An internet questionnaire to predict the presence or absence of organic pathology in chronic back, neck and limb pain patients

Nelson Hendler, Allison Baker

Abstract: The Mensana Clinic Diagnostics Pain Validity Test (PVT) is a 32 question test, administered over the Internet and scored by computer. It can predict the presence or absence of physical abnormalities in patients with chronic back, neck or limb pain. This can help a neurosurgeon or orthopaedic surgeon determine if further medical testing is necessary. A retrospective chart review of 149 patients with complaints of chronic neck, back and/or limb pain was conducted at Mensana Clinic. A correlation between the scores on PVT and objective measures of organic pathology was conducted. Results of x-rays, MRI, 3D-CT, EMG, nerve conduction studies, current perception threshold, bone scans, Gallium and Indium scans, nerve blocks, root blocks, facet blocks, and provocative discogram were graded in terms of severity of physical abnormality**.** Patients who scored 17 points or less on the PVT had moderate or severe physical abnormalities 94.5% of the time. These would be classified as Objective Pain Patients, and are patients with a "pain disorder associated with a general medical condition, which is not a mental disorder.*" Patients scoring 21 points or more had mild or no physical abnormalities 84.6% of the time. They were found to have moderate or severe abnormalities on at least one objective measure of organic pathology only 15.4% of the time. These patients are classified as Exaggerating Pain Patients, and "have pain associated with psychological factors" (307.80 - DSM-IV*). Scores on PVT significantly correlate with the presence or absence of organic pathology ($r = -0.413$; $t = 5.5$ for > 100 degrees of freedom, $p < 0.0001$, Chi square = 56.25 for 2 degrees of freedom, $p < 0.0001$). *(p15-24)*

*page 458 - DSM IV = Diagnostic and Statistical Manual IV - American Psychiatric Association

Key words: *Psychological tests for pain, MMPI, back pain, neck pain, measuring pain, validating pain, health care cost savings, predicting organic pathology and misdiagnosis of chronic pain*

Introduction

Chronic pain (constant pain lasting 6 months or longer) is a subjective experience, which is influenced by many premorbid (before the onset of pain) psychological problems. However, chronic pain often causes depression, anxiety, and marital difficulties.[11] Although physical examination and other studies, including x-ray studies, 3D-CT, electromyelograms (EMG), nerve conduction velocity studies and MRI in many cases may document an organic basis of chronic back pain, some organic syndromes defy definition by objective tests.[3,20,21,42] This may be a greater problem for women, where physician prejudice can result in a significantly less extensive evaluation of their complaints of back pain.[2] Also, any litigation may influence symptoms and the type of litigation may influence outcomes.[4,39] Therefore, there is a need to differentiate between "organic" and "functional" (negative physical and laboratory examination) back pain.[35]

In an effort to provide a consistent method of assessing patients with chronic pain, one must bear in mind that patients with severe personality disorders may also have organic disease. In fact, it would be prudent to think of these two types of disorders as existing on two separate and independent intersecting axes.[9,19] Complicating this is the psychological response to chronic pain which changes over time. This has been termed by Hendler "The Four Stages of Pain".[10,11,14] Therefore, one not only must consider the premorbid (pre-pain) psychological adjustment of the chronic pain patient, but also the chronological stages of their chronic pain in order to determine the appropriateness of their psychological response to pain.

Many psychological tests have been used to evaluate the

The Mensana Clinic
Stevenson, MD
USA

Correspondence:
Dr. Nelson Hendler, MD, MS
The Mensana Clinic
1718 Greenspring Valley Road
Stevenson, MD 21153
USA
Tel: (1 410) 653 2403
Fax: (1 410) 653 6165
Email: DOCNELSE@aol.com
Website: www.MensanaDiagnostics.com

validity of the complaint of pain.[9] One frequently employed test is the Minnesota Multiphasic Personality Inventory (MMPI), a 566 question, self-administered test consisting of true-false answers. By using this test, researchers have identified several clusters of personality traits which occur commonly in chronic pain patients.[1,26,29,31] However, the only criterion for inclusion of patients in these reports was the complaint of pain. With the exception of one study from the Mayo Clinic, there have been no MMPI studies that observe patients with chronic pain on a longitudinal basis.[7] Other researchers have used the MMPI to differentiate between "organic" and "functional" groups of chronic back pain patients with varying degrees of success.[28,32,40] In these articles, "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. This lack of reliability of the MMPI led to the development of other subtests of the MMPI, which were also unreliable.[25,40,41]

In counter-distinction to the MMPI, The Mensana Clinic Diagnostics (MCD) Pain Validity Test (PVT) (previously called the Hendler 10-minute Screening Test, and Mensana Clinic Back Pain Test) was developed in 1979, by the recording of a patient's normal physical and psychological response to documented chronic back, neck and limb pain regardless of any pre-existing personality disorder.[23] Specifically, it was not validated on facial pain, abdominal pain nor genital pain. The original test was 15 questions, which was essentially a structured psychiatric and medical interview. The answers were interpreted by the clinician administering the test, which created problems with inter-rater reliability.[23] The test was developed retrospectively. It correlated with objective physical findings 83% of the time, and predicted a positive outcome to surgery or pain-related procedures 77% of the time in a group of 315 men and women.[23] Prospective studies in 83 patients found that the test could predict the presence of organic pathological conditions 77% of the time for women, 91% of the time for men, and 85% of the time overall, while it could predict the absence of organic pathology 100% of the time.[16-18] In a multi-centre study, involving 251 patients, at 7 medical centres, the PVT could predict which patients had moderate or severe physical abnormalities 94% of the time, and those who had mild or no physical abnormalities 85% of the time.[13] In this study, the MCD PVT significantly correlates with the presence or absence of organic pathology ($r = 0.554$; $p < 0.0001$).[13]

No attempt has been made to correlate MMPI findings with the presence or absence of objective physical findings, other than work by Hendler and his colleagues. They found scale 2 (depression) had a weak correlation with physical findings in men and, in a combined study, found that the F scale (faking) correlated with physical findings.[16-18] However, despite the fact that a relationship could be established between these two scales of the MMPI, the correlation was just barely statistically significant.

The present study is designed to investigate the validity of MCD PVT in a new self administered format, available over the Internet, for predicting the presence or absence of documented organic pathological conditions in chronic back, neck and limb pain patients.

Methods

***Patients*:** Patient charts were derived from Mensana Clinic, a tertiary referral centre. One hundred and forty-nine charts were selected for inclusion in the study. Since the PVT was designed only to assess the impact of the complaint of chronic back 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 patients who had received the appropriate objective physical tests (see over) were included. Excluded from the study were patients with too few tests, inappropriate tests, pain of less than six months' duration and inappropriate location of the pain (headache, gastrointestinal pain, facial pain, etc.)

For the 149 patients, demographic data was derived from chart review. The average age of all patients was 42.1 years (n=149, range 23 - 65). There were 90 males and 59 females in the study. Of the 149 patients, 132 were Caucasian, 16 were African-American, and 1 was Oriental (Table 1).

***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 consisted of physiological tests, which were electromyography, nerve conduction studies, quantitative flow-meter studies (Doppler), nerve blocks, root blocks, facet blocks, provocative discometry and neurometer studies. The second group consisted of tests which were anatomical in their function, such as myelogram and/or iohexol-enhanced CT of the back, or a combination of the two tests. Also, in this group were MRI, with or without gadolinium enhancement, 3D-CT, CT, flexion-extension x-rays with obliques, bone scan, Gallium scan or Indium III scan. A patient had to receive at least one test in the first group or one test in the second group to be included in the study.

Table 1 - Comparison of pain validity test score to objective test of organic pathology
0 = no abnormality, 1 = mild abnormality, 2 = moderate abnormality, 3 = severe abnormality

Pts.	Age	Race	Sex	Score	EMG/ NCV	Neurometer	X-ray	Three D CT	MRI	Discogram	Bone scan	Myelogram	Doppler	Root block	Facet block	Nerve block	Indium	Gallium	ENG/ BAER	Max Obj Findings	Score category
KS	43	W	F	**8**		2			2											**2**	**Obj**
TM	55	W	M	**9**				1	0	3				2						**3**	**Obj**
AW	34	AA	M	**9**	2	2			2		0		3							**3**	**Obj**
SF	38	W	F	**9.5**		1	0	1	2		2									**2**	**Obj**
TC	54	W	M	**9.5**		2		2	2	0										**2**	**Obj**
BC	41	W	M	**9.5**		2					2									**2**	**Obj**
MS	41	W	M	**9.5**		2		1	2	0				3	2					**3**	**Obj**
JM	23	W	M	**10**		3		3												**3**	**Obj**
VM	54	W	M	**10.5**		0		2												**2**	**Obj**
US	40	W	F	**10.5**						3	2	1	0							**3**	**Obj**
MP	48	W	M	**11**				3								3	0			**3**	**Obj**
CD	53	W	M	**11.5**		2	2	2												**2**	**Obj**
JM	51	W	M	**11.5**		2	1	1	1											**2**	**Obj**
MP	36	W	M	**11.5**		2	0				2			3	3		0	0		**3**	**Obj**
PG	54	AA	F	**11.5**			2	3	2											**3**	**Obj**
GH	43	W	F	**11.5**						3				3						**3**	**Obj**
WW	49	W	M	**11.5**				2	1	3										**3**	**Obj**
MB	48	W	M	**12**				2	2		3			3			3			**3**	**Obj**
EB	47	W	F	**12**		2		2			3						0			**3**	**Obj**
JM	51	W	F	**12.5**		2		1	1											**2**	**Obj**
JS	62	AA	F	**12.5**				1	2		2									**2**	**Obj**
MB	52	AA	M	**12.5**	2	2					0									**2**	**Obj**
LN	38	W	F	**12.5**				3		3				3	3					**3**	**Obj**
WJ	55	AA	F	**12.5**			0		2	3				0	0					**3**	**Obj**
JF	41	W	M	**12.5**		0		3	3											**3**	**Obj**
RE	64	W	M	**13.5**				2	2											**2**	**Obj**
PT	40	W	M	**13.5**		2		2		0	0				0		0	0		**2**	**Obj**
SF	59	AA	F	**13.5**		2				2										**2**	**Obj**
DP	55	W	F	**13.5**	2	2		2		3			0							**3**	**Obj**
MB	57	W	F	**13.5**		2		2		3				3						**3**	**Obj**
RS	40	W	F	**13.5**		2	1		2	3			0							**3**	**Obj**
FW	47	W	F	**13.5**		2	1	2	2	3	2					3				**3**	**Obj**
KM	37	W	M	**13.5**			2	2									3	3		**3**	**Obj**
JM	44	W	M	**13.5**	2	1				3			0							**3**	**Obj**
MC	35	AA	F	**14**	3				1											**3**	**Obj**
AL	29	W	F	**14**	2				2	3			0		3	3				**3**	**Obj**
SM	35	W	F	**14**												3				**3**	**Obj**

Table 1/cont'd

JT	54	W	F	**14**		2		3	2											**3**	**Obj**
AM	48	W	F	**14**		1	1		1	3						3				**3**	**Obj**
PV	27	W	M	**14.5**			1	0	2											**2**	**Obj**
RW	51	W	F	**14.5**			2		2	2		1					0	0		**2**	**Obj**
WK	53	W	F	**14.5**		2	2	2		3										**3**	**Obj**
SH	52	W	M	**14.5**	2	2	1						3	1						**3**	**Obj**
BB	45	W	F		2	2		3												3	Obj
PH	55	W	F	**14.5**		2	2			3			2							**3**	**Obj**
AC	48	W	M	**14.5**		2		2		3										**3**	**Obj**
DY	52	W	M	**14.5**					2	3				2	0					**3**	**Obj**
KM	40	W	M	**15**		2		2	2		2									**2**	**Obj**
RM	52	W	M	**15**							2							2		**2**	**Obj**
PW	44	W	M	**15**		2		2	2						2					**2**	**Obj**
NB	55	W	F	**15**	3	2										3				**3**	**Obj**
CC	43	W	F	**15**		3	0	1	3	3				3	3					**3**	**Obj**
ST	37	AA	F	**15**		3			0	3										**3**	**Obj**
JM	43	W	M	**15.5**		2		2												**2**	**Obj**
CC	60	W	F	**15.5**		2					2									**2**	**Obj**
TB	31	AA	F	**15.5**		2	0													**2**	**Obj**
KJ	57	W	F	**15.5**		2			2		2									**2**	**Obj**
TK	65	W	F	**15.5**			2	2			2	0								**2**	**Obj**
DM	62	W	M	**15.5**					2		2						0			**2**	**Obj**
RP	46	W	M	**15.5**	2	2			0				2							**2**	**Obj**
JR	34	W	M	**15.5**		2			2		2									**2**	**Obj**
JR	46	W	M	**15.5**				2				1					0	0		**2**	**Obj**
KK	45	W	F	**15.5**			1	1						3						**3**	**Obj**
LS	50	W	M	**15.5**		2		2	2					3						**3**	**Obj**
GD	38	W	M	**15.5**	2	2				3				2	3					**3**	**Obj**
LK	57	W	F	**15.5**					2	3					3					**3**	**Obj**
PO	50	W	F	**15.5**			0	3												**3**	**Obj**
RA	49	W	M	**15.5**			2	2		3										**3**	**Obj**
NC	58	W	M	**15.5**	2			3								2				**3**	**Obj**
JE	28	W	M	**15.5**												3				**3**	**Obj**
ER	42	W	F	**16**	0	1		0	1		0					1				**1**	**Obj**
KC	43	W	F	**16**	2	2			2		2									**2**	**Obj**
MD	54	W	F	**16**			2	1	2											**2**	**Obj**
SS	55	W	M	**16**			2	2	2											**2**	**Obj**
LN	53	AA	F	**16**		3		3		3										**3**	**Obj**
EP	49	W	F	**16**		2		2		3	0	0			3					**3**	**Obj**
NC	46	W	F	**16.5**		2	1		2											**2**	**Obj**
CD	33	W	F	**16.5**				2	2	2										**2**	**Obj**
DT	69	W	F	**16.5**		2	2	2	2											**2**	**Obj**

Table 1/cont'd

RP	48	W	M	**16.5**	0			1	2											**2**	**Obj**
KB	51	W	F	**16.5**			1	2	1	3										**3**	**Obj**
KK	25	W	F	**16.5**																**0**	**Obj**
RL	43	W	F	**16.5**		2			2	3					0					**3**	**Obj**
YS	53	AA	F	**16.5**					3	3										**3**	**Obj**
JB	24	W	M	**16.5**	2	2				3			2				0			**3**	**Obj**
VD	54	W	F	**16.5**		2	3		3	3	2			3	3					**3**	**Obj**
AM	39	W	F	**17**		1	1	1												**1**	**Obj**
SK	46	W	F	**17**	2	2	1	2	2	3	2		0	3	3		0			**3**	**Obj**
KM	28	W	F	**17**		2	0		2	3	0			3						**3**	**Obj**
RP	39	W	M	**17**						3										**3**	**Obj**
MB	40	W	F	**17**		2	2		2	3	1									**3**	**Obj**
LM	52	W	F	**17**		2			2		3							2		**3**	**Obj**
LS	53	W	F	**17**		2	2	3	2											**3**	**Obj**
VM	35	W	M	**17**					3											**3**	**Obj**
GD	51	W	F	**17.5**		1				0	0									**1**	**Obj**
LR	51	W	F	**17.5**		1	1	1	1											**1**	**Obj**
EM	49	W	M	**17.5**		1														**1**	**Obj**
RR	47	W	F	**17.5**						2										**2**	**Obj**
CB	43	W	F	**17.5**		2		1	1											**2**	**Obj**
NH	33	W	F	**17.5**			2	1			2									**2**	**Obj**
TH	59	W	M	**17.5**	2															**2**	**Obj**
MS	42	W	M	**17.5**	2	2	0		2		2									**2**	**Obj**
CB	50	W	F	**17.5**	2		2		2											**2**	**Obj**
TP	59	W	M	**17.5**				2	3		2									**3**	**Obj**
TR	42	W	M	**17.5**	3	2		2	3	3				3	3					**3**	**Obj**
CA	46	W	M	**17.5**		2		2	3		2			3	3					**3**	**Obj**
SC	45	W	F	**17.5**		3														**3**	**Obj**
VV	47	W	F	**17.5**			3	3	2	3										**3**	**Obj**
TJ	48	W	M	**17.5**		0		1	2	3										**3**	**Obj**
AH	39	W	F	**18**		0														**0**	**M**
CK	38	W	F	**18**					1											**1**	**M**
AY	62	W	F	**18**		2	1	2			2									**2**	**M-Ex**
NM	38	W	F	**18**				1								3	0			**3**	**M-Ex**
SM	52	W	F	**18**					3				2	3		3				**3**	**M-Ex**
CB	67	W	F	**18**	2	2	2						2	3	3					**3**	**M-Ex**
KP	58	W	F	**18**					2	3	2									**3**	**M-Ex**
CR	37	W	M	**18**		2		2		3										**3**	**M-Ex**
SC	44	W	M	**18.5**			0	1		0										**1**	**M-Ex**
JD	39	W	F	**18.5**					2	3					3	3				**3**	**M-Ex**
TC	43	W	F	**18.5**			0	0	2	2			0	3	3					**3**	**M-Ex**
LG	44	W	F	**18.5**				3			2					3				**3**	**M-Ex**

Table 1/cont'd

DP	42	W	F	**18.5**						3				3	3					**3**	**M-Ex**
DM	57	W	M	**19**	1			1			1	1								**1**	**M-Ex**
ML	39	AA	F	**19**	0	1		1					0			1				**1**	**M-Ex**
JB	45	W	M	**19**		2		1			1									**2**	**M-Ex**
KE	44	W	F	**19**			0		2	0	0		3		2					**3**	**M-Ex**
JW	38	W	M	**19.5**		2	0		2	2	0									**2**	**M-Ex**
WW	45	AA	M	**19.5**	2	1	0	0	1							3			0	**3**	**M-Ex**
AV	17	W	F	**20**			1	1			0									**1**	**M-Ex**
MW	35	AA	F	**20**		1	0		2		0									**2**	**M-Ex**
EE	34	W	M	**20**		2	0	0		0			3	3						**3**	**M-Ex**
JB	42	W	F	**20**		1	2	2						3	3					**3**	**M-Ex**
RE	31	O	F	**20**			1		2	3										**3**	**M-Ex**
TS	50	W	F	**20**		2	0		2	3										**3**	**M-Ex**
KG	21	W	M	**20.5**		1		1			1									**1**	**M-Ex**
VH	40	AA	F	**20.5**		1	1		1	2										**2**	**M-Ex**
KS	43	W	F	**21**	0	0					0									**0**	**Exag**
JS	51	W	M	**21**				0												**0**	**Exag**
HW	32	W	F	**21**		1	0	1	1											**1**	**Exag**
GH	51	AA	M	**21**		1		1	1		1									**1**	**Exag**
RR	69	W	M	**21**					1											**1**	**Exag**
GF	48	W	F	**21**	2					3				3	3					**3**	**Exag**
WP	43	W	M	**21.5**							0						0			**0**	**Exag**
CC	36	W	F	**22**		1	1		1											**1**	**Exag**
MK	43	W	F	**22.5**	1	1	1		1											**1**	**Exag**
JB	45	W	M	**22.5**		1														**1**	**Exag**
LS	43	W	F	**24**		1		1		0					1		0	0		**1**	**Exag**
RB	48	W	F	**24**		2			3											**3**	**Exag**
RB	56	W	F	**28.5**				0	0										0	**0**	**Exag**

***Analysis of physical test results*:** The senior author blindly reviewed the medical charts of patients. He graded the severity of physical findings based on a simplified ranking system. Other physicians who administered the tests, such as radiologists, neurologists, vascular technicians, physiatrists, and anaesthesiologists, interpreted the results of medical tests. The senior author relied upon the report he received from the other physicians to determine the severity of the objective abnormality. Physical tests in which the report indicated there were no abnormal findings were assigned a score of 0; those reports with equivocal and minimal findings were scored as a 1. Test results reported as moderate or severe were given scores of 2 or 3 respectively. Assessing the physical values for the objective tests was standardized. On EMG nerve conduction velocity studies, and neurometer studies, any mild abnormalities were considered a 2 and moderate and severe abnormalities were considered a 3. A report with no findings were given a 0. On MRIs, a bulging disc was considered a 1, a bulging disc with nerve root displacement and/or impingement on the spinal cord was considered a 2, and any mention of a herniated disc was considered a 3. On CT scans, the same criteria applied. On MRI and CT scans, as well as x-rays, minimal facet hypertrophy was considered a 1, while moderate and severe facet hypertrophy was considered a 2 and 3 respectively. Foraminal stenosis, if mild, was considered a 1, if moderate, considered a 2 and if severe, considered a 3. Likewise, all spinal stenosis considered mild, moderate, and severe was scored 1, 2 and 3 respectively. It should be noted that spinal stenosis could be caused by a triad of hypertrophy of the ligamentum flavum, facet hypertrophy and a bulging disc. Likewise, facet hyper-

trophy and a bulging disc could cause foraminal stenosis.

Nerve blocks, root blocks, and facet blocks were scored based on the patient's pre-block pain rating, and post-block pain rating, only within a three hour period after the block. Pain reduction of 75% or greater was graded as a 3. Pain reduction between 50 - 75% was graded as a 2. Pain reduction between 25 and 50% was graded as a 1, and anything less than 25% pain reduction was graded as 0. Provocative discograms were graded by the response to the disc injection by the neuro-radiologist, and any injections that reproduced the pain the patient normally experienced, on a scale of 6/10 or greater were considered a 3, 4 - 6 was a 2, 2 - 4 was a 1, and anything less was a 0. Creation of pain that was not concordant with the pain the patient normally experienced was graded as 0, regardless of the severity.

Quantitative flow-meter studies were considered mildly abnormal if there was a 10% or more reduction of blood flow when the arm was elevated compared with the neutral position, moderate findings if there was a 20% reduction in blood flow reduction, and severe if blood flow was reduced 30% or more. These were scored 1, 2 and 3 respectively. Any chiropractic x-rays were discounted. Myelograms were considered abnormal using the same criteria as CT scan, MRI and x-ray. In addition, nerve root filling was considered on myelogram with mild blunting of the nerve root filling being considered a 1, moderate and severe amputation of the nerve root considered 2 and 3 respectively. It is important to note that a patient might have a herniated disc which showed on MRI, CT or myelogram which was scored in the above-mentioned manner but the level of herniation was not compatible with the patient's symptoms. Therefore, in this fashion, test results were biased against the researchers since an asymptomatic herniated disc could occur in an exaggerated pain patient, resulting in a high physical score in a patient who was not having symptoms.

After all physical tests had been scored; the number value for the test with the most severe physical abnormality was used to represent the degree of objective physical findings in a particular patient. As an example, if the patient had no abnormalities on x-ray, they had a score of 0, but they might also have mild abnormalities on CT, getting a score of 1, mild findings on EMG nerve conduction velocity studies resulting in a score of 2, and a herniated disc on MRI resulting in a score of 3. Based on the combination of findings the patient would be given a physical finding score of 3, the highest (most severe) physical abnormality.

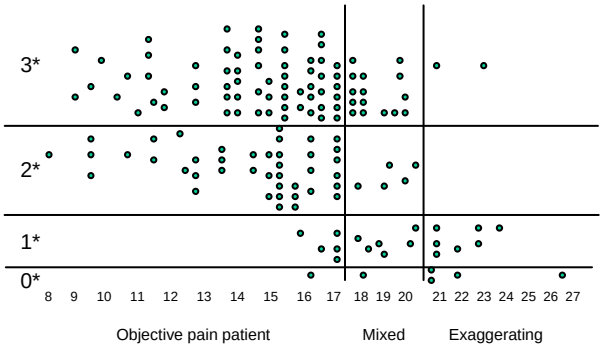
***Test interpretation*:** Each scale score on PVT, when available, as well as the total score on PVT was recorded for analysis. In the past, the PVT was administered by 5 persons at a single centre, previously reported as having a 91% rate of inter-rater reliability.[23] However, the purpose of the conversion of the test to a self-administered form, which was computer scored and interpreted, was to eliminate errors due to inter-rater reliability. In the process, the original clinician administered and scored PVT was converted from 15 questions with open-ended, therefore infinite possible answers, subject to interpretation, to a 32 question test, with 197 possible answers, without subjective interpretation.

***Data analysis*:** A correlation coefficient, using the Pearson Product Moment Correlation Test (R Test), was computed using the scattergram, between the most severe objective physical test rating of each patient and the total score of MCD PVT. Using the summary of the scattergram, a Chi-Square test was used to analyze the significance of the frequency distribution, despite its limitations.[24]

Results

The scattergram for PVT scores compared with the severity of physical findings is shown in Figure 1. The PVT score for each patient was compared with their score for the most severe objective physical finding. The PVT reliably could predict who would or would not have physical abnormalities. The r test score was -0.413, giving a t value of 5.5, which is significant at the level of $p < 0.0001$ for > 100 degrees of freedom.

Figure 1 - Scattergram of computer scored Mensana Clinic Diagnostics Pain Validity Test n = 149

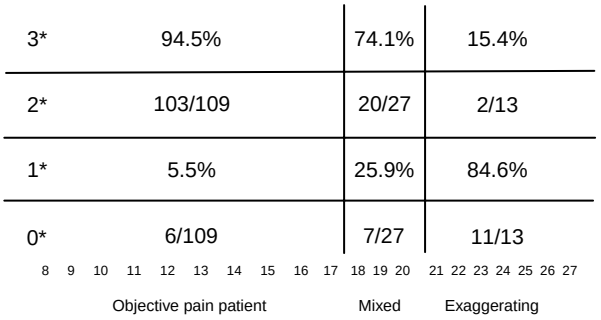


*severity of objective physical abnormalities: 0 = none, 1 = mild, 2 = moderate, 3 = severe
r = -0.413, t = 5.50 , p < 0.0001 for > than 100 degrees of freedom

Figure 2 shows tabulation of the Chi-square test for the MCD PVT. The 6 cell Chi-square test result was 56.25, with 2 degrees of freedom, which was significant at $p < 0.0001$. On the PVT, the cut off score for an objective pain

patient is 17.9 points or less. If a patient had 17.9 points or less, 103 of 109 patients (94.5 %) had a moderate or severe physical abnormality that could be documented using objective testing described above in "Physical Tests" section. A score between 18 and 20.9 points, inclusively, was considered a mixed objective-exaggerating pain patient, and 20/27 of the time (74.1%) of these patients had objective physical findings. 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 28 points, inclusively, on PVT, the patient was considered an exaggerating pain patient, and 11/13 of the patients (84.6%) had only mild findings, or no abnormalities, on objective tests of organic pathology.

Figure 2 - Scattergram of computer scored Mensana Clinic Diagnostics Pain Validity Test n = 149



*severity of objective physical abnormalities: 0 = none, 1 = mild, 2 = moderate, 3 = severe
2 degrees of freedom Chi square = 56.25, p < 0.0001

Discussion

Much of the confusion that has arisen in the diagnosis of chronic pain patients is based on the failure to recognize that organic pathology and psychiatric disorders may exist independently, and do not necessarily have a cause and effect relationship.[19] Although much has been written about psychiatric disorders presenting as pain problems, the incidence of this occurrence has never been clearly defined.[6,27] However, the clinician must consider that chronic pain may create anxiety and depression.[22] In a study conducted in the psychiatry department of Johns Hopkins Hospital, Edwin and his co-workers were surprised to find that 80% of the 67 patients admitted to a psychiatry ward because of their complaint of chronic pain, really had physical abnormalities to explain their complaints.[5] Also, the incidence of psychiatric diagnosis using the American Psychiatric Association's Diagnostic and Statistical Manual criteria or the Symptom Checklist 90 Test was nearly the same in these pain patients whether or not they had documented physical disorders.[5] Rosenthal lends credence to the concept that pain complaints and psychiatric disturbance exists on two separate axes and a clinician may not automatically assume that the coexistence of psychiatric disease and the complaint of pain means functional pain.[33] Indeed, chronic pain may create psychiatric problems, such as depression, in a previously well-adjusted individual.[10,11,19,22]

The F scales of the MMPI correlated with the severity of objective organic pathologic conditions.[16] However, in two other test populations, it was found that either the depression scale (scale 2) of the MMPI negatively correlated with physical pathology or that none of the scales of the MMPI correlated with the severity of objective organic pathological conditions.[17,18] The variability in MMPI results suggests this test is unreliable for determining the validity of physical complaints

Over 300 articles have been published using the MMPI to assess chronic pain patients. However, only one research report ever followed patients prospectively. From a preoperative sample of 50,000 MMPIs, Hagedorn and his colleagues at the Mayo Clinic found 59 patients who subsequently had back surgery over a 20-year follow-up.[7] 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".[7] 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.[30]

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 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.[16-18,36] Additionally, elevated MMPI scores in pain patients seem to be the result of pain rather than the cause of the complaint.[7,27]

Other psychological tests may correlate with the presence or absence of physical abnormalities but, with the exception of PVT, no articles report any psychological tests capable of predicting the presence of absence of organic pathology. The Diagnostic and Statistical Manual IV (DSM IV), compiled by the American Psychiatric Association, defines "somatization disorder" as a disorder that occurs in patients whose "multiple somatic complaints cannot be fully explained by any known general medical condition…".[34] 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.[8,12,15] This high misdiagnosis rate creates a self-fulfilling prophecy, leading to inappropriate psychiatric diagnoses, when in truth the patient never received a proper medical diagnosis. In counter-distinction to the use of the DSM IV criteria, PVT assesses the impact of pain on the patient's life, regardless of pre-existing abnormal personality traits or reactive psychological states.

When comparing the results from the research reported in this paper with earlier results, an improvement was noted in the ability of PVT to predict the presence of abnormal physical findings on objective measures of organic pathology. This improvement is attributable to the elimination of errors from inter-rater variability, and subjective interpretation of answers, as well as the addition of the computer-administered format, which assures that a patient will answer all the questions. Eliminating these variables increased the ability of the PVT to predict the presence of organic pathology from 85 to 94.5% as reported in this article.[16] On the other hand, on three previously reported articles, none of the patients (N = 13), who scored 21 points or greater, had abnormal physical findings on objective measures of organic pathology.[16-18] With the increased number of patients who scored above 21 points as reported in a multi-centre study, and in this research, the predictive component of the exaggerating part of the test dropped from 100 to 84.6 %.[22] This may be attributable to the small number of patients in the exaggerating pain patient category, and the possibility that asymptomatic disc herniation and other abnormalities which were scored as being a positive physical finding, but did not relate to the complaints of the patient, were included for the sake of completeness.

Since the inter-rater reliability, and incomplete answers from patients, seemed to be the variables that introduced a number of erroneous PVT scores in earlier research, a method to reduce these sources of errors was needed. Several self scored versions of the PVT were developed, and the final version produced 97% correlation of tests scores with tests administered by the senior author of this paper and the developer of the PVT (unpublished data). The new version of the PVT, reported in this article, is now available in the self-administered, and computer scored form. It is available over the Internet at www.Mensana Diagnostics.com.

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 in the Ottawa province of Canada.[37,38] 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.

For the neurosurgeon or orthopaedic surgeon, the PVT may offer a viable objective alternative to the more subjective psychiatric evaluation, or the inappropriate use of the MMPI, for differentiating organic from functional disorders. For this reason, the test can help a surgeon determine if additional medical testing is warranted, and to select surgical candidates with greater confidence. Additionally, the PVT may provide cost savings for organizations that pay for health care costs, such as insurance carriers and government agencies, 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.

References

1. Armentrout DP, Moore JE, Parker HC, et al: Pain-patient MMPI subgroups: The psychological dimensions of pain. J Behav Med 1982, 5(2): 201-211
2. Armitage KJ, Schniederman LJ, Bass RA: Response of physicians to medical complaints in men and women. JAMA 1970, 241: 2186-2187
3. Brown BR Jr: Diagnosis and therapy of common myofascial syndromes. JAMA 1978, 239(7): 646-648
4. Daus AT, Freeman WW, Wilson J, et al: Psychological variable and treatment outcome of compensation and auto accident patients in a multidisciplinary chronic spinal pain clinic. Orthop Rev 1984, 3: 596-605
5. Edwin DH, Pearlson GD, Long DM: Psychiatric symptoms and diagnosis in chronic pain patients. Pain 1984, 2: S-80
6. Engle GL: Psychogenic pain and the pain prone patient. Am J Med 1959, 25: 899-918
7. Hagedorn SD, Maruta T, Swanson RC, et al: Premorbid MMPI profiles of low back pain patients: Surgical successes *vs*. surgical failures. Pain 1984, 2: S-258
8. Hendler N: Differential diagnosis of complex regional pain syndrome. Pan Arab J Neurosurg 2002, 6(2): 1-9
9. Hendler N: Exaggerated pain caused by personality disorders: The histrionic personality disorders: The histrionic personality versus the hysterical neurosis. In: Hendler N (ed): Diagnosis and Non-surgical Management of Chronic Pain. New York, Raven Press 1981, pp 54-79
10. Hendler N: Objective pain patients. In: Hendler N (ed): Diagnosis and Non-surgical Management of Chronic Pain. New York, Raven Press 1981, pp 16-25
11. Hendler N: The four stages of pain. In: N Hendler, D Long, T Wise (eds): Diagnosis and Treatment of Chronic Pain. Littleton MA, Wright-PSG Publishing Co 1982, pp 1-8
12. Hendler N, Bergson C, Morrison C: Overlooked physical

diagnoses in chronic pain patients involved in litigation, Part 2. Psychosomatics 1996, 36 and 37: 509-517
13. Hendler N, Cashen A, Hendler S, Brigham C, Osborne P, LeRoy P, Graybill T, Catlett L, Gronblad M: A Multi-center study for validating the complaint of chronic back and limb pain using the "Mensana Clinic Pain Validity Test". Forensic Examiner 2005, 14(2): pp41-49
14. Hendler N, Derogatis L, Avella J, Long D: EMG biofeedback in patients with chronic pain. Dis Nervous Sys 1997, 38(7): 505-509
15. Hendler N, Kozikowski J: Overlooked physical diagnosis in chronic pain patients involved in litigation. Psychosomatics 1993, 34(6): 494-501
16. Hendler N, Mollett A, Talo S, Levin S: A comparison between the MMPI and the "Mensana Clinic Back Pain Test" for validating the complaint of chronic back pain. J Occup Med 1988, 30(2): 98-102
17. Hendler N, Mollett A, Viernstein M, et al: A comparison between the MMPI and the "Hendler Back Pain Test" for validating the complaint of chronic back pain in men. J Neurol Orthop Med Surg 1985, 6(4): 333-337
18. Hendler N, Mollett A, Viernstein M, et al: A comparison between the MMPI and the "Mensana Clinic Back Pain Test" for validating the complaint of chronic back pain in women. Pain 1985, 23: 243-251
19. Hendler N, Talo S: Chronic pain patient versus the malingering patient. In: Foley K, Payne R (eds): Current Therapy of Pain. Philadelphia, BC Decker Inc, 1989: pp 14-22
20. Hendler N, Uematsu S, Long D: Thermographic validation of physical complaints in "psychogenic pain" patients. Psychosomatics 1982, 23(3): 283-287
21. Hendler N, Zinreich J, Kozikowski J: Three-dimensional CT validation of physical complaints in "psychogenic pain" patients. Psychosomatics 1993, 34(1): 90-96
22. Hendler NH: Depression caused by chronic pain. J Clin Psychi 1984, 45: 30-36
23. Hendler WH, Viernstein M, Gucer P, et al: A preoperative screening test for chronic back pain patients. Psychosomatics 1979, 20: 801-808
24. Kuzma JW: Limitations in the Use of the Chi-Square. Basic statistics, for the Health Sciences. California, Mountain View, Mayfield Publishing Co., 1984, pp155
25. Leavitt F: Comparison of three measures for detecting psychological disturbance in patients with low back pain. Pain 1982, 13: 299-305
26. Leavitt F, Garron DC: Patterns of psychological disturbance and pain report in patients with low back pain. J Psychosom Res 1982, 26: 301-307
27. Maruta T, Swanson D, Swanson W: Pain as a psychiatric symptom: Comparison between low back pain and depression. Psychosomatics 1976, 17:123-127
28. McCreary C, Turner J, Dawson E: Differences between functional versus organic low back pain patients. Pain 1977, 4: 73-38
29. McGill JC, Lawlis GF, Selby D, et al: The relationship of Minnesota Multiphasic Personality Inventory (MMPI) profile clusters to pain behaviors. J Behav Med 1983, 6: 77-92
30. Naliboff BD, Cohen MJ, Yellen AN: Does the MMPI differentiate chronic illness from chronic pain? Pain 1982, 13: 333-341
31. Pilling L, Brannick TL, Swenson WM: Psychologic characteristics of psychiatric patients having pain as a presenting symptom. CMAJ 1967, 97: 387-394
32. Rosen JC, Frymoyer JW, Clements JH: A further look at validity of the MMPI with low back patients. J Clin Psychol 1980, 36: 994-1000
33. Rosenthal R, Ling F, Rosenthal T, et al: Chronic pelvic pain: Psychological features and laparoscopic findings. Psychosomatics 1984, 25: 833-841
34. Somatization Disorder: Diagnostic and Statistical Manual of Mental Disorders. 4th Ed, Washington DC, American Psychiatric Association 1994, pp 446-450
35. Southwick SM, White AA: The use of psychological tests in the evaluation of low-back pain. J Bone Joint Surg (Am) 1983, 65: 560-565
36. Sternback R, Wolfe SB, Murphy RW, et al: Traits of pain patients: The low back "loser". Psychosomatics 1973, 14: 226-229
37. Stiell IG, Greenberg GH, McKnight RD, Nair RC, McDowell I, Reardon F, Stewart JP, Maloney J: Decision rules for the use of radiography in acute ankle injuries. Refinement and prospective validation. JAMA 1993, 269(9): 1127-32
38. Stiell IG, Greenberg GH, Wells GA, McDowell I, Cwinn AA, Smith NA, Cacciott, TF, Sivilotti ML: Prospective validation of a decision rule for the use of radiographs in acute knee injuries. JAMA 1996, 275(8): 611-5
39. Talo S, Hendler N, Brodie J: Effects of active and completed litigation on treatment results: Workers compensation patients compared with other litigation patients. J Occup Med 1989, 31 (3): 265-269
40. Towne WS, Tsushima WT: The use of the low back and the dorsal scales in the identification of functional low back patients. J Clin Psychol 1978, 34: 88-91
41. Tsushima WT, Towne WS: Clinical limitations of the low back scale. J Clin Psychol 1979, 35: 306-308
42. Uematsu S, Hendler N, Hungerford D, Long D, Ono N: Thermography and electromyography in the differential diagnosis of chronic pain syndromes and reflex sympathetic dystrophy. Electrolyo and Clin Neuropsy 1981, 21: 165-182