. In one of these studies, 88% of CPPs endorsed angry statements during focused experiential psychotherapy,6 whereas in a second study, 69% of chronic low-back pain patients reported being angry at someone.5 However, there appears to be only a few controlled studies on the prevalence of anger within CPPs. We were only able to find five such studies: CPPs appear to have significantly greater scores on the hostility scale of the SCL-90 than their spouses;7 chronic headache patients were shown to be aroused to anger more often, but were also more likely to suppress angry feelings than headache-free controls;8 chronic headache patients as compared with headache-free controls demonstrated higher levels of anger than anger-out;9 and fibromyalgia and chronic headache patients showed greater levels of anger-in than pain-free controls.9,10

Contrary to the issue of anger prevalence, a significant number of reports stress the importance of FOAs to the perception of pain. These can be summarized as follows. A tendency to manage anger via anger-out is associated with acute responsiveness to acute and clinical pain stimuli11–13 and is generally related to elevated chronic pain intensity.14 There is a significant relationship between pain intensity and anger, hostility, and anger-out.15 Efforts to suppress anger (anger-in) may actually increase pain,16,17 and may also be related to reported level of depression.18,19 In contrast, expressing anger may lead to improvement in control over pain.20 Recent evidence also indicates that an anger-out style moderates how much attention is allocated to pain during acute pain induction,21 and swearing as an indication of anger-out has been shown to lead to a hypoalgesic effect or increased pain tolerance.22 Of those CPPs who are angry, the most common object of their anger is the medical/social security/legal system.23 Overall, these studies indicate that anger issues should be prevalent in CPPs and that they should be important to the behavior of CPPs.

The issue of the prevalence of anger within CPPs in relationship to other groups such as the community of nonpatients is further complicated by two issues. First, it appears that patients with any chronic illness may be more angry than nonpatients,24 thus confounding a comparison between CPPs and pain-free controls. Second, psychiatric patients have generally been found to be angry and aggressive.25 As many CPPs have significant psychiatric symptoms,4 it is not clear whether the anger in these CPPs is characterological, pain-related, part of the psychiatric syndrome, or a combination of these. As such, we wished to design a study that could determine the prevalence of FOAs in CPPs and acute pain patients (APPs) in comparison with patients in the community and determine if these FOAs could be predicted by other variables.

The goals of this study are as follows: (1) to compare community nonpatients, community patients, rehabili-
tation patients without pain, rehabilitation CPPs, and rehabilitation APPs for the risk of different FOAs, (2) to determine if there is a relationship between these different FOAs within each of the above nonpatient/patient/pain patient groups, and (3) develop variable predictive models for some FOAs for APPs and CPPs. Because of the access to community nonpatients, community patients, and APPs, this is the first such study in the literature.

METHODS

Subjects/Participants

The study described in the following discussion is a data mining study of a data set (a set of items) termed the Battery for Health Improvement Research (BHI-R). The BHI-R is not an inventory or test. This set of items was compiled in order to develop the Battery for Health Improvement 2 (BHI 2) whose items are made up of a subset of the BHI-R items. The subjects of the present study are six BHI-R items that were selected because they appeared to have face validity (most closely approximate) the six FOAs defined by the literature and presented in the Introduction. These items, and the FOA that they represent, were as follows: being more angry than one should be (anger); being unable to resolve angry feelings (chronic anger); wanting to break things (aggression); difficulty expressing anger (anger-in); losing control when angry (anger-out); and believing that one has been toyed with and betrayed by others (hostility).

The BHI-R items had been administered to 777 patients undergoing rehabilitation treatment for pain or a physical injury who were from 30 states and represented all geographical regions of the continental United States. They were recruited by posters or flyers provided to them by their providers and were from a variety of settings: physical therapy, work hardening programs, chronic pain programs, physician offices, and vocational rehabilitation settings. These patients were also drawn from various payor systems (Medicare/Medicaid, private insurance, worker’s compensation, and personal injury insurance). Their nonspecific and specific diagnoses were the following as a percentage of the total patients: Headache pain 12.2% (n = 95); whiplash associated pain 6.8% (n = 53); non-whiplash cervical sprain associated pain 8.1% (n = 63); upper extremity injury associated pain 25.2% (n = 196); low back injury associated pain 44.4% (n = 345); lower extremity injury associated pain 25.4% (n = 197); head injury associated pain 11.2% (n = 87); carpal tunnel syndrome 6% (n = 47); thoracic outlet syndrome 2.2% (n = 17); reflex sympathetic dystrophy 1.4% (n = 11); and fibromyalgia 1.4% (n = 11). These nonspecific and specific diagnoses were received from the treating facilities either before referral to the facility or during treatment. We have no information as to what types of physicians assigned these diagnoses. Of these 777 rehabilitation patients, 667 had pain (numerical rating scale [NRS] score greater than zero) and 110 had no pain. Of patients with pain, 341 suffered from chronic pain (CPPs; greater than 90 days duration). The remaining patients (n = 326) had acute pain (APPs; less than 90 days duration).

Community healthy (n = 1329; reported no serious medical condition) and community unhealthy (n = 158; reported a serious medical condition) groups had also been administered all the BHI-R items. These subjects were from 16 states in all four geographical areas of the United States. They were recruited by newspaper advertisements and posters; stratified according to race, education, age, and gender; and recruited to match these demographics. No subject was excluded on the basis of past or present medical or psychological diagnoses. For a complete description of these subjects, please see Bruns and Disorbio.26

Instrumentation

The BHI-R data set contained 600 items. Two of the items related to a horizontal 10 cm NRS scale anchored at 0 (no pain or discomfort) and 10 (worst pain or discomfort I can imagine having). Using this scale, and considering all of the pain affected parts of the body, the subjects were asked to rate both the highest and the lowest pain experienced in the last month.

The BHI-R is not an inventory. It contains no scales and therefore has no associated reliability and validity data. However, each item in the BHI-R has 1 week test–retest reliability scores. The items representing the FOAs of interest to this study had the following test–retest reliability scores: chronic anger—0.67, anger—0.75, anger in—0.68, anger out—0.74, aggression—0.73, and hostility—0.82. The mean test–retest reliability score for these six items was 0.73. Some items from the BHI-R item set have been found to be associated with some interesting clinical issues (28–36).27,28

Additional variables had also been collected with the BHI-R items: age; gender; highest level of education (less than high school graduate, high school graduate, some
college, or college grad or higher); ethnicity (non-white vs. all others); worker’s compensation status (yes vs. no); worker’s compensation litigation status (yes vs. no); personal injury status (yes vs. no); personal injury litigation status (yes or no); injury type (head, neck, arm/hand, lower back, leg/foot, or other injuries); insurance type (Medicare/Medicaid, personal injury, private health insurance, or worker’s compensation); medical setting (physical therapy, pain program, or work hardening); employment status (employed vs. unemployed); smoking status (yes vs. no); marital status (married vs. unmarried); pain scores (peak pain, maximum tolerable pain, a pain tolerance index, a pain range [based on the highest minus the lowest numerical pain rating in the last month], number of areas with pain, number of symptoms, and total number of pain areas and symptoms); number of days suffering an injury; history of neck surgery; history of low-back surgery; number of jobs past 5 years; and cigarette smoking status (none, less than one pack/day, one or more packs/day).

The BHI 2 was developed from the pool of BHI-R items and contains 18 scales described in the Appendix. Test–retest reliability of these scales ranged from 0.88 to 0.97 and the mean test–retest reliability was 0.93. Internal reliability of these scales ranged from 0.75 to 0.97 and the mean internal reliability of these scales was 0.84. The validity of these scales was tested against a number of instruments, the results of which are also presented in the Appendix.

Data Collection Procedures
Participation was by self selection, and subjects were reimbursed for their participation. Any patient wishing to participate in the BHI-R study was allowed study entrance. The only exclusion criteria were being less than 18 years or over 65 and not being able to read the BHI-R items. The BHI-R items were administered in a confidential manner (questionnaires were assigned a random ID number). No records were kept regarding which ID number a patient or nonpatient was assigned and the data were processed by persons having no contact with, or knowledge of, the respondents (data were de-identified). All groups signed an informed consent form advising the subjects/patients of the risks and benefits of participation in completing the BHI-R items. The consent form indicated that the information gathered from the BHI-R items would not influence the course of their clinical care. No IRB was utilized in the rehabilitation treatment facilities. However, the consent form had been developed by Pearson Assessments and reviewed by an internal committee that had followed IRB principles and concepts in development and review of the informed consent form. The BHI-R data set was presented in a de-identified format for data mining and analysis.

Data Analysis
Response groups (affirmation vs. nonaffirmation) to the six FOAs were established as follows. Each item was scored on a Likert scale format with the responses being strongly disagree, disagree, agree, and strongly agree (assigned scores 1 through 4, respectively). For the analyses described below, items were transformed into a dichotomy. Thus, participants were classified as agreeing with the item if they agreed or strongly agreed.

Data were analyzed using SPSS 15.0 software. Frequency and descriptive statistics were calculated to check all relevant characteristics of the data for each patient group. The relative risk for positive responses to the six FOAs was calculated using the healthy community sample as the reference group compared with community patients, rehabilitation CPPs, rehabilitation APPs, and rehabilitation patients without pain. Relative risk data presentation was chosen as it provides direct comparison between the control group (in this case, the health community nonpatient sample) and other groups. In addition, frequency of affirmation was compared by chi-square between community patients and APPs and community patients vs. CPPs for all six FOAs.

BHI 2 scales were scored according to the BHI 2 protocol from the responses of the community nonpatients, community patients, and the rehabilitation patient groups (no pain, APPs, CPPs) to the BHI-R items. Four of the six FOAs under investigation were on BHI 2 scales. As this would contaminate the results, these four items were removed from their associated BHI 2 scales and all the scales were then re-normed, using the original norm groups, in the new T-scores that were based on the modified scales calculated. It was these modified T-scores that were used in this study. Only valid BHI 2 profiles were utilized in the analyses described below.

In addition, we included a number of other items from the BHI-R data set into the steps described below as independent variables: violent ideation against a
Results

Table 1 presents the demographic characteristics of the BHI-R study subjects/patients.

Table 1. Demographic Characteristics of BHI-R Study Subjects/Patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Community Healthy (n = 1,329)</th>
<th>Community Patients (n = 158)</th>
<th>Rehabilitation Patients without Pain (n = 110)</th>
<th>Rehabilitation Acute Pain Patients (n = 326)</th>
<th>Rehabilitation Chronic Pain Patients (n = 341)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
<td>M = 37.6 SD = 12.1 R = 18.65</td>
<td>M = 44.4 SD = 11.7 R = 18.65</td>
<td>M = 36.4 SD = 10.6 R = 18.64</td>
<td>M = 39.8 SD = 10.1 R = 19.65</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>Black 119 (9.0%) White 1,095 (56.7%)</td>
<td>Black 27 (17.7%) White 119 (75.3%)</td>
<td>Black 28 (13.1%) White 119 (80.3%)</td>
<td>Black 19 (5.9%) White 278 (86.1%)</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>Male 751 (56.5%) Female 751 (56.5%)</td>
<td>Male 44 (44.9%) Female 45 (40.9%)</td>
<td>Male 87 (55.1%) Female 65 (59.1%)</td>
<td>Male 180 (55.2%) Female 146 (44.4%)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>Unknown 3 (0.2%) Unknown 3 (0.2%)</td>
<td>Unknown 0 Unknown 0</td>
<td>Unknown 0 Unknown 0</td>
<td>Unknown 0 Unknown 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relative Risk of Affirmation for the Six Anger Items

Table 2 displays the number of participants who were APPs, CPPs, or community participants who endorsed the six FOA items. Using APPs as the reference group, the relative risk (RR) of endorsing the six FOA items was calculated among patients without pain, healthy community participants, and community participants. Patients without pain, healthy community participants, and community participants with a history of wanting to die, wanting to die for reasons other than pain, recent frequent suicide ideation, having a suicide plan, a history of suicide attempt, and committing homicide followed by suicide. These items were included because we had previously demonstrated that anger problems in CPPs are associated with violent ideation,29–32 wish to sue a physician,33,34 and suicidality (D. Fishbain, unpublished data).32

Student t-tests were used to assess age, pain scores, and the BHI 2 scales for each of the six FOAs comparing those who did and did not affirm that item. Chi-squares were used for categorical, demographic, and clinical history variables comparing those who affirmed the six FOAs to those who did not. Phi coefficients were then calculated among all of the six FOAs for APPs and CPPs. For each significant BHI 2 scale, we also broke the scale down into its individual items and compared them with chi-square against the six anger items. We employed a very strict level (P < 0.001) to choose variables that were significant. Our rationale for setting such a restrictive P value was that it served to reduce the risk of false positives caused by performing multiple statistical tests. By using this restrictive P value, these variables would then be significant regardless of the correction method chosen, and our Type 1 error was minimized. The items selected in this manner were used as independent variables in logistic regression models to assess the predictability of the dependent FOA variables. Logistic regression analysis was only performed for two FOAs (anger and chronic anger) where we found a significantly different prevalence between APPs, CPPs, and the community patients.

Results

Table 1 presents the demographic characteristics of the BHI-R study subjects/patients.

Table 2 displays the number of participants who were rehabilitation APPs, rehabilitation CPPs, rehabilitation patients without pain, healthy community participants, and community patients, and the percentage of these participants who endorsed the six FOA items. Using health community participants as the reference group, the relative risk (RR) of endorsing the six FOA items is also presented with either the patients without pain, APPs, or CPPs typically having the highest risk for each item. This table also presents z score comparisons for the six anger items for frequency of endorsement.
between APPs vs. community patients and CPPs vs. community patients. CPPs were significantly more likely to endorse “anger” and “chronic anger.” APPs were not significantly more likely than community patients to endorse any of the FOAs.

**Correlation Matrices of Six Anger Items for APPS and CPPS**

For both groups of patients, items were typically significantly correlated among themselves. Correlation values ranged from 0.002 to 0.32 for APPs and —0.12 to 0.41 for CPPs (Table 3).

**Final Logistic Regression Models to Predict “Anger” as the Dependent Variable with Significant Independent Variables for APPs and CPPs**

For APPs in the initial chi-square/student t-test analyses, the following variables were statistically significant at the P ≤ 0.001 level and were used as potential predictors in the regression model: BHI 2 scales for Somatic Complaints, Muscular Bracing, Depression, Anxiety, Hostility, Borderline, Symptom Dependency, Chronic Maladjustment, Perseverance, Family Dysfunction, and Survivor of Violence; number of pains; number of symptoms; total number of pain and symptoms; and items reflecting wanting to die at times in the past and recently wanting to die (Table 4). The final model chi-square was significant (χ² = 112.7[4], P < 0.001) and explained 43% of the variance in the dependent variable according to Nagelkerke R². The model overall classified 77% of the

---

### Table 2. Relative Risk of Endorsing FOA Items for Community and Noncommunity Samples and Comparisons of Frequency of Endorsement for each Item between APPs, Community Patients, and CPPs

<table>
<thead>
<tr>
<th>Item</th>
<th>Community healthy</th>
<th>Community patients</th>
<th>Rehabilitation without pain</th>
<th>Rehabilitation with pain</th>
<th>Rehabilitation chronic pain</th>
<th>Z score and P value between community patients and chronic pain patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes to Anger</td>
<td>427 (31.9%)</td>
<td>110 (25.6%)</td>
<td>232 (22.8%)</td>
<td>341 (29.9%)</td>
<td>128 (28.5%)</td>
<td>Z score and P value between community patients and chronic pain patients</td>
</tr>
<tr>
<td>n (%)</td>
<td>1,229</td>
<td>1,58</td>
<td>1,10</td>
<td>3,41</td>
<td>1,28</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>Yes to Chronic Anger</td>
<td>110 (37.5%)</td>
<td>326 (23.4%)</td>
<td>117 (10.0%, 1.37)</td>
<td>237 (18.0%, 3.14)</td>
<td>128 (28.5%)</td>
<td>Z = 2.12, P = 0.01</td>
</tr>
<tr>
<td>n (%)</td>
<td>1,229</td>
<td>3,26</td>
<td>1,17</td>
<td>2,37</td>
<td>1,28</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>Yes to Aggression</td>
<td>427 (31.9%)</td>
<td>110 (25.6%)</td>
<td>232 (22.8%)</td>
<td>341 (29.9%)</td>
<td>128 (28.5%)</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>n (%)</td>
<td>1,229</td>
<td>1,10</td>
<td>232</td>
<td>341</td>
<td>128</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>Yes to Anger Management In</td>
<td>427 (31.9%)</td>
<td>110 (25.6%)</td>
<td>232 (22.8%)</td>
<td>341 (29.9%)</td>
<td>128 (28.5%)</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>n (%)</td>
<td>1,229</td>
<td>1,10</td>
<td>232</td>
<td>341</td>
<td>128</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>Yes to Anger Management Out</td>
<td>427 (31.9%)</td>
<td>110 (25.6%)</td>
<td>232 (22.8%)</td>
<td>341 (29.9%)</td>
<td>128 (28.5%)</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
<tr>
<td>n (%)</td>
<td>1,229</td>
<td>1,10</td>
<td>232</td>
<td>341</td>
<td>128</td>
<td>Z = 2.22, P = 0.01</td>
</tr>
</tbody>
</table>

Final Fishbain et al.
subjects correctly, which was significantly better than the base rate prediction of 62.5%. Sensitivity of the model was 63% and specificity was 87%.

Final Logistic Regression Models to Predict “Chronic Anger” as the Dependent Variable with Significant Independent Variables for APPs and CPPs

For APPs in the initial chi-square/student t-test analyses, the following variables were statistically significant at the $P \leq 0.001$ level and were used as potential predictors in the regression model: BHI 2 scales for Somatic Complaints, Functional Complaints, Muscular Bracing, Depression, Anxiety, Hostility, Borderline, Symptom Dependency, Chronic Maladjustment, Perseverance, and Family Dysfunction; number of symptoms; total number of pain and symptoms; and items reflecting violent ideation, thoughts of suing a physician, having a suicidal plan, wanting to die because of pain, having suicide/homicide thoughts, and frequent thoughts of suicide (Table 5). The final model chi-square was significant ($\chi^2 = 112.6[7]$, $P < 0.001$) and explained 62% of the variance in the dependent variable according to Nagelkerke $R^2$. The model overall classified 92% of the subjects correctly, which was significantly above the base rate prediction of 87.7%. Sensitivity of the model was 47% and specificity was 97%.

For CPPs in the initial chi-square/student t-test analyses, the following variables were statistically significant at the $P \leq 0.001$ level and were used as potential predictors in the regression model: BHI 2 scales for Somatic Complaints, Functional Complaints, Muscular Bracing, Depression, Anxiety, Hostility, Borderline, Symptom Dependency, Chronic Maladjustment, Perseverance, Family Dysfunction, Survivor of Violence, and Doctor Dissatisfaction; number of symptoms; total number of pain and symptoms; and the items reflecting having a suicidal plan, wanting to die because of pain, a history of suicidal ideation, a history of suicide attempts, and recent, frequent thoughts of suicide, wanting to die because of pain, and recently wanting to die. The final model chi-square was significant ($\chi^2 = 123.8[5]$, $P < 0.001$) and explained 50% of the variance in the dependent variable according to Nagelkerke $R^2$. The model overall classified 86% of the subjects correctly, which was more than the base rate prediction of 80.4%. Sensitivity of the model was 48% and specificity was 96%.

**DISCUSSION**

The results of this study are pertinent to some observations that the previous literature has developed on the relationship between anger and chronic pain. Previous literature has observed that CPPs may be more angry than controls.7–9 Of the FOAs investigated in this study, only the constructs of anger and chronic anger were affirmed by CPPs at a statistically greater frequency vs. community patients. This is at variance with some studies8–10 that had demonstrated that CPPs have greater levels of anger-in than controls. Contrary to these studies, we utilized community patients as a comparison group rather than pain free nonpatients. As patients in general may be more angry than community nonpatients,24 this may be a more appropriate comparison group. We also found that APPs did not endorse any FOA at a greater frequency than community patients. This indicates that APPs are at significantly less risk than CPPs for anger and chronic anger, which could be related to the difference in the amount of time that pain has been present. Thus we do not believe that this is a measurement artifact. This finding also indirectly supports previous literature on the association of chronic pain and anger but is the first study to demonstrate a difference in FOA endorsement between APPs and CPPs. The obvious implication of this finding is that future pain anger studies will need to separate out APPs from CPPs in performing the studies. Overall, our results, utilizing approaches new to this literature, support the presence of some FOAs in CPPs.

**Table 3. Phi Correlation Coefficients among Anger Index Items for APPs (Above the Diagonal) and CPPs (Below the Diagonal)**

<table>
<thead>
<tr>
<th></th>
<th>Anger</th>
<th>Chronic Anger</th>
<th>Aggression</th>
<th>Anger Management In</th>
<th>Anger Management Out</th>
<th>Hostility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>1</td>
<td>0.230</td>
<td>0.175</td>
<td>-0.185</td>
<td>0.315</td>
<td>0.173</td>
</tr>
<tr>
<td>Chronic anger</td>
<td>0.272</td>
<td>1</td>
<td>0.154</td>
<td>0.066†</td>
<td>0.187</td>
<td>0.275</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.283</td>
<td>0.236</td>
<td>1</td>
<td>0.002†</td>
<td>0.276</td>
<td>0.214</td>
</tr>
<tr>
<td>Anger management in</td>
<td>-0.122*</td>
<td>0.068†</td>
<td>0.007†</td>
<td>1</td>
<td>-0.008†</td>
<td>0.013†</td>
</tr>
<tr>
<td>Anger management out</td>
<td>0.406</td>
<td>0.248</td>
<td>0.396</td>
<td>-0.122*</td>
<td>1</td>
<td>0.090†</td>
</tr>
<tr>
<td>Hostility</td>
<td>0.302</td>
<td>0.270</td>
<td>0.260</td>
<td>0.014†</td>
<td>0.338</td>
<td>1</td>
</tr>
</tbody>
</table>

All correlations are significant at $< 0.01$, except for * which is significant at $< 0.05$ and † which is nonsignificant.
### Table 4. Final Model Logistic Regression Results for Significant Independent Variables with “Anger” as the Dependent Variable for APPs and CPPs

<table>
<thead>
<tr>
<th>Step</th>
<th>$c^2$(df), $\ P$ value</th>
<th>% of Cases Predicted Correctly by the Model</th>
<th>Step Nagelkerke $R^2$</th>
<th>Variable</th>
<th>Associated BHI 2 Scale</th>
<th>B</th>
<th>Wald, $P$ value</th>
<th>Odds Ratio</th>
<th>Lower 95% CI for Odds Ratio</th>
<th>Upper 95% CI for Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPs</td>
<td>75.1 (1), &lt; 0.001</td>
<td>73.6</td>
<td>0.304</td>
<td>Hostility Scale</td>
<td>Not applicable</td>
<td>0.17</td>
<td>36.6, &lt; 0.001</td>
<td>1.18</td>
<td>1.12</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>19.3 (1), &lt; 0.001</td>
<td>73.9</td>
<td>0.066</td>
<td>Fighting with loved ones</td>
<td>Borderline</td>
<td>1.87</td>
<td>18.5, &lt; 0.001</td>
<td>6.51</td>
<td>2.77</td>
<td>15.26</td>
</tr>
<tr>
<td></td>
<td>11.2 (1), 0.001</td>
<td>77.3</td>
<td>0.037</td>
<td>Distrust of most people</td>
<td>Hostility</td>
<td>-1.53</td>
<td>11.7, 0.001</td>
<td>0.22</td>
<td>0.09</td>
<td>0.52</td>
</tr>
<tr>
<td></td>
<td>7.0 (1), 0.008</td>
<td>76.6</td>
<td>0.023</td>
<td>Fear of dying</td>
<td>Anxiety</td>
<td>0.84</td>
<td>7.0, 0.008</td>
<td>2.31</td>
<td>1.24</td>
<td>4.28</td>
</tr>
<tr>
<td>CPPs</td>
<td>112.4 (1), &lt; 0.001</td>
<td>77.3</td>
<td>0.400</td>
<td>Hostility Scale</td>
<td>Not applicable</td>
<td>0.15</td>
<td>45.6, &lt; 0.001</td>
<td>1.16</td>
<td>1.11</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>11.5 (1), 0.001</td>
<td>76.7</td>
<td>0.034</td>
<td>Having patience</td>
<td>Perseverance</td>
<td>-1.00</td>
<td>10.5, 0.001</td>
<td>0.37</td>
<td>0.20</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>9.1 (1), 0.003</td>
<td>78.3</td>
<td>0.026</td>
<td>Lack of initiative</td>
<td>Perseverance</td>
<td>0.86</td>
<td>8.9, 0.003</td>
<td>2.37</td>
<td>1.35</td>
<td>4.18</td>
</tr>
</tbody>
</table>

### Table 5. Final Model Logistic Regression Results for Significant Independent Variables for APPs and CPPs

<table>
<thead>
<tr>
<th>Step</th>
<th>$c^2$(df), $\ P$ value</th>
<th>% of Cases Predicted Correctly by the Model</th>
<th>Step Nagelkerke $R^2$</th>
<th>Variable</th>
<th>Associated BHI 2 Scale</th>
<th>B</th>
<th>Wald, $P$ value</th>
<th>Odds Ratio</th>
<th>Lower 95% CI for Odds Ratio</th>
<th>Upper 95% CI for Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPs</td>
<td>50.6 (1), &lt; 0.001</td>
<td>89.3</td>
<td>0.307</td>
<td>Hostility Scale</td>
<td>Not applicable</td>
<td>0.12</td>
<td>20.4, &lt; 0.001</td>
<td>1.13</td>
<td>1.07</td>
<td>1.19</td>
</tr>
<tr>
<td></td>
<td>17.9 (1), &lt; 0.001</td>
<td>91.0</td>
<td>0.097</td>
<td>Shortness of breath</td>
<td>Somatic complaints</td>
<td>1.69</td>
<td>12.8, &lt; 0.001</td>
<td>5.41</td>
<td>2.14</td>
<td>13.64</td>
</tr>
<tr>
<td></td>
<td>10.1 (1), 0.001</td>
<td>92.0</td>
<td>0.052</td>
<td>Irrational health fears</td>
<td>Anxiety</td>
<td>1.74</td>
<td>10.0, 0.002</td>
<td>5.71</td>
<td>1.94</td>
<td>16.76</td>
</tr>
<tr>
<td></td>
<td>9.0 (1), 0.003</td>
<td>91.6</td>
<td>0.044</td>
<td>Remaining hopeful despite setbacks</td>
<td>Perseverance</td>
<td>-1.49</td>
<td>9.0, 0.003</td>
<td>0.23</td>
<td>0.09</td>
<td>0.60</td>
</tr>
<tr>
<td>CPPs</td>
<td>77.5 (1), &lt; 0.001</td>
<td>84.2</td>
<td>0.337</td>
<td>Hostility Scale</td>
<td>Not applicable</td>
<td>0.08</td>
<td>11.7, 0.001</td>
<td>1.08</td>
<td>1.03</td>
<td>1.13</td>
</tr>
<tr>
<td></td>
<td>17.4 (1), &lt; 0.001</td>
<td>84.8</td>
<td>0.065</td>
<td>Somatic Complaints Scale</td>
<td>Not applicable</td>
<td>0.04</td>
<td>5.0, 0.025</td>
<td>1.04</td>
<td>1.01</td>
<td>1.08</td>
</tr>
<tr>
<td></td>
<td>10.0 (1), 0.002</td>
<td>86.6</td>
<td>0.036</td>
<td>Feeling betrayed by others</td>
<td>Borderline</td>
<td>1.41</td>
<td>12.7, &lt; 0.001</td>
<td>4.09</td>
<td>1.89</td>
<td>8.85</td>
</tr>
<tr>
<td></td>
<td>8.6 (1), 0.003</td>
<td>86.3</td>
<td>0.030</td>
<td>Loss of identity</td>
<td>Borderline</td>
<td>1.34</td>
<td>8.6, 0.003</td>
<td>3.81</td>
<td>1.56</td>
<td>9.31</td>
</tr>
</tbody>
</table>
Previous pain literature has divided anger into the six FOAs.\textsuperscript{1,15} Theoretically therefore, these constructs should be associated with each other. Our phi correlation results demonstrated that in both APPs and CPPs, anger, chronic anger, aggression, anger management-out, and hostility are significantly intercorrelated in the expected, correct direction. The only exception was between anger management-out and hostility in APPs (not significant). Also, as expected, anger management-in was not significantly correlated or negatively correlated with all the other anger constructs. In addition, for both the “anger” and “chronic anger” constructs in both APPs and CPPs, the BHI 2 hostility scale was the strongest predictor (Tables 3 and 4). This last result supports and is supported by previous literature\textsuperscript{7,9} but most important, overall these results indirectly support the theoretical underpinnings for an association between some of the FOAs in CPPs and APPs.

Previous literature has indicated the following: pain levels may have an effect on some FOAs,\textsuperscript{2,3,13,14} anger may be associated with fear/sadness\textsuperscript{35,36} and depressive symptoms,\textsuperscript{19} and gender.\textsuperscript{37–39} Our models for anger and chronic anger did not identify any of these variables as being predictive. However, our models did identify some new and unique variables as being predictive: anxiety, perseverance, somatization,\textsuperscript{40} and borderline characteristics. Except for borderline, the presence of these variables in the models is difficult to explain and therefore these results will need to be replicated. Borderline, however, is a personality disorder (PD) and PDs are frequently associated with chronic pain.\textsuperscript{4,41} Borderline PD is characterized by significant emotional expression of anger. Thus, the presence of patients with borderline characteristics within chronic pain populations could explain the perception of why these patients are angry and our results on the greater frequency of anger within CPPs vs. community patients.

Because some of these model results are at variance with past literature, at issue then is how much better are these models than the “base rate prediction”? The concept of the “base rate” is demonstrated by examining the “anger” construct. Here, 37.54% of the CPPs endorsed this construct (Table 4). If one is to predict that no one is angry, the prediction would be correct 62.46% of the time. Thus, the model has to classify patients correctly at greater than 62.46% of the time. As presented in the results, all our models predicted both “anger” and “chronic anger” at greater than the base rate. As such, these models should have clinical utility in identifying angry patients. However, in general, although the specificity of the models was excellent, the sensitivity was low.

There are a number of potential confounders to the results of this study. First, the FOA items under investigation were dichotomized. This procedure made it possible to apply commonly used statistical methods such as odds ratios to the data. Overall, this increased the clarity and interpretability of the results. We do not believe that this affected the distribution and broader psychometrics of these measures, although this is a possibility.

Second, our use of stepwise logistic regression in this study has both advantages and disadvantages. The advantage is that this method identifies the combination of variables that best predict the dependent variable. However, a weakness in this method is that if there are two independent variables of approximately equal predictive power, and if these two variables are strongly correlated, only one of these variables is likely to be included in the regression equation. Thus, stepwise regression methods may exclude variables that are significant predictors when other similar predictors are also present. This method, however, is commonly used but can lead to results that can be an artifact of the regression analyses. In addition, this type of analysis allows for no consideration of a temporal relationship between the dependent and independent variables.

Third, there is a possibility for self selection bias for entrance into the BHI-R study. As noted in the Methods, the 777 rehabilitation patients were recruited from various clinics by poster/flyers, ensuring some random selection. However, this procedure did not preclude self selection bias in entering/not entering the BHI-R study. Thus, this issue could have served as a potential confounder to the results of this study. Similarly, community patients and nonpatients were also recruited by newspaper advertisements and posters. As such for these groups also, self selection bias could have occurred, potentially confounding the results of this study.

**CONCLUSION**

According to the results of this study anger and chronic anger are more frequently found in CPPs than in community patients supporting the long held clinical perception that CPPs are frequently angry. The results of this study indicate that clinicians should actively screen CPPs for the presence of anger in order to engage these CPPs in anger management treatment.
REFERENCES


Appendix

The BHI 2 contains the following scales: two validity scales—Self-Disclosure and Defensiveness; four physical symptom scales—Somatic Complaints (a wide variety of physical symptoms associated with somatization and symptom magnification), Pain Complaints (combined report of pain intensity across 9 body areas), Functional Complaints (the patient’s perception of his/her ability to function at work and daily life), and Muscular Bracing (tendency to respond to stress, injury, and trauma with increased levels of muscle tension); three affective scales—Depression (thoughts and feelings associated with depression), Anxiety (thoughts and feelings associated with anxiety), and Hostility (angry feelings, cynicism, and aggressiveness); five character scales—Borderline (traits of borderline personality disorder), Symptom Dependency (tendencies to use complaints about pain or suffering to seek attention from others), Chronic Maladjustment (level of success at normal life tasks such as functioning in school, work, and personal relationships), Substance Abuse (report of past or present alcohol or drug addiction), and Perseverance (psychological hardiness, self efficacy, and optimism, and assesses self-perceived ability to persevere); and four environmental scales—Family Dysfunction (nonsupportive or conflicted family environment), Survivor of Violence (history of traumatic and abusive events), Job Dissatisfaction (dissatisfaction with work, job duties, employer, or supervisor), and Doctor Dissatisfaction (a patient’s dislike or distrust of their doctors).

The validity of the BHI 2’s scales was determined by the following correlations. The Somatic Complaint scale correlated 0.76 with the MMPI 2 HyO scale\(^4\) and 0.74 with the McGill Pain Questionnaire.\(^4\) The HyO scale is a shortened version of the HY scale, which has had psychometrically weak items removed from it, and which was judged to be a better criterion scale for this analysis. The Pain Complaints scale correlated 0.70 with a scored pain drawing and 0.61 with the McGill Pain Questionnaire. The Pain Complaint scale also correlated 0.59 with the MMPI 2 HyO and 0.58 with MMPI 2 Hypochondriasis (Hs). The Functional Complaint Scale correlated (−0.64) with the Physical Functioning Scale of the SF36,\(^4\) 0.66 with the MMPI 2 HyO, and 0.61 with MMPI 2 Hypochondriasis (Hs) scale. The Muscular Bracing Scale correlated 0.65 with the Anxiety Scale of the MMPI 2.\(^4\) The Depression Scale correlated 0.70 with the MMPI 2 Depression (D), 0.71 with the MCMI-III Dysphoric Disorder Scale (D), and 0.67 with the MCMI-III Major Depression Scale (CC). The BHI 2 Anxiety Scale correlated 0.54 with the MMPI 2 Anxiety Scale (A) and 0.54 with the Anxiety Content Scale (ANX) score as well. The BHI 2 hostility scale correlated 0.67, 0.60, and 0.63, respectively, with the MMPI 2 Anger (ANG), Explosive Behavior (ANG 1), and Irritability (ANG 2) Scales. The BHI 2 Borderline score correlated with the MCMI-III Borderline Scale (C) 0.62. The Symptom Dependency Scale did not have an exact corresponding scale of either the MMPI 2 or MCMI-III, but correlated 0.54 with the MMPI 2 (HyO) Scale. The Chronic Mal-Adjustment Scale correlated .62 with the MCMI-III Anti-Social (6A) scale, and 0.46 with the MMPI Psychopathic Deviate (PD) scale. It also correlated 0.57 with the MCMI-III Alcohol Dependence (B) scale. The Substance Abuse Scale of the BHI 2 correlated 0.55 with the MMPI 2 Admission Addiction Scale (AAS). The BHI 2 Perseverance score correlated 0.51 with the MMPI 2 Ego Strength (Es) scale, and was strongly negatively correlated (−.62) with the MMPI 2 Negative Treatment Indicators (TRT) Scale. The BHI 2 Family Dysfunction Scale correlated 0.70 with the MMPI 2 Family Problems (FAM) Scale. The BHI 2 Survivor of Violence Scale has no exact corresponding measure on the BHI 2 or MCMI-III, but did correlate 0.55 with the MMPI 2 Family Problems (FAM) Scale. The Doctor Dissatisfaction Scale did not have an equivalent measure on the MCMI-III or MMPI 2 tests, but has been found in previous studies to be a strong predictor of violent ideation directed toward physicians,\(^3\) as well as litigious ideation directed toward physicians.\(^3\) Finally, the Job Dissatisfaction Scale correlated (−.64) with the Minnesota Satisfaction Questionnaire,\(^4\) which is a measure of job satisfaction.