Research Article

Predicting medical test results and intra-operative findings in chronic pain patients using th`e on-line "pain validity test"

Abstract

Previous reports indicated The Pain Validity Test (PVT) can predict the presence of abnormalities on the correct medical testing, with 94% accuracy, and the absence of abnormalities on the correct medical testing with 85% accuracy, in patients with chronic back, neck or limb pain. However, 40%-71% of chronic pain patients are misdiagnosed, primarily because physicians use the wrong medical tests, or use tests, such as the MRI, which have a false negative rate as high as 78%. Rather than rely on inaccurate medical testing which is typically used, we conducted research to see if the Pain Validity Test could predict a more reliable and irrefutable indication of pathology, i.e. intra-operative findings. Prior to surgery, the Pain Validity Test (PVT) correctly predicted which patients had abnormal results on the correct medical tests with 94% accuracy, (r = 0.554; p < .0001). Of the original 149 patient studied in the original report, 74 patients had surgery. In the 71 patients with abnormal medical testing, the Pain Validity Test correctly predicted that 69 patients would have abnormal testing (97.1 %). Of the 74 patients with intra-operative pathology, the Pain Validity Test predicted 69 would have pathology (93.2%). Of the 69 patients predicted to have abnormal medical testing, 69 of the 69 had moderate or severe intra-operative pathology (100%), so there were no false positives. Two of the remaining 5 patients in whom the Pain Validity Test predicted no pathology, did have abnormal medical testing, and intra-operatively did have pathology. Three of the remaining 5 patients in whom the Pain Validity Test predicted no abnormal medical testing did not have abnormal testing, but intra-operatively, were found to have moderate pathology. Therefore, The Pain Validity Test can predict who will have a) abnormal medical testing with 97.1% accuracy (69/71) and b) regardless of pre-operative testing, will predict who will have intra-operative pathology if surgery is indicated with 93% accuracy (69/74).

Keywords: MMPI, intra-operative findings, psychological tests for pain, back pain, neck pain, measuring pain, validating pain, predicting organic pathology, misdiagnosis of chronic pain, arm pain, leg pain

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Introduction

A surgeon is often faced with multi-factorial challenges when evaluating a patient with chronic pain problems. Chronic pain is defined as a constant pain lasting 6 months or longer and often causes psychological problems, which interferes with accurate medical assessment.[1] X-ray studies, Electro Myelograms (EMG), nerve conduction velocity studies and EMG[2–4] may document an organic basis of chronic back pain, but some pain problems cannot be identified by objective tests, since there are many false negative and false positive results on "objective" medical testing.[5] Physician prejudice against woman patients can result in a significantly less extensive evaluation of their complaints of back pain.[6] Litigation may influence symptoms[7] and the type of litigation may influence outcomes.[8] For that reason, there is a need to differentiate between "organic" (valid) and "functional" (negative physical and laboratory examination) back, neck and limb pain, before undertaking an extensive medical evaluation, prescribing narcotic medication, or performing surgery.[9]

Personality disorders, and organic disease are independent of each other, yet doctors often do not recognize this independence.[10,11] Chronic pain creates psychological changes over time.[1,12,13] Psychological tests, of different varieties, have been used to evaluate the validity of the complaint of pain.[9] A frequently used test is the Minnesota Multiphasic Personality Inventory (MMPI), Researchers have identified several clusters of personality traits which occur commonly in chronic pain patients.[14–17] In fact, one scale, the "Fake Bad Scale" provides such inaccurate information that researchers from the Department of Psychology, University of Minnesota, where the MMPI was developed, recommended that this scale not be used.[17] Only one study from the Mayo Clinic, reported on patients with chronic pain on a longitudinal basis after MMPI administration, and found that it had no predictive value.[18]

"Functional" pain is defined as a pain for which there is no organic pathology, while "organic" pain is defined as pain that does have a medical explanation. The MMPI had been used to differentiate between "organic" and "functional" groups of chronic back pain patients with varying degrees of accuracy,[19–21] and specifically developed subtests of the MMPI were also unreliable.[21–23] One group of researchers tried to correlate MMPI findings with the presence or absence of objective physical findings.[24–26] These researchers found scale 2 (depression) had a slight correlation with physical findings in men and, in a combined study, found that the F scale (faking) correlated with physical findings, but these findings were not consistent.[24–26]

The Pain Validity Test (PVT) was developed by a group of researchers from Johns Hopkins Hospital. The questions address medical, psychological and social issues in a patient's life. It was based on normative responses to medical, psychological and social issues in patients with documented chronic back, neck and limb pain regardless of any pre-existing personality disorder, or co-existing

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psychiatric problem.[27] Multi-center studies found that the test could reliably predict the presence or absence of abnormalities on objective medical tests.[24–26,28] The most recent study showed the Internet version of the Pain Validity Test (PVT), not subject to inter-rater reliability problems, could predict the presence of organic pathology 94% of the time, and the absence of organic pathology 85% of the time.[29] The Pain Validity Test is a 32 question test, available in English and Spanish over the Internet at www.MarylandClinicalDiagnostics.com. Results are emailed back to physicians in 5 minutes after completion of the test.

However, medical tests very often have false positive and false negative results, which confound the decision to perform surgery. The real concern is not whether a patient has an abnormal test. This real issue is the presence or absence of intra-operative pathology, i.e. was the surgery warranted. Therefore, a verbal test which could predict intra-operative findings would be a valuable screening tool for non-medical professionals, such as psychologists, insurance carriers, or attorneys. It would help them decide if expensive medical tests should be ordered, and if the surgeon should obtain more extensive testing, or rely on erroneous testing results, such as the MRI of discs, in which the false negative rate could reach as high as a 78%. This is particularly valuable in chronic pain patients, who have pre-existing or co-existing psychological issues.

The present study is designed to investigate the usefulness of PVT for predicting the presence or absence of intra-operatively documented organic pathological conditions in patients with chronic back, neck and/or limb pain. This research is an attempt to determine if a properly designed questionnaire can predict the actual intra-operative findings using predictive analytic techniques.

Methods

Patients

One hundred and forty-nine patient charts were reviewed. As reported in previous articles, the PVT was administered over a computer, with an Internet connection. A number of patients expressed concerns about their skills with a computer, and several times entered the wrong answers to the Pain Validity Test, and wanted to correct their answers. Unfortunately, due to programming restrictions, the patients are unable to reverse the page sequence of the test, in order to correct their answers, which may lead to entry of erroneous answers. Despite these problems, the Internet version of the Pain Validity Test is able to predict medical test abnormalities with 94% accuracy and the absence of organic pathology with 85% accuracy.[29] Of these 149 patients, 74 received surgery. Seventy-three percent of these 74 patients were from outside the State of Maryland, while the remainders were from the State of Maryland. Since PVT was designed only to assess the impact of the complaint of chronic back, neck and limb pain, only patients with the chief complaint of consistent pain in the back, back and legs(s), neck, neck and arm(s) or all the combinations thereof of six months' duration or longer were included in the study. In addition, only those patients who had received the appropriate objective physical tests (see below) were included. Excluded from the study were patients with too few tests, pain of less than six months' duration and inappropriate location of the pain (headache, gastrointestinal pain, genital pain, facial pain, etc.)

For the 74 patients, demographic data was derived from chart review, if the information was available. The average age of all patients was 41.4 years (n = 74 range 23-61). There were 45 males and 29 females in the study.

Physical tests

Objective physical tests were divided into two groups based on the ability of these tests to assist in the diagnosis of chronic back and/or back and limb pain. The first group, which was comprised of physiological tests, consisted of electromyography, nerve conduction studies, facet blocks, root blocks, peripheral nerve blocks, current perception threshold testing, quantitative flow-meter studies (Doppler), provocative discometry, bone scan, gallium scan or Indium III scan. The second group, which was comprised of anatomical tests, consisted of myelogram and/or iohexol-enhanced CT of the back, or a combination of the two tests, MRI, with or without gadolinium enhancement, 3D-CT, CT, and flexion-extension X-rays with obliques. A patient had to receive at least two tests in the first group or two or more tests in the second group to be included in the study.

Results

Analysis of physical test results

The medical charts were graded for the severity of physical findings based on a simplified ranking system. The charts were blindly reviewed, i.e. the researchers did not know the score on the Pain Validity Test. Physical tests in which there were no abnormal findings were assigned a score of 0; those with equivocal and minimal findings were scored as a 1. Tests interpreted as moderate or severe were given scores of 2 or 3 respectively. The ratings were based on the reported results from the various laboratories in which the objective tests were performed. Assessing the physical values for the objective tests was standardized, as previously reported.[29]

Analysis of intra-operative findings

The operative note from each patient who received surgery was blindly reviewed by a researcher who did not perform the surgery. Findings were considered normal if pathology reports and intra-operative notes indicated no pathology. Findings were considered mild if pathology reports and intra-operative notes found "mild scaring of a nerve root," or "mild scarring of a peripheral nerve" or "mild neural foraminal stenosis," or "mild compression of a vessel." Likewise, if the reports or note contained the word moderate or severe, then the pathology was considered moderate or severe.

Various surgeries were performed, including rotator cuff repair, 360 degree fusions, artificial disc implants, resection of the first rib for thoracic outlet syndrome, decompression of peripheral nerves and others. Table 1 lists the various surgeries for which intra-operative findings were reviewed.

Test Interpretation

In this study, inter-rater reliability for the Pain Validity Test was not a factor, since every testing encounter was consistent. The questions were always the same questions, and answers were multiple choice answers administered over the Internet. The score calculated by a computer.

The patients scoring as objective pain patients on the Pain Validity Test, and only having 1 or 0 points rating their physical abnormalities, could have errors that were the result of incomplete medical evaluations, false negative results on medical testing, and absence of exhaustive physical testing. However, to off-set this type of error, the actual intra-operative finding was considered more reliable than medical testing, since false negatives and false positives occur with medical testing.[5]

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Table I Various surgeries performed and intra-operative findings
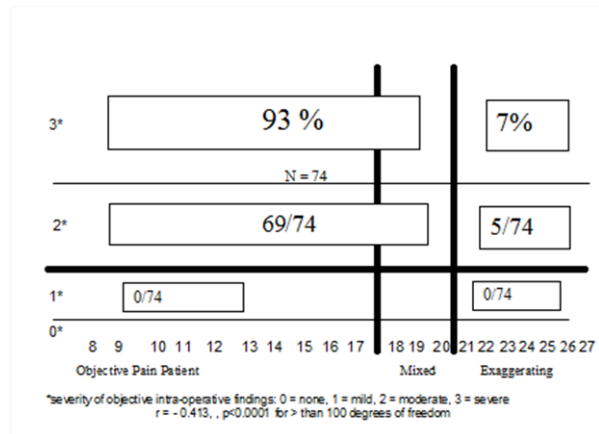
Surgery	Finding
Thoracic outlet first rib removal	Dense scarring of the brachial plexus, and artery
Anterior cervical fusion	Reduced disc space height, and degenerated disc
Ulnar nerve decompression	Dense scarring of the ulnar nerve at the elbow
Foraminotomy	Severe neural foraminal stenosis
Radial nerve decompression	Dense scarring of the radial nerve in the radial groove
Lumbar disc herniation	Protrusion of the nucleus polposa with compression of a nerve root or thecal sac
Cervical disc herniation	Protrusion of the nucleus polposa with compression of a nerve root or spinal cord.
Saphenous nerve entrapment	Dense scarring of the saphenous nerve at the knee
Tibial nerve entrapment	Dense scarring of the tibial nerve at the ankle
Peroneal nerve entrapment	Dense scarring of the peroneal nerve at the knee
Complex regional pain syndrome	Scarring of the sympathetic chain
Anteriolysthesis	Break and dislocation of the pars interarticularis
Rotator cuff tear	Tear of the rotator cuff
Labral tear	Tear of the labrum
Acromo-clavicular impingement	Hypertrophy of the acromo-clavicular joint.
Medial meniscus tear	Tear of the medial meniscus
Fracture of the lateral maleolus	Fracture of the lateral maleolus
Carpel tunnel syndrome	Dense scarring of the median nerve at the wrist
Radial nerve entrapment	Moderate or dense scarring of radial nerve
Ulnar nerve entrapment	Moderate or dense scarring of ulnar nerve

Patients who scored as exaggerating pain patients, on the Pain Validity Test, but who had 2 or 3 points rating their physical abnormalities could have severe pre-existing psychopathology. This skews the results of the Pain Validity Test. If medical testing was moderately or severely abnormal, surgery was warranted, regardless of pre-existing or co-existing psychopathology. Usually, these patients presented as management problems pre and post operatively, due to their psychopathology, but clearly, they were not malingering, nor faking their organic pathology, as documented by abnormal medical testing.

Data analysis

Of the original 149 patient studied in the original report, 74 patients had surgery. In the 71 patients with abnormal medical testing pre-operatively, the Pain Validity Test correctly predicted that 69 patients would have abnormal testing (97.1 %). Of the 74 patients with intra-operative pathology, the Pain Validity Test predicted 69 would have pathology (93.2%). Of the 69 patients predicted to have abnormal medical testing, 69 of the 69 had moderate or severe intra-operative pathology (100%), so there were no false positives. Two of the remaining 5 patients in whom the Pain Validity Test predicted no pathology, did have abnormal medical testing, and intra-operatively did have pathology. Three of the remaining 5 patients in whom the Pain Validity Test predicted no abnormal medical testing did not have

abnormal testing, but intra-operatively, were found to have moderate pathology. Therefore, The Pain Validity Test can predict who will have a) abnormal medical testing with 97.1% accuracy (69/71) and b) regardless of pre-operative testing, will predict who will have intra-operative pathology if surgery is indicated with 93% accuracy (69/74).

Figure I Scattergram of Computer Scored Pain Validity Test Vs Severity of Intra-Operative Findings.
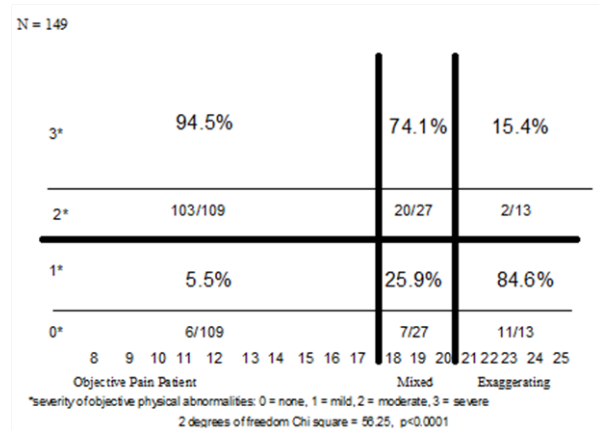
Figure 2 Scattergram of Computer Scored Pain Validity Test v Findings on Laboratory Tests.

A correlation coefficient, using the Pearson Product Moment Correlation Test (R Test), was computed between the severity rating of intra-operative findings of each patient and The Pain Validity Test score. Scattergrams are plotted for the Pain Validity Test versus the severity of intra-operative findings. A Chi-Square test was used to analyze the significance of the frequency distribution of the scattergram, despite its limitations.

The scattergram for PVT scores compared with the severity of intra-operative findings is shown in Figure 1. PVT score for each patient was compared with their score for the most severe intra-operative finding. A correlation of $r = 0.413$ was obtained, which is significant at the level of $p<0.0001$.

Figure 2 shows tabulation of the Chi-square test for The Pain Validity Test versus the severity of abnormal medical test findings. The Chi-square test result was 56.25 which was significant at $p<0.0001$. On PVT the cut off score considered to be an objective pain patient is 17 points or less. If a patient had 17 points or less, 94.4% of the time he or she had an intra-operative abnormality that could be documented using objective testing described under Physical tests (103/109). A score between 18 and 20 points, inclusively, was

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considered a mixed objective-exaggerating pain patient, and 74.1% % of the time these patients had objective physical findings (20/27). This group may represent patients with a poor pre-morbid physiological adjustment, who had documented physical pathological conditions. If a patient scored 21 points to 29 points, inclusively, on PVT, he or she was considered an exaggerating pain patient, and 84.6% of the time had only mild findings on objective tests of organic pathology, or no test was positive (11/13). However, the group consisted of patients with definable organic syndromes, with only mildly abnormal or absent objective findings, such as found in myofascial syndrome or facet syndrome. Earlier research indicated that between 50% to 55% of properly diagnosed chronic pain patients were referred for surgery. In this report 74 of 149 patients (49.6%) of patients were referred for surgery, based on their diagnosis, and laboratory testing results. Of the 74 patients who received surgery, only 5 patients scored in the Exaggerating Pain Patient Category, and 69 were in the Objective, or Mixed Objective Exaggerating Pain Patient Category. All 69 patients in the latter two categories had moderate or severe abnormies on pre-operative medical testing, and moderate or severe abnormalities were found intra-operatively. Five of the Exaggerating Pain Patients had moderate or severe abnormies on pre-operative medical testing, and moderate or severe abnormalities were found intra-operative. Therefore, the Pain Validity Test accurately predicted that 93% of the patients (69/74) would have moderate or severe intra-operative findings, and had a 7% false negative rate, i.e. indicated that 5 of the 74 patients would not have moderate or severe intra-operative findings, when in fact they did.

Discussion

Surgeons may encounter a patient who is demanding, histrionic in their behavior, or have negative radiological studies.[10,11] Due to the increased amount of time required to deal with these patients, and other management issues, the surgeons often ask for a psychiatric evaluation for these patients. Often, this evaluation is conducted by a non-medical clinician, such as a psychologist or social worker, who may use the MMPI to assist them in the evaluation of the patient. The lack of medical training, coupled with the use of a psychological test which is inappropriate to determine the validity of the complaint of pain, leads to misdiagnosis.

The failure to recognize that organic pathology and psychiatric disorders may exist independently leads to confusion in the diagnosis of chronic pain patients and do not necessarily have a cause and effect relationship.[10] The incidence of psychiatric disorders presenting as pain problems had never been defined.[30–32] However, the clinician must consider that chronic pain may create anxiety and depression.[31] In a study conducted by the psychiatry department of Johns Hopkins Hospital, 80% of the 67 patients admitted to a psychiatry ward because of their complaint of chronic pain had physical abnormalities to explain their complaints.[34] Rosenthal also lends credence to the concept that pain complaints and psychiatric disturbance exists on two separate axes.[35]

The F scales of the MMPI correlated with the severity of objective organic pathologic conditions.[27] However, in two other test populations, it was found that either the depression scale (scale 2) of the MMPI negatively correlated with physical pathology[26] or that none of the scales of the MMPI correlated with the severity of objective organic pathological conditions.[25] The variability in MMPI results suggests this test is unreliable for determine the validity of physical complaints.

From a preoperative sample of 50,000 MMPIs, Hageron and his

colleagues at the Mayo Clinic found 59 patients who subsequently had back surgery over a 20-year follow-up.[18] This group concluded that the MMPI abnormalities noted after the onset of back pain were the result of pain "rather than a reflection of pre-existing personality traits".[18] In the absence of longitudinal studies, one cannot determine whether or not the MMPI scales are elevated prior to or as a result of the chronic pain syndrome.[36]

In summary, it seems that the MMPI is not able to differentiate organic from functional low back pain with any degree of validity or reliability. In addition, it would be imprudent and irresponsible for a clinician to label as functional any chronic pain patient who happens to have elevations of MMPI scales as has been done by one author[37] since the MMPI cannot predict the presence or absence of an organic pathological condition with any degree of certainty in patients with chronic back pain.[24–26] Additionally, elevated MMPI scores in pain patients seem to be the result of pain rather than the cause of the complaint.[18,31]

The DSM IV (providing definitions and ICD codes for psychiatric disorders) defines "somatization disorder" as a disorder that occurs in patients whose "multiple somatic complaints cannot be fully explained by any known general medical condition…".[38] However, this definition suffers from circular logic since many patients with concurrent psychiatric disease and chronic pain receive inadequate physical evaluations and are medically misdiagnosed 40% to 71% of the time.[39–41]

Only two other tests in the medical literature try to correlate the verbal history with actual findings on medical testing. The Ottawa ankle rules and the Ottawa knee rules were found to correlate with the presence and absence of organic pathology, and these tests resulted in cost savings of over $50,000,000 a year in preventing needless X-rays the Ottawa province of Canada.[42–44] The PVT differs from these two verbal tests, since it can be used to predict the presence or the absence of abnormal laboratory tests, of all types, not just X-rays, in patients with back, neck and limb pain. This could result in even larger savings for health care systems.

California State Auditor Elaine Howle[45] says the $30,000,000 annual assessment to combat workers compensation fraud in California may be wasted. The insurance carriers cannot measure the effectiveness of their efforts. The fraud division publishes statistics showing the number of investigations, arrests, convictions, and restitution, but cannot show if anti-fraud efforts are cost-effective.[45] The Pain Validity Test, a 31 question, self administered test available on the Internet (www.Need IME website.com) was designed to tell an insurance adjustor if a claimant has a valid complaint of pain. It can predict that a claimant will have organic pathology detected by objective testing 94% of the time, and predict that a claimant will not have organic pathology 85% of the time.[29] Earlier research reports that only 6% to 13% of chronic pain patients are exaggerating their symptoms, while 87% to 94% of patients have a valid complaint of pain.[24-27] Unfortunately the patients with valid pain are misdiagnosed 40%-71% of the time.[39–41] Using the Pain Validity Test, which costs $300, saved a major insurance carrier an average of $1,554 per claim, by eliminating the need for independent medical examinations (IMEs), nurse case reviewers, and surveillance.[46] This allowed the insurance adjustor to focus the surveillance and independent medical examinations on the patients who were exaggerating their claims. It also gives the insurance adjustor an indication of which claimants need better diagnosis and proper treatment.

Until now, no verbal test has ever been reported to predict the

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presence of intra-operative pathology. The Pain Validity Test does predict medical testing abnormalities, but this approach to verifying pain still has problems, due to the false negative and false positive rates of most medical tests. As an example, the false positive rate for detecting disc pathology for the MRI is 29%[47] while the false negative rate is between 76% to 79%.[48,49] Therefore, a test that predicts abnormal medical tests is less valuable than a test that can predict the real pathology, i.e. intra-operative findings.

Several tests have been used to predict surgical outcome, which is a different issue than predicting the more objective findings of the presence or absence of organic pathology, or actual intra-operative findings.[50–52] These articles on surgical outcome recognize that multiple factors influence results, including legal, social, medical and psychological factors.

Current methods of evaluating the validity of a patient's complaint, using the MMPI, have little chance of meeting the Daubert criteria since they do "not meet the applicable 'general acceptance' standard for the admission of expert testimony".[53] Furthermore "expert opinion based on a scientific technique is inadmissible unless the technique is 'generally accepted' as reliable in the relevant scientific community".[53] The Pain Validity Test has seven published articles in peer reviewed medical journals describing its accuracy. Therefore, medical evaluations utilizing the Pain Validity Test are more likely to be accepted than just a medical evaluation alone or those that employ the MMPI. Additionally, the PVT may provide cost savings for insurance carriers in the same fashion as the Ottawa ankle and knee rules do, while improving the quality of health care. By employing a multidisciplinary model rather than just a medical or psychological model for diagnosing chronic pain patients, a clinician may improve the accuracy of his or her evaluation, to the benefit of all parties involved in the health care process.

Conclusion

i. The MMPI is a verbal psychological test that cannot predict the results of objective medical testing.

ii. Very often, psychological assessments are done by non-medical personnel.

iii. The PVT is a verbal medical-psycho-social test which can predict which patient will have moderate or severe abnormalities on objective medical testing with 94% accuracy, and which patient will have negative or minimally abnormal objective medical testing with 85% accuracy. The PVT should be used be used to supplement, but not replace clinical assessments.

iv. The PVT is a verbal medical-psycho-social test which can predict which patient will have moderate or severe intra-operative pathology with 93% accuracy. The intra-operative pathology is proof positive of real organic problems, and directly answers the question about the origin of pain.

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Conflicts of interest

Author declare that there is no conflict of interest.

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