Development of and psychometric testing for the Brief Pain Inventory–Facial in patients with facial pain syndromes

Clinical article

JOHN Y. K. LEE, M.D.,1 H. ISAAC CHEN, M.D.,1 CHRISTOPHER URBAN, B.S.,1
ANAHITA HOJAT, B.S.,1 EPRAIM CHURCH, B.A.,1 SHARON X. XIE, PH.D.,2
AND JOHN T. FARRAR, M.D., PH.D.2

Departments of 1Neurosurgery and 2Biostatistics and Epidemiology, University of Pennsylvania, Philadelphia, Pennsylvania

Object. Outcomes in clinical trials on trigeminal pain therapies require instruments with demonstrated reliability and validity. The authors evaluated the Brief Pain Inventory (BPI) in its existing form plus an additional 7 facial-specific items in patients referred to a single neurosurgeon for a diagnosis of facial pain. The complete 18-item instrument is referred to as the BPI-Facial.

Methods. This study was a cross-sectional analysis of patients who completed the BPI-Facial. The diagnosis of classic versus atypical trigeminal neuralgia (TN) was made before analyzing the questionnaire results. A hypothesis-driven factor analysis was used to determine the principal components of the questionnaire. Item reliability and questionnaire validity were tested for these specific constructs.

Results. Data from 156 patients were analyzed, including 114 patients (73%) with classic and 42 (27%) with atypical TN. Using orthomax rotation factor analysis, 3 factors with an eigenvalue > 1.0 were identified—pain intensity, interference with general activities, and facial-specific pain interference—accounting for 97.6% of the observed item variance. Retention of the 3 factors was confirmed via a Cattell scree plot. Internal reliability was demonstrated by calculating Cronbach’s α: 0.86 for pain intensity, 0.89 for interference with general activities, 0.95 for facial-specific pain interference, and 0.94 for the entire instrument.

Initial validity of the BPI-Facial instrument was supported by the detection of statistically significant differences between patients with classic versus atypical pain. Patients with atypical TN rated their facial pain as more intense (atypical 6.24 vs classic 5.03, p = 0.013) and as having greater interference in general activities (atypical 6.94 vs classic 5.43, p = 0.0033). Both groups expressed high levels of facial-specific pain interference (atypical 6.34 vs classic 5.95, p = 0.527).

Conclusions. The BPI-Facial is a rigorous measure of facial pain in patients with TN and appears to have sound psychometric properties and is responsive to differences between classic and atypical TN. Future studies must assess the instrument’s test-retest reliability, validity in additional populations, and responsiveness with respect to changes in patient outcomes following neurosurgical interventions and medical therapies. (DOI: 10.3171/2010.1.JNS09669)

Key Words • trigeminal neuralgia • facial pain • Brief Pain Inventory • psychometric property

Abbreviations used in this paper: BPI = Brief Pain Inventory; IMMPACT = Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials; NRS = Numerical Rating Scale; TN = trigeminal neuralgia.
Brief Pain Inventory for Facial Pain

In the literature, we endeavored to create a rigorous method for measuring facial pain intensity and the effect of pain on activities of daily living. As the basis for our instrument, we chose to use a simple, carefully validated, and widely applied questionnaire—the BPI—to measure pain in those in whom facial pain had been diagnosed. The BPI instrument has been thoroughly tested for reliability and validity.8,12,16,19 It has been translated into more than 75 languages and used successfully in hundreds of clinical trials in a variety of patient populations with a diversity of pain conditions. We used the BPI in its current form as a general pain measure and extended it by developing separate interference items specific to facial pain. We then analyzed the psychometric properties of this BPI-Facial in a manner similar to that undertaken in prior published work.3,5

Methods

Patient Sample

Patients who were referred to the primary neurosurgeon (J.Y.K.L.) with a diagnosis of TN or facial pain were asked to complete the BPI as well as 7 additional facial pain items; this combined 18-item questionnaire was called the BPI-Facial (see Appendix). Patients completed this survey as part of their routine intake history and physical forms. Patients with multiple sclerosis–related TN, posttraumatic facial neuralgia, postherpetic neuralgia, and glossopharyngeal neuralgia were excluded. Institutional review board approval was obtained from the University of Pennsylvania to use the anonymous data for our analysis.

Clinical Diagnosis

Facial pain syndromes were diagnosed by a single neurosurgeon (J.Y.K.L.), taking into consideration the International Headache Society1 definition of TN as well as Burchiel’s classification scheme.7 Patients were categorized as having either Burchiel Type 1 classic TN, or Burchiel Type 2 TN and/or atypical facial pain. The diagnosis was made prior to systematic data analysis to avoid observer bias. We reviewed the results of the BPI-Facial, but the analysis featured in this paper was not known to the neurosurgeon while making the clinical diagnosis of TN.

Item Generation and Testing

To generate the items for facial-specific interference for the BPI (and create the BPI-Facial), we queried the literature and 3 expert practitioners in the field of neurosurgical treatment for facial pain. After careful review, the 7 items believed to best cover the facial functional disorders were chosen for inclusion in the BPI-Facial.

Statistical analysis of readability was based on the Flesch Reading Ease score, and the Flesch-Kincaid grade-level assessment (Microsoft Word Professional, Microsoft Corp.) was performed on the 7 new items of the BPI-Facial. An in-depth interview of 10 persons not enrolled in this study was conducted immediately after they had completed the instrument. They were asked for their comments regarding ambiguity or uncertainty of the facial-specific pain-interference items. In part based on their comments, all 7 items were kept in the BPI-Facial.

The BPI-Facial

The BPI is commonly used to assess 2 factors of chronic pain: pain intensity and interference (that is, how pain interferes with the patient’s general activity and function). The pain intensity factor is elucidated by questions about a patient’s worst, least, average, and current level of pain. For the interference factor, the BPI includes items that assess how pain interferes with a patient’s general activity, mood, walking ability, normal work, relationships with other people, sleep, and enjoyment of life. These 7 interference items are referred to as “interference with general activities” in this study to differentiate them from the facial-specific interference items. These 7 items were part of the original BPI and were left intact for the assessment of our patients to provide a comparison with this well-validated measure. The additional 7 facial interference items include eating a meal, touching one’s face (including grooming), brushing or flossing one’s teeth, smiling or laughing, talking, opening one’s mouth widely, and eating hard foods such as apples.

Factor Analysis

Three hypotheses were tested: 1) the BPI-Facial is a 2-factor questionnaire, 2) the BPI-Facial is a 3-factor questionnaire, and 3) pain intensity and interference scores will differ between patients in whom a diagnosis of classic TN versus atypical facial pain has been made. Principal factor analysis with subsequent varimax rotation (Factor, Rotate, Stata Corporation) was used to determine whether underlying factors statistically identified within baseline data collected using the questionnaire were consistent with theoretical factors associated with chronic pain. The item-total correlation matrix and item-test correlations (Alpha, Stata Corporation) were used to detect negative correlations and to screen for items that had consistently weak correlations with other items on the scale.

For individual items, differences between the 2 groups were tested using the Wilcoxon rank-sum test (Ranksum, Stata Corporation) for nonparametric measures. Within an individual factor or domain, the individual scores were summed and averaged for a mean score. Differences between the 2 groups were tested using a Student t-test (Ttest, Stata Corporation) for parametric measures (Table 1).

Regression Analysis

For the purposes of characterizing patients with more severe pain, we performed forward linear regression analysis on the numerical rating score (that is, an average of the worst, least, average, and current level of pain in the prior week). Variables in the linear regression analysis included sex, age by decade, number of current pain medications, duration of pain classified as greater or less than 3 years, diagnosis of Burchiel Type 1 classic TN or Burchiel Type 2 TN/atypical facial pain, history of multiple sclerosis, and side of pain. A forward linear regression analysis was performed with an entry p value...
of 0.2 for addition into the model (Regress, Stata Corporation). Linear regression using the dependent NRS score was performed in 2 populations: all patients and just those with Burchiel Type 1 classic TN. There were not enough patients with atypical facial pain alone to warrant a forward linear regression analysis. All statistical tests were 2-sided. Statistical significance was set at the p < 0.05 level unless otherwise indicated.

**Results**

**Sample Characteristics**

Data from 156 patients were available for review. Burchiel Type 1 classic TN was diagnosed in 114 patients (73%). Atypical facial pain and/or Burchiel Type 2 TN with a predominance of constant burning pain was diagnosed in the remaining 42 (27%). The percentage of females with either diagnosis was consistent between the groups, at ~ 63%. The atypical group was slightly younger (average age 56 years vs 61 years; p = 0.08; Table 1).

**Item Generation and Testing**

Seven items were ultimately chosen from a literature review and interviews with neurosurgical experts and patients. These items included the following: eating a meal, touching one’s face (including grooming), brushing or flossing one’s teeth, smiling or laughing, talking, opening one’s mouth widely, and eating hard foods such as apples. Queried persons suggested no changes to the existing 7 items.

Interitem correlation matrix for the BPI-Facial revealed that all items had interitem correlations and item-test correlations consistently > 0.45. Hence, no item was removed. The weakest performing item was interference with walking on the standard BPI (item-test correlation 0.45). This finding has face validity in that facial pain is unlikely to affect walking, except as a side effect of medication. (A test is said to have “face validity” if it “looks like” it is going to measure what it is supposed to measure.) The Flesch reading ease score was 67.2, and the Flesch-Kincaid grade level was 8.7, suggesting that the instrument was relatively easy to read.

**Factor Analysis**

Eighteen items (4 intensity items, 7 standard BPI interference items, and 7 facial-specific interference items) were entered into the orthogonal, varimax-rotated factor analysis. Three factors were identified with an eigenvalue (variance of factor) > 1.0. The remaining factors had eigenvalues < 0.40. The retention of 3 factors was confirmed using a scree plot, which is a graph that plots eigenvalues against a factor number (Fig. 1). Moreover, the Kaiser criterion confirmed the retention of 3 factors as well. The 3 factors in the BPI-Facial accounted for 97.6% of the variance in the instrument and were identified on the basis of the items contained in each factor. The intensity of pain comprised 4 items and had an eigenvalue of 2.3. Interference with general activities of function (original BPI interference items) consisted of 7 items and had an eigenvalue of 4.3. Interference with activities specific to facial pain consisted of 7 items and had an eigenvalue of 5.4 (Table 2).

**Instrument Reliability**

The internal consistency reliability of the entire instrument was excellent. Cronbach’s α was 0.94 for the entire instrument, 0.86 for the items referring to the intensity of pain, 0.89 for the items related to interference with general activities, and 0.95 for the interference of facial-specific items. There were no negative terms for interitem correlations. These data suggested that each item within a factor was assessing the same attribute. Item-test correlations and uniqueness are summarized in Table 2.

**Burchiel Type 1 TN Versus Burchiel Type 2 TN and/or Atypical Facial Pain**

Analysis of the BPI-Facial instrument revealed sev-

### Table 1: Summary of characteristics and BPI-Facial scores in 156 patients

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typical TN</th>
<th>Atypical Facial Pain or Burchiel Type 2 TN</th>
</tr>
</thead>
<tbody>
<tr>
<td>no. of patients (%)</td>
<td>114 (73)</td>
<td>42 (27)</td>
</tr>
<tr>
<td>no. of females (%)</td>
<td>73 (64)</td>
<td>25 (60)</td>
</tr>
<tr>
<td>mean age (yrs)</td>
<td>61</td>
<td>56</td>
</tr>
<tr>
<td>median severity of pain score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>worst</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>least</td>
<td>2</td>
<td>4*</td>
</tr>
<tr>
<td>average</td>
<td>5</td>
<td>8*</td>
</tr>
<tr>
<td>current</td>
<td>3</td>
<td>7*</td>
</tr>
<tr>
<td>mean</td>
<td>5.03</td>
<td>6.24†</td>
</tr>
<tr>
<td>median interference w/ general function score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>activity</td>
<td>7</td>
<td>8*</td>
</tr>
<tr>
<td>mood</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>walking</td>
<td>0</td>
<td>3*</td>
</tr>
<tr>
<td>work</td>
<td>5</td>
<td>8*</td>
</tr>
<tr>
<td>relationships</td>
<td>6</td>
<td>8*</td>
</tr>
<tr>
<td>sleep</td>
<td>5</td>
<td>8*</td>
</tr>
<tr>
<td>enjoyment of life</td>
<td>8</td>
<td>10*</td>
</tr>
<tr>
<td>mean</td>
<td>5.43</td>
<td>6.94†</td>
</tr>
<tr>
<td>median interference w/ facial function score</td>
<td></td>
<td></td>
</tr>
<tr>
<td>eating</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>touching</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>brushing</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>smiling</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>talking</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>opening mouth</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>hard foods</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>mean</td>
<td>5.95</td>
<td>6.34</td>
</tr>
</tbody>
</table>

* p ≤ 0.05 using Wilcoxon rank sum test (nonparametric test).
† p ≤ 0.05 using Student t-test (parametric test).
The pain occurs within the distribution of the trigeminal nerve, such as touch, drafts of air, and facial movements, can elicit acute attacks of pain. The median age at diagnosis is atypical craniofacial neuralgia is TN. The pain is severe, sharp, and shooting, resembling an electric shock. The pain occurs within the distribution of the trigeminal nerve, nearly always unilaterally, and is paroxysmal, lasting <2 minutes or only a few seconds. Innocuous stimuli, such as touch, drafts of air, and facial movements, can elicit acute attacks of pain. The median age at diagnosis is

Severe Pain

To better understand which patients had more severe pain, we performed a linear regression analysis. In the evaluation of all participants (156 patients), the 4 separate numerical rating scale values (Appendix) were correlated in the regression analysis with the multiple independent variables. A diagnosis of atypical pain was the most significant predictor of a higher NRS. The self-reported NRS at the perceived worst amount of pain was borderlinenone significantly, linearly correlated with an atypical diagnosis (1.01, p = 0.111) as was a >3-year history of pain (1.07, p = 0.071). The self-reported NRS on the average level of pain during the week was also borderline significantly, linearly correlated with an atypical diagnosis (0.95, p = 0.101). The NRS on completing the questionnaire (current pain) was significantly, linearly correlated with an atypical diagnosis (1.64, p = 0.018). The self-reported NRS at the perceived worst pain during the week was not significantly correlated with any variable. Hence, patients with an atypical diagnosis were most likely to rate their pain higher on the least, average, and current NRS. This result is consistent with the diagnosis of atypical facial pain, since such patients have constant pain. In addition, patients with >3 years of pain trended toward higher levels of self-reported pain at their least level, and thus suggesting that >3 years of pain may convert the pain into a more atypical form more refractory to treatment.

In the analysis of patients with classic TN (114 patients), only a history of >3 years of pain was borderline significantly, linearly associated with a least NRS (1.12, p = 0.107). Hence, those with classic TN and a history of >3 years of pain ranked higher on their least NRS score in the past week, again suggesting that >3 years of pain may be more likely to convert more classic into atypical forms of TN.

Fig. 1. Scree plot demonstrating the eigenvalues derived from factor analysis of the BPI-Facial. Eigenvalues, which determine the variance of the factors, are plotted against the number of factors. The line connecting values for factors 4 through 18 is relatively flat, which indicates that each successive factor accounts for smaller and smaller amounts of the total variance in the BPI-Facial instrument. The 3 factors retained for the BPI-Facial accounted for 97.6% of the total variance. Intensity of pain consisted of 4 items and had an eigenvalue of 2.3; interference with general activities of function consisted of 7 items and had an eigenvalue of 4.3; and interference with activities specific to facial pain consisted of 7 items and had an eigenvalue of 5.4.

Discussion

In this study, we defined a facial pain measurement scale that was carefully constructed following a well-accepted pain intensity and pain interference format. The impetus for designing this scale was to develop an informative method for measuring facial pain in neurosurgical outcomes studies. The BPI-Facial has excellent reliability and factor analysis properties as a separate instrument. By incorporating the complete original BPI into the BPI-Facial, comparisons with studies of other pain syndromes can be made. The incorporation of the facial pain–specific interference items provides face validity that the instrument is covering the symptoms that patients and physicians believe are relevant. This aspect of the instrument should allow it to be more responsive to changes in the clinical status of patients, although this must be tested in longitudinal studies.

To put this instrument into perspective, we need to consider the disease being studied, the typical disabilities it causes in patients, and the range of potential therapies. The prototypical craniofacial neuralgia is TN. The pain is severe, sharp, and shooting, resembling an electric shock. The pain occurs within the distribution of the trigeminal nerve, nearly always unilaterally, and is paroxysmal, lasting <2 minutes or only a few seconds. Innocuous stimuli, such as touch, drafts of air, and facial movements, can elicit acute attacks of pain. The median age at diagnosis is...
There are several management options for patients with TN, including 1) oral medications, 2) peripheral nerve blocks, 3) destructive neural procedures targeting the ganglion or retrogasserian ganglion such as rhizotomy and stereotactic radiosurgery, 4) electrical stimulation of neural structures, and 5) surgical decompression of neural and vascular elements. The choice of an optimal management plan involves carefully weighing risks, benefits, and patient preferences. Unfortunately, pain is a subjective experience and impossible to measure directly. Although there are well-validated measurement methods in the study of chronic pain and even recommendations from experts familiar with different types of chronic pain outcomes, most neurosurgical outcome studies evaluating the treatment of TN have not utilized validated instruments. In a recent review, Zakrzewska and Lopez reviewed 222 studies but accepted only 28 (13%) for analysis because of the myriad methodological problems with the measurement of outcomes, including a lack of standardized measures and statistical analyses.

In an effort to provide neurosurgeons improved measures of pain for the population with TN, we created the BPI-Facial. Our validation strategy followed standard methods with excellent results. Specifically, we were able to show that the BPI-Facial is a 3-factor, 18-item questionnaire that can effectively measure pain in those who present with a diagnosis of facial pain at a neurosurgeon’s office. We demonstrated the reliability and initial validity of the instrument in a group of 156 patients with facial pain. This group included 114 patients (73%) with classic TN and 42 patients (27%) with Burchiel Type 2 TN and/or atypical facial pain.

### TABLE 2: Factor analysis and interitem correlation matrices for 18 items on the BPI-Facial in 156 patients

<table>
<thead>
<tr>
<th>Factor</th>
<th>Item</th>
<th>Factor Loading</th>
<th>Uniqueness</th>
<th>Item-Test Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>severity of pain, (\alpha = 0.86)§</td>
<td>worst pain</td>
<td>0.48</td>
<td>0.42</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>least pain</td>
<td>0.74</td>
<td>0.32</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>average pain</td>
<td>0.76</td>
<td>0.19</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>current pain</td>
<td>0.66</td>
<td>0.45</td>
<td>0.55</td>
</tr>
<tr>
<td>interference w/ general function, (\alpha = 0.89)§</td>
<td>activity</td>
<td>0.83</td>
<td>0.14</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>mood</td>
<td>0.83</td>
<td>0.17</td>
<td>0.70</td>
</tr>
<tr>
<td></td>
<td>walking</td>
<td>0.38</td>
<td>0.64</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>work</td>
<td>0.76</td>
<td>0.26</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>relationships</td>
<td>0.69</td>
<td>0.35</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>sleep</td>
<td>0.54</td>
<td>0.48</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>enjoyment</td>
<td>0.79</td>
<td>0.20</td>
<td>0.74</td>
</tr>
<tr>
<td>interference w/ orofacial function, (\alpha = 0.95)§</td>
<td>eating</td>
<td>0.73</td>
<td>0.31</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>touching</td>
<td>0.79</td>
<td>0.27</td>
<td>0.73</td>
</tr>
<tr>
<td></td>
<td>brushing</td>
<td>0.87</td>
<td>0.17</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>smiling</td>
<td>0.87</td>
<td>0.12</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>talking</td>
<td>0.85</td>
<td>0.14</td>
<td>0.83</td>
</tr>
<tr>
<td></td>
<td>opening</td>
<td>0.80</td>
<td>0.20</td>
<td>0.77</td>
</tr>
<tr>
<td></td>
<td>hard foods</td>
<td>0.84</td>
<td>0.19</td>
<td>0.75</td>
</tr>
</tbody>
</table>

* Factor loading represents correlations between the items and factors. The squared factor loading is the percent variance of the item that can be explained by the factor. Loading values > 0.4 indicate that the item is highly correlated with the factor.
† Uniqueness represents the portion of the variance for each item that cannot be explained by the factor. When an item has a uniqueness value > 0.60, it may not be related to the other items or there may be an additional factor that needs to be evaluated.
‡ Item-test correlation represents correlations of each individual item with the total scale (with that item omitted). Items should have a correlation > 0.20 with the total score to be retained.
§ \(\alpha\) represents Cronbach’s \(\alpha\). Cronbach’s \(\alpha\) for entire instrument = 0.94. Measures the extent to which the item responses are highly correlated with each other; Cronbach’s \(\alpha\) should be \(\geq 0.70\) for a set of items to be considered a scale.

67 years, and the diagnosis relies completely on clinical criteria as there are no confirmatory laboratory or radiological tests for diagnosis.

There are several management options for patients with TN, including 1) oral medications, 2) peripheral nerve blocks, 3) destructive neural procedures targeting the ganglion or retrogasserian ganglion such as rhizotomy and stereotactic radiosurgery, 4) electrical stimulation of neural structures, and 5) surgical decompression of neural and vascular elements. The choice of an optimal management plan involves carefully weighing risks, benefits, and patient preferences. Unfortunately, pain is a subjective experience and impossible to measure directly. Although there are well-validated measurement methods in the study of chronic pain and even recommendations from experts familiar with different types of chronic pain outcomes, most neurosurgical outcome studies evaluating the treatment of TN have not utilized validated instruments. In a recent review, Zakrzewska and Lopez reviewed 222 studies but accepted only 28 (13%) for analysis because of the myriad methodological problems with the measurement of outcomes, including a lack of standardized measures and statistical analyses.

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The BPI-Facial was found to be highly reliable based on excellent internal consistency (Cronbach’s \(\alpha\) = 0.94 overall, and Cronbach’s \(\alpha\) > 0.8 for each of the 3 factors). Assessment of internal consistency involved only a single administration of the instrument and did not consider variability at a later point in time. Hence, future evaluation of this instrument should be directed at its test-retest reliability.

In the absence of a valid gold standard for assessing pain in the syndrome of interest, it is necessary to use a number of approaches to assess the validity of the BPI-Facial (that is, the degree to which the instrument accurately measures the intensity and impact of facial pain), which included face, content, and construct validity. Face and content validity (that is, judgments that test items appear to be reasonable) consisted of an assessment by a handful of experts as to whether the instrument seemed appropriate for the intended purpose. The BPI-Facial was evaluated by 3 neurosurgeons who regularly see patients...
with facial pain, and they concluded that the instrument assessed the desired qualities (face validity) and sampled the relevant content (content validity).

The BPI-Facial was then tested for construct validity. Construct validity is evaluated when the attribute being measured cannot be directly observed. Chronic pain cannot be seen, and thus we have to trust the patient-reported measurements of pain. There is no single experiment or statistic that can unequivocally prove the construct of pain. Multiple analyses and assessments are therefore needed to determine whether a construct appears valid. Construct validity was first tested using factor analysis. The 3 factors that we hypothesized would be present a priori were consistent with the findings, that is, pain intensity, interference with general activities, and interference with facial-specific activities. Facial-specific pain interference was shown to be a separate factor in the BPI-Facial, which indicates that the 7 facial-specific items that we created assessed an additional dimension of pain beyond the original BPI. Moreover, validation in 2 differing groups with classic TN versus atypical facial pain revealed that patients with atypical facial pain report higher scores on 2 of the 3 factors: pain intensity and interference with general activities. Thus, these 2 approaches provide evidence that the BPI-Facial is a valid instrument for measuring facial pain in patients.

Classic TN Versus Atypical Facial Pain

The International Headache Society has defined TN as a stereotypical, paroxysmal facial pain syndrome that lasts < 2 minutes. Patients must be free of pain between episodes. Pain must be distributed along the distribution of the trigeminal nerve and must have the following characteristics: severe, sudden, intense, sharp, superficial, stabbing, or burning in character. In addition to these diagnostic criteria set forth by the International Headache Society, an extremely important feature of the history that correlates with treatment success is the differentiation between classic and atypical facial pain. Experienced clinicians have reported that atypical facial pain and atypical forms of TN are less likely to respond to both radiofrequency rhizotomy and microvascular decompression. Atypical facial pain is a deep or superficial diffuse pain that is unilateral but can become bilateral in one-third of patients. Patients with atypical facial pain use the following McGill Pain Questionnaire descriptors: boring, aching, nagging, terrifying, blinding, or torturing. It is recognized as an entity distinct from TN and may or may not be neuropathic in origin. Another diagnostic consideration besides atypical facial pain is patients who appear to have characteristics of both atypical facial pain and classic TN. Recognizing the importance of the accurate classification of TN pain, Burchiel has proposed a revised TN classification scheme, which includes a hybrid between classic TN and atypical facial pain. Burchiel defines this form of atypical TN as having a burning and constant component as well as the lancinating, electric shock–like, intermittent pain of classic TN. Patients with this diagnosis have a predominance (> 50%) of burning or constant pain and also have a minority component (< 50%) of intermittent, lightning-like episodes of pain. For purposes of the present analysis, patients were classified as either having classic TN or not.

The BPI-Facial was created to provide a more comprehensive instrument for measuring pain intensity as well as the interference of pain in life activities. In following the BPI format, our instrument revealed gradations across a range of patients and is likely to be responsive to changes in pain, which will need further exploration in longitudinal studies. While it was not designed to differentiate between classic and atypical pain, our comparison across these two groups demonstrated an important advantage of the BPI format—namely, the measurement of different pain intensity characteristics. When patients with TN experience an acute attack of facial pain, they rate their worst pain as a median of 9/10. This rating is the same as that for patients with atypical pain. By definition, however, patients with atypical pain generally do not have pain-free periods between attacks, frequently rating their least level of pain as > 0. They also rate the intensity of their average and current level of pain higher than do patients with classic TN, which may reflect the absence of pain-free periods. Moreover, patients with atypical facial pain as opposed to classic TN rate their pain as causing greater interference with most of the general activities of life such as walking, normal work, relationships, sleep, and enjoying life. While this finding does not differentiate between groups, it does indicate that atypical facial pain and Burchiel Type 2 TN produce a greater degree of interference with important life activities. In the area of facial-specific items, however, persons with classic and those with atypical pain rated their pain similarly. Since these questions specifically ask how pain interferes with facial activity, it is likely that all patients assume the questions relate to how these activities are affected when they have pain, which is severe in both groups. Patients with classic TN may be better able to contain their pain and its effects to the facial region, whereas those with atypical facial pain experience a level of pain that interferes with wider areas of their life.

This discrepancy between patients with classic and those with atypical facial pain raises the issue of which other domains or factors may account for the observed variance. The IMMPACT (Initiative on Methods, Measurement, and Pain Assessment in Clinical Trials) has recommended that several core outcome domains be considered when designing clinical trials of chronic pain. These core outcome domains include 1) pain, 2) physical functioning, 3) emotional functioning, 4) participant ratings of improvement and satisfaction with treatment, and 5) symptoms and adverse events. The BPI-Facial, which includes the standard BPI instrument, measures 3 of these domains: pain intensity, facial-specific activity, and segments of emotional functioning. With the addition of a single question regarding the patient's global impression of change and a standard measure of adverse events tailored to the treatment being evaluated, all of the primary core domains can be easily measured in a clinical trial. Hence, the use of the BPI-Facial to determine outcomes is an important step toward reliable and valid measurement of pain outcomes in a clinical trial of TN.
**Study Limitations**

There are several limitations to our analysis. First, the patient sample was derived from the practice of 1 neurosurgeon at a tertiary care medical center. Results based on this sample may therefore be biased and not readily generalizable to other patient groups. Second, as discussed above, the BPI-Facial measures 3 core domains of pain as outlined by IMMPACT criteria, but we did not address changes with treatment. The lack of longitudinal data prevented us from assessing the instrument’s test-retest reliability and its responsiveness to changes in patient clinical status, including treatment effects. We plan to address this deficiency in future studies.

**Conclusions**

The BPI-Facial can be used to measure pain in patients who present with a diagnosis of facial pain. This inventory appears to have sound psychometric properties with respect to reliability and validity. While not designed to differentiate the 2 syndromes, by using the BPI-Facial, we were able to observe significant differences in the way that patients with TN and atypical facial pain report and experience pain. Future studies on the BPI-Facial will be needed to validate the instrument in new populations, to assess test-retest reliability, and to confirm responsiveness to changes in patient outcomes over time and with medical and neurosurgical interventions.

**Appendix**

*The Brief Pain Inventory—Facial*

Circle the ONE number that describes how, during the past week, pain has interfered with your:

1. General activity
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

2. Mood
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

3. Walking ability
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

4. Normal work (includes both work outside the home and housework)
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

5. Relations with other people
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

6. Sleep
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

7. Enjoyment of life
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

8. Eating a meal
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

9. Touching your face (including grooming)
   - 0: Does not interfere
   - 10: Completely interferes
   0 1 2 3 4 5 6 7 8 9 10

10. Brushing or flossing your teeth
    - 0: Does not interfere
    - 10: Completely interferes
    0 1 2 3 4 5 6 7 8 9 10

11. Smiling or laughing
    - 0: Does not interfere
    - 10: Completely interferes
    0 1 2 3 4 5 6 7 8 9 10

12. Talking
    - 0: Does not interfere
    - 10: Completely interferes
    0 1 2 3 4 5 6 7 8 9 10

13. Opening your mouth widely
    - 0: Does not interfere
    - 10: Completely interferes
    0 1 2 3 4 5 6 7 8 9 10

14. Eating hard foods like apples
    - 0: Does not interfere
    - 10: Completely interferes
    0 1 2 3 4 5 6 7 8 9 10

Circle the ONE number that describes your pain at its WORST in the last week:

- 0: No pain
- 10: Pain as bad as you can imagine

Circle the ONE number that describes your pain at its LEAST in the last week:

- 0: No pain
- 10: Pain as bad as you can imagine
Brief Pain Inventory for Facial Pain

Circle the ONE number that describes your pain at its AVERAGE in the last week.

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0 1 2 3 4 5 6 7 8 9 10

No pain

Pain as bad as you can imagine
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Circle the ONE number that describes your pain RIGHT NOW.

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0 1 2 3 4 5 6 7 8 9 10

No pain

Pain as bad as you can imagine
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**Disclosure**

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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Address correspondence to: John Y. K. Lee, M.D., Department of Neurosurgery, University of Pennsylvania, 3400 Spruce Street, 3 Silverstein, Philadelphia, Pennsylvania 19107. email: leejohn@uphs.upenn.edu.