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Predictive Validity of the MMPI among Chronic Pain Patients

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Abstract

The objectives of this study were to (1) determine the frequency of the MMPI profile types identified by Marks and Seeman (1963) among chronic pain patients, and (2) determine the predictive validity of the profile types found. One thousand, six hundred and seven valid MMPIs from chronic pain patients seen at a multidisciplinary pain center for possible inpatient treatment were categorized into the profile types developed by Marks and Seeman (1963). The most common profile types were: 482/842/824, 31/13, 321, 89/98, 231/213 and Normal K+. The most frequent "spike" profiles were: spike 1, spike 2, and spike 3. To determine the predictive validity of the MMPI profile types, patients with each profile were compared with all other patients on demographic and pain-related measures using chi-square tests for dichotomous variables, and t-tests for continuous variables. The results indicated significant differences between patients with different profile types on a number of measures. The results provide a preliminary empirical guide for determining the correlates of MMPI profile types among chronic pain patients. The specific descriptive characteristics of each profile type are presented.
Key words: Chronic pain, MMPI, predictive validity

Resumen

Los objetivos de este estudio eran, por una parte, determinar la frecuencia de los perfiles del MMPI, según Marks y Seeman (1963), en sujetos con dolor crónico y, por otra, estudiar su validez predictiva. Un total de 1607 perfiles válidos de personas con problemas de dolor crónico, candidatos a recibir tratamiento en un centro multidisciplinar para el tratamiento del dolor, fueron categorizados según los perfiles de Marks y Seeman (1963). El análisis realizado muestra que los perfiles más comunes son: 482/842/824, 31/13, 321, 89/98, 231/213 y Normal K+. Las elevaciones más habituales han sido las detectadas en las escalas 1, 2 y 3. Para determinar la validez predictiva de estos perfiles se compararon distintas variables demográficas y parámetros de dolor. Los resultados indican diferencias significativas entre pacientes con perfiles distintos, en un buen número de medidas. Los resultados de este trabajo pueden servir como una guía preliminar para determinar los correlatos de los perfiles del MMPI entre pacientes con dolor crónico.
Palabras clave: Dolor crónico, MMPI, validez predictiva

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The MMPI (Minnesota Multiphasic Personality Inventory; Hathaway and McKinley, 1940, 1967), an assessment tool developed over 50 years ago to aid in the diagnosis of mental and emotional disorders, is the most widely used measure to assess the personality characteristics of chronic pain patients. It has been used extensively in the chronic pain field to: (a) predict the outcome of various medical and psychological treatments, (b) identify possible psychological factors that might be contributing to patients' pain and disability, and (c) describe chronic pain patients, identifying different patients subgroups.

The first attempt to empirically identify homogeneous subgroups of chronic pain patients is described by Bradley, Prokop, Margolis and Gentry (1978). This group of investigators used a multivariate clustering method with two samples of chronic low back pain patients. They identified three male and four female homogeneous MMPI profile subgroups. The results provided by Bradley *et al*. (1978) indicated that the conversion-V profile, which has traditionally been considered to be the characteristic profile for most chronic pain patients, may actually only be describing a small portion of them. Different investigators have generally replicated the results obtained by Bradley and co-workers (see, for example, Armentrout, Moore, Parker, Hewett and Felz, 1982; Atkinson, Ingram, Kremer and Saccuzzo, 1986; Bradley and Heide, 1984; Guck, Meilman, Skultety and Poloni, 1988; Hart, 1984; Moore, Armentrout, Parker and Kivlahan, 1986; see also Deardorff, Chino and Scott, 1993).

Although previous research has identified specific MMPI profile subtypes, to date, little research has been performed to identify specific behavioral correlates of individual MMPI profiles among chronic pain patients. In fact, most of the existing research is addressed to identify specific profiles in relation to certain patients' characteristics, like sex and age (*e.g.*, Fow, Sittig, Dorris, Breisinger and Anthony, 1994), coping (*e.g.*, Kleinke, 1994), litigation (*e.g.*, Dush, Simons, Platt, Nation and Ayres, 1994), pain site and laterality (*e.g.*, Gagliese, Schiff and Taylor, 1995), ethnic characteristics (*e.g.*, Nelson, Novy, Averill and Berry, 1996), and different psychopathological conditions (*e.g.*, Cripe, Maxwell and Hill, 1995; Etscheidt, Steger and Braverman, 1995; Lonsberg, Greonman and Schmidt, 1996).

The present study sought to address this gap in the literature. The two goals of this study were (1) to determine the frequency of specific MMPI profile types among chronic pain patients, and (2) to determine the correlates of each profile type.

Method

Subjects

The subjects consisted of 1607 chronic pain patients seen for possible inpatient treatment at the University of Washington Medical Center, who provided valid MMPI profiles as a part of their screening evaluation. Demographic and pain-related data concerning the subjects are presented in Table 1. 35% of these subjects were subsequently admitted to the inpatient pain management program.

Table 1. Demographic and pain-related characteristics. Values equal means or percentages with standard deviations in parenthesis.

Age (yrs.)	43.54	(13.3)
Sex (%)		
F	55.3	
M	44.7	
Race (%)		
Caucasian	84.8	
Native American	3.1	
African-American	2.8	
Hispanic	2.2	
Asian	0.7	
Other	1.1	
Marital status (%)		
Married	66.5	
Never married	9.4	
Divorced	17.1	
Widowed	3.1	
Living with s/o	4.0	
Working status (%)		
Work full-time	17.2	
Work part-time	7.0	
Attending school	2.7	
Retired	8.4	
Homemaker	10.6	
Not working because of pain	50.9	
Unemployed other reasons	3.1	
Receiving Workers' compensation (%)	29.8	
Receiving SSDI (%)	11.3	
Having an attorney for pain (%)	32.5	
Litigation pending (%)	15.0	
Pain location (%)		
Low back	36.8	
Cervical region	7.2	
Headache, face, and mouth	17.6	
Upper/lower extremities	20.8	
Other	18.6	
No. pain sites (%)		
1	56.6	
2	24.2	
3	19.2	
No. pain surgeries (%)		
0 - 1	34.5	
2 - 3	39.5	
3 - 4	23.2	
> 4	17.0	

Measures

At screening, in addition to the MMPI, subjects provided information concerning several other areas. These included measures of physical and psychosocial functioning (Sickness Impact Profile, or SIP; Bergner, Bobbitt, Carter and Gibson, 1981), depressive symptoms (Beck Depression Inventory, or BDI; Beck, Rush, Shaw and Emery, 1979), pain severity (McGill Pain Questionnaire, or MPQ; Melzack, 1975), number of pain sites, surgeries and emergency room visits, litigation and employment status, as well as the presence of compensation for pain. In addition, several outcome and performance measures of the 555 subjects who were subsequently admitted and treated in the inpatient program were obtained. These included postreatment BDI, MPQ, pain intensity (using a 10-cm visual analogue scale), and early discharge because of either: (a) lack of progress or compliance, or (b) early significant improvement so that additional treatment was not necessary. Two weeks after treatment, patients completed the SIP again to assess physical and psychosocial functioning during the two-week epoch immediately after treatment.

Procedure

Marks and Seeman's (1963) rules for classifying patient's profiles into homogeneous subgroups were used in this study. Being one of the most used rules (see Graham, 1987), they provided an important data base against which to compare the results. Hence, the MMPI profiles obtained at screening were categorized into: (a) one of the 16 clinical profile types developed by Marks and Seeman (1963), or (b) "spike" profiles (*i.e.*, having one scale score 70 T or greater).

The frequency of each profile type was computed. Next, to determine the predictive validity of the MMPI profile types that had been obtained, the patients who had a profile type that was among the most common (*i.e.*, those that occurred among 25 or more patients) were compared to all other patients for the measures obtained at screening and treatment using chi-square tests for dichotomous variables, and t-tests for continuous variables.

Results

Frequency of profile types

The most common profile types, in order, were as follows: Normal K+ (*i.e.* all scales except scale 5< 70, n= 184), 321 (n= 154), 31/13 (n= 41), 482/842/824 (n= 31), 231/213 (n= 29), and 89/98 (n= 26). Marks and Seeman's profile types that had less than 25 subjects, for which no analyses were conducted, included: 83/38 (n= 10), 462/642 (n= 9), 28/82 (n= 8), 27 (n= 6), 274/247/472 (n= 5), 49 (n= 4), 46/64 (n= 3), 86/68 (n= 3), 278 (n= 2), and 96/69 (n= 1). Only three subscales had more than 25 subjects whose profiles "spiked" on that scale. They were scale 1 (n= 53), scale 2 (n= 46), and

scale 3 (n= 69), and these were the ones included in the analyses performed. Spikes on the other scales were much less frequent (scale 4: n= 16; scale 6: n= 0; scale 7: n= 2; scale 8 n= 3; scale 9: n= 15; scale 0: n= 6).

A substantial number of patients (n= 881, or 55%) had profiles that did not fit into any of Marks and Seeman's types, were not "normal" and did not "spike" on a single scale; at least not under their strict rules about coding, which not only involve the scales of interest but also include how the clinical scales and the validity scales relate to each other (see Marks and Seeman, 1963). Among those 881 profiles not codeable as Marks and Seeman's types, a total of 588, or 60%, could be coded into specific profile groups of 10 or more, based on elevations on the clinical scales alone.

Table 2. Number and percentage of profile types as well as spikes (Marks and Seeman's coding system)

	Number	Percentage
Profile type		
Normal K+	184	11.45
321	154	9.58
31/13	41	2.55
482/842/824	31	1.92
231/213	29	1.80
89/98	26	1.61
83/38	10	0.62
462/642	9	0.56
28/82	8	0.49
27	6	0.37
274/247/472	5	0.31
49	4	0.24
46/64	3	0.18
86/68	3	0.18
278	2	0.12
96/69	1	0.06
"Spikes" on		
Scale 1	53	3.29
Scale 2	46	2.86
Scale 3	69	4.29
Scale 4	16	0.99
Scale 6	0	0
Scale 7	2	0.12
Scale 8	3	0.18
Scale 9	15	0.93
Scale 0	6	0.37

As can be seen, some of them matched the Marks and Seeman's profiles *except* for the fact that they did not meet the other Marks and Seeman's criteria. These non-Marks and Seeman profiles are listed on table 3.

Table 3. Number and percentage of profile types as well as spikes (non-Marks and Seeman's coding system)

	Number	Percentage
Profile type		
13/31	124	7.71
123/321	79	4.92
123478/874321	41	2.55
1234/4321	36	2.24
12378/87321	29	1.80
23/32	27	1.68
12/21	27	1.68
1234678/8764321	25	1.55
138/831	23	1.43
1236/6321	21	1.31
134/431	17	1.06
1237/7321	17	1.06
123780/087321	14	0.87
12370/07321	14	0.87
123678/876321	13	0.81
137/731	13	0.81
1234789/9874321	12	0.75
12348/84321	11	0.68
12347/74321	10	0.62
"Spikes" on		
Scale 1	15	0.93
Scale 2	20	1.24

Predictive validity

Due to the large number of analyses in this study (252 statistical tests listed in table 4) it was necessary to lower the alpha level required for significance in order to control for *Type I error* and increase the confidence that findings identified as significant would be reliable. However, a highly conservative approach, such as the *Bonferroni*, in which the chosen significance level is divided by the number of analyses to yield a *p* value that must be reached for results to be deemed significant, would result in a *p* value so low (*e.g.*, 0.05/252= 0.00019) that it substantially increases the risk of *Type*

Table 4. Characteristics of patients' profiles.

	Normal K+	321	31/13	482/842/824	231/213
DEMOGRAPHICS/PAIN HISTORY					
% Working full time (N)	26 (47)*	14 (22)	10 (4)	13 (4)	10 (3)
% Work part-time (N)	10 (18)	5 (8)	0	7 (2)	3 (1)
% Attending school (N)	4 (8)	3 (4)	10 (4)*	0	3 (1)
% Retired (N)	8 (15)	11 (16)	10 (4)	0	7 (2)
% Not working because of pain (N)	35 (63)*	57 (87)	58 (23)	74 (23)	62 (18)
% Homemaker (N)	13 (23)	9 (13)	8 (3)	7 (2)	7 (2)
% Unemployed for other reasons (N)	4 (7)	2 (3)	5 (2)	0	7 (2)
% Receiving Workers' compensation (N)	25 (46)	34 (53)	40 (16)	39 (12)	41 (12)
% Receiving SSDI (N)	2 (4)*	16 (24)	8 (3)	13 (4)	21 (6)
% Having attorney for pain (N)	21 (35)*	39 (52)	43 (16)	50 (15)	21 (6)
% Litigation pending (N)	8 (14)	15 (22)	22 (8)	40 (12)	10 (3)
% of ER visits (SD)	2 (1)	2 (1)	2 (1)	2 (1)	2 (1)
% of surgeries (SD)	3 (3)	2 (1)	3 (3)	3 (5)	4 (2)
% of pain sites (SD)	1 (1)*	2 (1)	2 (1)	2 (1)	2 (1)
TEST SCORES					
Screening SIP Total (SD)	12 (7)*	22 (8)	20 (14)	21 (12)	21 (9)
Screening SIP Physical (SD)	7 (7)*	15 (11)	14 (14)	14 (12)	15 (13)
Screening SIP Psychosocial (SD)	10 (8)*	23 (12)	17 (14)	21 (16)*	20 (9)
Screening MPQ-PRI	26 (12)*	34 (14)	37 (14)	33 (14)	37 (13)
Admission BDI (SD)	10 (6)*	15 (7)	10 (6)	15 (9)*	19 (3)
% Entered program (N)	31 (57)	42 (64)	40 (16)	39 (12)	24 (7)
PERFORMANCE IN PROGRAM					
Screening – Discharge BDI change (SD)	4 (6)*	8 (7)	6 (5)	7 (8)	6 (3)
Admission MPQ – Discharge MPQ (SD)	9 (14)	12 (13)	13 (15)	11 (16)	18 (11)
Screening–2week SIP Total (SD)	8 (6)	13 (8)	5 (9)	10 (10)	10 (10)
Screening–2week SIP Physical (SD)	6 (6)	9 (6)	5 (7)	9 (9)	11 (14)
Screening–2week SIP Psychological (SD)	6 (5)	17 (12)	1 (14)	10 (14)	9 (9)
VAS at Discharge (SD)	5 (2)	5 (2)	4 (2)	5 (3)	6 (1)
% Early Discharge (<18 days) (N)	30 (17)	23 (13)	8 (1)	0	0
% Early Discharge (pt/staff required) (N)	11 (6)	2 (1)	6 (1)	0	0

Note: * $p < 0.001$ (chi-square for dichotomous variables, *t*-test for continuous).

II errors. Thus, we elected to compromise between these two risks, and choose a *p* value of 0.001 that must be reached in order for a particular finding to be deemed statistically significant.

The results of the comparisons of each of the Marks and Seeman profile type with all other profiles are presented in table 4. As can be seen, there were several significant differences between patients with a Normal K+ profile and other patients. Normal K+ profile patients were more likely to be working full time, and (for those not working) to be not working because of pain rather than for other reasons, such as being

retired or disabled for other (nonpain) reasons. Normal K+ profile patients also had fewer pain sites, reported lower pain severity, reported fewer depressive symptoms, were not receiving compensation for pain, and had not retained an attorney for pain. They also reported less physical and psychosocial dysfunction.

Table 4 (Continued). Characteristics of patients' profiles.

	89/98	Spike 1	Spike 2	Spike 3
DEMOGRAPHICS/PAIN HISTORY				
% Working full time (N)	4 (1)	23 (12)	30 (14)	34 (23)*
% Work part-time (N)	12 (3)	10 (5)	7 (3)	10 (7)
% Attending school (N)	0	2 (1)	0	2 (1)
% Retired (N)	8 (2)	10 (5)	20 (9)	4 (3)
% Not working because of pain (N)	69 (18)	37 (19)	28 (13)*	35 (24)
% Homemaker (N)	8 (2)	17 (9)	15 (7)	10 (7)
% Unemployed for other reasons (N)	0	2 (1)		4 (3)
% Receiving Workers' compensation (N)	42 (11)	19 (10)	17 (8)	28 (19)
% Receiving SSDI (N)	15 (4)	11 (6)	7 (3)	12 (8)
% Having attorney for pain (N)	38 (9)	33 (16)	21 (9)	29 (18)
% Litigation pending (N)	28 (7)	18 (9)	10 (4)	11 (7)
% of ER visits (SD)	2 (1)	2 (1)	1 (1)*	1 (1)*
% of surgeries (SD)	2 (1)	3 (2)	3 (2)	2 (1)
% of pain sites (SD)	2 (1)	2 (1)	1 (1)*	1 (1)
TEST SCORES				
Screening SIP Total (SD)	26 (11)*	17 (7)	15 (10)*	13 (7)*
Screening SIP Physical (SD)	18 (12)	12 (9)	11 (13)	8 (8)*
Screening SIP Psychosocial (SD)	29 (17)*	15 (9)	14 (10)	12 (9)*
Screening MPQ-PRI	40 (16)*	30 (11)	30 (16)	26 (11)*
Admittance BDI (SD)	21 (9)*	15 (12)	12 (8)	10 (4)*
% Entered program (N)	58 (15)	26 (14)	26 (12)	32 (21)
PERFORMANCE IN PROGRAM				
Screening – Discharge BDI change (SD)	12 (6)*	10 (14)	6 (3)	4 (4)
Admission MPQ – Discharge MPQ (SD)	17 (16)	9 (15)	2 (16)	7 (11)
Screening–2week SIP Total (SD)	15 (9)	13 (13)	9 (7)	4 (7)
Screening–2week SIP Physical (SD)	11 (4)	10 (14)	7 (7)	6 (6)
Screening–2week SIP Psychological (SD)	20 (18)	21 (14)	9 (9)	.27 (11)*
VAS at Discharge (SD)	6 (3)	5 (3)	4 (2)	5 (3)
% Early Discharge (<18 days) (N)	33 (5)	7 (1)	25 (3)	26 (5)
% Early Discharge (pt/staff required) (N)	7 (1)	8 (1)	8 (1)	9 (2)

Note: * $p < 0.001$ (chi-square for dichotomous variables, t-test for continuous)

Patients with the "31/13" profile showed differences on just one area; these patients were more likely to be going to school than the other patients in the study

were. Patients with the "89/98" profile reported more pain sites, higher levels of psychosocial dysfunction, and pain severity. They also reported more depressive symptoms at admission, and a greater decrease in depressive symptoms from screening to discharge. Patients with a spike on scale 1 had lower levels of psychosocial dysfunction.

Patients with a spike on scale 2 were more likely than other patients to report that they were retired. Among those not yet retired, patients with a 2 spike were more likely than other patients to report that they were not working because of pain-related reasons. Patients with a spike on scale 2 were also more likely to report fewer pain sites, lower levels of global psychosocial dysfunction, as fewer emergency room visits.

Patients with a spike on scale 3 were more likely than other patients in the study to be working full time. These patients also had fewer pain sites, had gone fewer times to the emergency room, and reported less pain severity and fewer depressive symptoms. In addition, these patients had lower levels of physical and psychosocial dysfunction at intake. Unlike other patients, they reported virtually no change in psychosocial dysfunction from screening to after treatment.

As can be observed in Table 3, no significant differences appeared when comparing patients with the "231/213" profile to the other patients participating in the study. As the primary objective of this study was to focus on the Marks and Seeman profiles, comparisons, involving the non-Marks and Seeman profiles, were not performed.[1]

Discussion

Each of the 16 code types identified by Marks and Seeman (1963) were present in this sample of chronic pain patients. Many other code types, based on >70 T score elevations alone, were found as well. No single scale occurred more than 12% of the time, and most common profile (at 11.5%) was the Marks and Seeman Normal K+ profile. The most frequent Marks and Seeman clinical profiles were: 321 (9.6%), 31/13 (2.6%), 482/842/824 (1.9%), 231/213 (1.8%), and 89/98 (1.6%). In addition, several patients had elevations on single scales for scales 1 (3.3%), 2 (2.9%), and 3 (4.3%). Nevertheless, a number of patients (881 patients, or 55% of the sample), did not have profiles that could be categorized into any one of the code types originally developed by Marks and Seeman or into "Spike" profiles.

These findings emphasize the great variability in the MMPI profiles found among chronic pain patients. Clearly, there is no "typical" MMPI profile that describes persons with chronic pain. This finding argues strongly against the traditional idea that the conversion-V profile is the characteristic profile for most chronic pain patients. Even combining the 41 patients who met the criteria for the Marks and Seeman 13/31 code type with the 124 patients who had significant (greater than a T score of 70) elevations on these two scales but did not meet the other rules for being coded as a Marks and Seeman 13/31, only 10.3% of these patients could be viewed as having a "conversion-V" profile.

Given the low alpha (.001) deemed necessary to control for experimentwise alpha inflation, and given the number of analyses performed (252) in the study, if the

MMPI profile types were not associated with any of the functioning or outcome variables in the population, less than one significant finding would be expected, on average, in our sample (.001 x 252= .25). However, 31 significant findings emerged at the $p < .001$ level. Many of these findings (17 or 55%) were related to the concurrent prediction of pain, depression, and physical and psychosocial dysfunction. These significant findings were associated with the Marks and Seeman Normal K+, 482/842/824, 89/98, as well as the Spike 2 and Spike 3 profiles. Individuals with the Normal K+ the Spike 3 profiles reported significantly lower levels of disability, pain, and depression (compared to all other patients), while the individuals with 482/842/824 and 89/98 profiles reported more psychosocial dysfunction, pain, and depression. Patients with the 89/98 and Spike 2 profiles also reported higher levels of overall disability (psychosocial and physical combined) than other patients did.

MMPI profile type was less able to predict demographic and pain history data. Of 11 significant findings, almost all (10) were related to the Normal K+ profile (5 significant findings), the Spike 2 (3 significant findings) or Spike 3 (2 significant findings) profiles. In general, and consistent with the findings predicting the pain and functioning measures, when significant differences were found, patients with the Normal K+ and Spike profiles reported doing better across measures than other pain patients did. For example, Normal K+s, Spike 2s and Spike 3s were more likely to be working full time than other patients were. This difference reached significance ($p < .001$) for the Normal K+s and Spike 3. Because these patients were more likely to be working, they were less likely to be not working for any reason, including pain. This lower likelihood to be not working because of pain reached statistical significance for patients with the Normal K+ and Spike 2 profiles. Normal K+ patients were also less likely to be receiving Social Security Disability Insurance and to have an attorney associated with the pain problem. Normal K+s and Spike 2s reported fewer pain sites than other patients did, and Spike 2s and Spike 3s reported visiting the emergency room less often than other patients.

MMPI profile code types were less able to predict behaviors during multidisciplinary pain treatment and treatment outcome; only three significant findings emerged. Normal K+s showed a lower improvement in depression, 89/98 showed a higher improvement in depression, and Spike 3s showed a lower improvement (virtually no change) in psychosocial disability, compared to all other patients pre- to posttreatment. These results are likely related to the pretreatment scores on the outcome measures for individuals with these profile types. Normal K+s had less room for improvement on the depression and psychosocial disability measures, respectively, to begin with. 89/98s, on the other hand, had more room for improvement (i.e., significantly higher depression scores to begin with). In sum, the MMPI profile code types of Marks and Seeman do not appear able to predict treatment outcome in multidisciplinary treatment above and beyond their association with pretreatment measures; those functioning worse pretreatment appear to improve more than those functioning better.

What are the implications of the present findings concerning the utility of the MMPI in the evaluation of chronic pain patients? First, the findings suggest that code type is associated with concurrent patient functioning; patients with code types that

include elevations on scale 8 (e.g., 483/842,824, 89/98) report not doing as well as other patients. Patients with elevations that involve scales 1 and 3 (e.g., 321, 31/13, Spike 1s) report about as much disability, pain, and depression as pain patients "on average," and patients with single elevations on 2 or 3, or with no elevations (Normal K+) report lower levels of disability. Thus, the MMPI may be used to predict general concurrent functioning.

However, the findings also indicate that the MMPI code types developed by Marks and Seeman may not be useful as predictors of treatment outcome. Using these code types to select patients, especially using code types that suggest psychopathology, may deprive some patients who could benefit from multidisciplinary treatment of receiving this treatment. However, even the patients who were functioning fairly highly on the measures of disability and depression, while showing less improvement than those functioning less well, still evidenced marked pre- to posttreatment changes on the measures of depression, physical disability, and pain severity. Most (all but the individuals with the Spike 3 profile) also showed improvement on the measure of psychosocial dysfunction. Thus, while many clinicians may find the MMPI useful for better understanding patients, the current study indicates that the MMPI may not be useful for screening patients out of multidisciplinary pain treatment.

In order to limit the number of tests performed in the current study, comparisons of the non-Marks and Seeman profile code types and the study measures were not performed. However, a closer examination of these profiles may be useful for the pain clinician seeking to understand the correlates of MMPI profiles with measures of patient functioning. Comparisons of these to the Marks and Seeman code types would also be useful. For example, it would be interesting to determine the extent to which patients with the Marks and Seeman 13/31 code type are similar to or different from patients whose 1 and 3 scales were elevated but otherwise do not meet Marks and Seeman's rules for classification as 13/31s.

Finally, it is important to acknowledge the limitations of our investigation. While the frequencies of specific profile types found very likely reflect the frequencies of profile types in the population of patients referred to the University of Washington Multidisciplinary Pain

Center (given the large N of the sample), this may, or may not, reflect the frequencies found in other pain centers or in pain patients in general. The characteristics of patients are known to vary from one pain center to another (Holzman et al., 1995). Future research will be needed to determine the extent to which the types of profiles identified in this study generalize to other settings. A second significant limitation of this study concerns its exploratory nature. Many Marks and Seeman profile types were identified, and these were compared to the group as a whole on a large number of pain-related variables. This required a reduction in the experiment-wise alpha level to control for possible alpha-inflation. The large number of analyses performed or the required reduction in alpha level could have resulted in an increase in Type I or Type II errors, respectively. While exploratory analyses do have their place for identifying possible correlates of MMPI profile types, replication of the findings will be necessary to identify those findings that generalize to other chronic pain patient samples.

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