

## Identifying Psychological Contributions to Chronic Pain Complaints With the MMPI-2: The Role of the *K* Scale

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Although the *1-3/3-1* Minnesota Multiphasic Personality Inventory (MMPI) code type is traditionally interpreted as suggesting that somatic complaints are caused or exacerbated by psychological factors, prior research has raised questions about the validity of this interpretation for chronic pain patients. This study examined alternative strategies for using the MMPI to identify psychological contributions to chronic pain complaints. A sample of 125 chronic pain patients completed the MMPI-2. They were also rated by clinical staff on a set of descriptive statements reflecting psychological features that can contribute to physical complaints. MMPI patterns that are traditionally used to identify these features, such as the *1-3/3-1* code type, were not related to the ratings. A relation was found between scores on the *K* scale and the ratings, where patients with higher scores on the *K* scale ( $T \geq 56$ ) received ratings suggesting less of a psychological contribution to their pain complaints. The implications of the findings for understanding the nature of the *K* scale are discussed.

The Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1983) is often used in part to evaluate whether psychological factors are causing or exacerbating physical complaints. Two of the original 13 scales were developed for this purpose. The *Hs* scale (Scale 1) is considered unidimensional, in that every item has to do with physical symptoms that may result from an overemphasis on bodily functioning. The *Hy* scale (Scale 3) measures two primary dimensions. Most items on Scale 3 reflect either the admission of somatic complaints or the de-

nial of psychological difficulties (Little & Fisher, 1958). The corresponding subscales are referred to as Admission (*Ad*) and Denial (*Dn*), respectively. Little and Fisher hypothesized that the patient who simultaneously admits to physical complaints and denies emotional distress would demonstrate hysteroid features such as conversion symptoms.

Several studies have demonstrated that when either Scale 1 or 3 is the most elevated clinical scale, the other is likely to be elevated as well. An elevation on the *D* scale (Scale 2) is also likely to occur (Archer, Griffin, & Aiduk, 1995; Gynther, Altman, & Sletten, 1973; Marks & Seeman, 1963). The consistency of this pattern made it possible for several researchers to examine the actuarial correlates of primary elevations on Scales 1 and 3. Both diagnostic data and clinician ratings suggest that the modal psychiatric patient with primary elevations on Scales 1 and 3 will report significant physical complaints, but the severity of these complaints is at least in part determined by psychological factors (Gilberstadt & Duker, 1965; Gynther et al., 1973; Marks & Seeman, 1963). This psychological contribution may manifest itself in any combination of three ways: (a) through the use of physical complaints to avoid emotional issues (a hysteroid style of defense), (b) through the use of physical complaints for attention seeking, (c) through the tendency to develop physical complaints in response to stress.

More recent studies have questioned the generalizability of this clinical description to chronic pain patients. Among pain patients, simultaneous elevation of Scales 1 and 3 indicates increased endorsement of physical complaint items, but does not generally reflect endorsement of the psychological denial items (Ornduff, Brennan, & Barrett, 1988; Prokop, 1986; Sherman, Camfield, & Arena, 1995; Watson, 1982). Although these studies suggest that the 1-3/3-1 code type is associated with significant functional impairment related to pain complaints, it does not provide evidence that these complaints are exacerbated by psychological factors. However, none of the studies looking at pain patients looked at the relation between elevations on Scales 1 and 3 and clinician ratings, as was done in the actuarial studies described previously. The possibility remains that the endorsement of a wide variety of physical complaint items by itself is sufficient evidence of a psychological contribution to pain complaints.

Several lines of research also suggest that the use of the MMPI to identify psychological contributions to physical conditions may be improved by examining the *K* scale. Based on Little and Fisher's (1958) initial hypothesis that hysteroid features should only be inferred if both the *Ad* and *Dn* subscales are elevated, McGrath and O'Malley (1986) investigated various methods of predicting simultaneous elevation on the two subscales using the traditional 13 scales. Scale *K* had the highest correlation with the *Dn* scale, whereas Scale 1 had the highest correlation with the *Ad* scale. This finding was not surprising; of the traditional scales, *K* and 1 come closest to being pure measures of the dimensions

ostensibly tapped by the *Dn* and *Ad* scales, and there is a fair amount of item overlap as well.

McGrath and O'Malley (1986) also found that simultaneous clinical elevation on Scales *K* and *1* was a better predictor of simultaneous elevation on the *Ad* and *Dn* subscales than other test patterns using Scales *1* and *3*. This finding was consistent across samples of medical patients, psychiatric patients, and chronic pain patients, and makes intuitive sense. However, they did not examine the relation between the *K-1* combination and independent indicators of psychological contributions to physical complaints. The findings were considered at best suggestive that an elevated score on *K* predicts the presence of such features.

On the other hand, it has been known for quite some time that the *K* scale is a predictor of healthy psychological adjustment and coping capacity rather than defensiveness in normal populations (Heilbrun, 1961; Smith, 1959; Sweetland & Quay, 1953). For example, studies have consistently demonstrated a positive relation between score on the *K* scale and level of education (Brophy, 1995; Lebovitz & Ostfeld, 1967). If one may assume that most chronic pain patients were nonpathological prior to developing pain, an elevated *K* score could be an indicator of an individual who demonstrates superior psychological adjustment to physical trauma.

This study examined the relation between various MMPI test patterns and clinical staff ratings of whether somatic complaints of chronic pain patients reflect a psychological component. Two questions were addressed. First, are the MMPI signs traditionally associated with psychological factors contributing to physical complaints, such as the *1-3/3-1* code type, related to staff ratings? Second, does the *K* scale enhance the prediction of psychological factors contributing to pain complaints, and if so, is it a positive or negative predictor?

## METHOD

### Participants

The sample consisted of 125 participants in a 4-week, full-time outpatient multidisciplinary rehabilitation program for patients with chronic pain. Patients were excluded from the sample if they did not complete the MMPI-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989), the recent revision of the MMPI, or if their *T* score on Scale *F* exceeded 90.

All participants were out of work during the program due to disability associated with their pain complaints. The sample consisted of 46.4% women and 53.6% men. The majority of the participants were married (64.0%) or divorced (17.6%). Patients were on average 39.5 years old ( $SD = 9.3$ ), with 11.9 years of education ( $SD = 2.1$ ).

## Procedure

Patients completed the MMPI-2 within the first 2 days of admission to the program. In all analyses, *K*-corrected *T* scores were used. Although this confounded variance from Scales *K* and *1* (as well as other less focal scales), *K* correction was used because it reflects typical MMPI practices of clinicians.

Each patient was also rated on 25 statements that were believed to be associated with the presence of a psychological contribution to physical complaints (see Table 1). These statements were selected by Robert E. McGrath and Michael Sweeney from descriptions of individuals with *1-3/3-1* code types provided in three standard texts on the interpretation of the MMPI (Graham, 1987; Greene, 1991; Lachar, 1974). Review of the statements suggested they represented six content domains: (a) developing physical complaints under stress, (b) limited insight into psychological problems, (c) attention seeking and insecurity, (d) the tendency to be self-centered, (e) apparent normality-conventionality, and (f) mild negative affect. Patients were rated on each statement using a 5-point scale ranging from 1 (*definitely false*) to 5 (*definitely true*).

TABLE 1  
Items Used for Ratings

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1. Tends to develop physical complaints when in stressful situations.
  2. Spends more time talking about physical, rather than psychological, complaints.
  3. Physical complaints are expressed in a manner that gains attention.
  4. Minimizes the psychological component of their current complaints.
  5. Demands more attention than the average patient.
  6. Relationships with others (patients, family, staff) seem to be shallow.
  7. Has a high level of self-concern.
  8. Ignores emotional problems or issues.
  9. Overly optimistic.
  10. Limited self-awareness or personal insight.
  11. Emotional reactions are exaggerated.
  12. Insecure about relationships, afraid others will leave them.
  13. Dependent, needy.
  14. Uses physical complaints to avoid psychological issues.
  15. Demands sympathy from others.
  16. Socially appropriate.
  17. Appears to be able to get along with others.
  18. Appears nervous.
  19. Appears mildly sad.
  20. Socially adaptable.
  21. Signs of thought disorder.
  22. Weird or eccentric.
  23. Aggressive or hostile.
  24. Tends to be overly pessimistic.
  25. Complains a lot
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TABLE 2  
Descriptive Statistics for the Standard MMPI Scales

<i>Scale</i>	<i>M</i>	<i>SD</i>
<i>L</i>	57.608	9.934
<i>F</i>	57.392	13.500
<i>K</i>	47.048	10.579
<i>1</i>	76.720	10.593
<i>2</i>	71.008	12.813
<i>3</i>	76.968	13.927
<i>4</i>	56.248	10.615
<i>5</i>	50.608	10.975
<i>6</i>	58.640	15.231
<i>7</i>	63.496	12.785
<i>8</i>	63.912	13.502
<i>9</i>	51.576	10.040
<i>0</i>	54.864	11.389

*Note.* MMPI = Minnesota Multiphasic Personality Inventory.

The program staff members who served as raters were selected on the basis of the following criteria. To avoid contamination of the ratings, only staff members who were unaware of the purpose of the study and did not have access to the MMPI-2 findings were eligible. Raters were required to be staff members in frequent contact with each patient. Finally, staff members were chosen who would observe the patients independently of each other. The program physician, vocational rehabilitation counselor, and practical nurse met the criteria and agreed to rate all participants in the study. Ratings were completed independently between 2 and 3 weeks after admission to the program.

The use of multiple raters is unusual in actuarial MMPI studies, but it allowed the computation of interrater reliabilities. Coefficient alpha was computed for each item. The mean coefficient alpha was modest (.51), but is not inconsistent with previous research. For example, Marks and Seeman (1963) reported a mean reliability coefficient of .50. To improve the reliability of the ratings, scores for the three raters were then averaged for each item.

## RESULTS

All statistical analyses were conducted using SYSTAT Version 6.0 (SPSS, 1996). Table 2 provides means and standard deviations for the 13 standard MMPI scales. The means provided in Table 2 suggest the MMPI profiles produced by this sample are similar to those collected in previous research on the use of the MMPI to predict psychological contributions to physical complaints. The highest mean elevations

were on Scales 1 and 3, although Scale 2 was also clinically elevated on average ( $T$  score  $\geq 65$ ). None of the other means fell in the clinically elevated range.

A number of MMPI profile patterns that were considered potentially predictive of psychological contributions to pain complaints were examined. With one exception noted later, a given pattern was only used further if the number of respondents demonstrating that pattern was 18 or greater. Ten patterns were identified for inclusion in subsequent analyses (see Table 3).

The first six were based on traditional patterns used to predict psychological factors in physical complaints. The last of the first six patterns, the Pure 1-3, was included despite the smaller number of profiles because of its theoretical importance. The conversion  $V$ , in which depression is absent despite significant physical complaints, suggests the possibility that the physical complaints are exaggerated for psychological reasons. However, one could argue that a  $D$  scale score below

TABLE 3  
MMPI Patterns Examined in Subsequent Analyses

Elevated 3	A profile exhibited this pattern when the MMPI-2 Scale 3 was clinically elevated ( $T$ score $\geq 65$ ); $n = 102$ out of 125 met this criterion.
Elevated 1-3	A profile exhibited this pattern when Scales 1 and 3 were both clinically elevated; $n = 95$ .
Code 1-3	A profile exhibited this pattern when Scales 1 and 3 were both elevated, and none of the $T$ scores for the other commonly researched clinical scales (Scales 2, 4, 6, 7, 8, and 9) were higher, indicating a 1-3/3-1 code type; $n = 54$ .
Reliable 1-3	Graham, Timbrook, Ben-Porath, and Butcher (1991) raised concerns about the reliability of code types that are not well defined. A code type is considered well defined when the $T$ scores for the scales comprising the code type exceed the $T$ scores for all other clinical scales by at least 5 points. A profile meeting criteria for the Code 1-3 pattern also exhibited the Reliable 1-3 pattern if none of $T$ scores for the other commonly researched clinical scales fell within 5 points of the $T$ score for Scales 1 and 3; $n = 37$ .
Conversion $V$	A profile meeting criteria for the Code 1-3 pattern also exhibited the Conversion $V$ pattern if the $T$ score for the Depression scale was less than 65; $n = 20$ .
Pure 1-3	A profile meeting criteria for the Code 1-3 pattern also exhibited the Pure 1-3 pattern if the $T$ scores for the other commonly researched scales all fell below 65; $n = 14$ .
Elevated $K$	This applied to any profile where the $T$ score for scale $K$ was greater than or equal to 56; $n = 32$ .
Elevated $K-1$	A profile exhibited this pattern if the $T$ score for Scale 1 was greater than or equal to 64 and the $T$ score for $K$ was greater than or equal to 56. The use of this combination to identify hysteroid features was suggested by McGrath and O'Malley (1986); $n = 29$ .
Elevated $K-1-3$	A profile meeting criteria for the Elevated 1-3 pattern also exhibited the Elevated $K-1-3$ pattern if the $T$ score for $K$ was greater than or equal to 56; $n = 24$ .
Code $K-1-3$	A profile meeting criteria for the Code 1-3 pattern also exhibited the Code $K-1-3$ pattern if the $T$ score for $K$ was greater than or equal to 56; $n = 18$ .

Note. MMPI = Minnesota Multiphasic Personality Inventory.

TABLE 4  
Multivariate Analysis of Variance Statistics for 10 Test Patterns

	<i>F</i>	<i>Canonical Correlation</i>
Elevated 3	0.693	.386
Elevated 1-3	0.736	.396
Code 1-3	0.823	.415
Reliable 1-3	1.339	.503
Conversion V	1.089	.464
Pure 1-3	1.002	.449
Elevated K	2.032*	.582
Elevated K-1	1.912*	.571
Elevated K-1-3	2.285*	.605
Code K-1-3	1.946*	.574

*Note.* The *F* value is that associated with Wilks's lambda; in all cases, *df* = 25, 99.

\**p* < .05.

the clinical range by itself does not insure the absence of emotional distress, because distress may emerge primarily as anxiety or general dissatisfaction, or in some other form better tapped by other clinical scales. To meet criteria for the Pure 1-3 pattern, the patient could not demonstrate any evidence of emotional distress associated with the reported somatic complaints. This represents the most conservative variant of the conversion V. However, given the small number of patients demonstrating this pattern, the data should be considered particularly tentative.

The last four patterns were included to examine whether elevated *K* scale scores enhanced the identification of psychological features in physical complaints. Three of these are variants of traditional signs, with the additional requirement of a *K* score greater than or equal to 56 *T*, whereas one is based on the *K* scale alone. Although patterns with clinically elevated *K* scores were considered, the number of cases demonstrating these patterns was so small ( $n < 9$ ) that the results could not be considered reliable. The significance tests were conducted for these patterns for exploratory reasons, but none approached significance. It may be noted that although 56 is less than the standard criterion for clinical elevation, Table 2 indicates that a *T* score of 56 on the *K* scale was approximately 1 *SD* above the mean for the sample. The *T* score of 56 also represents the minimum value at which Greene (1991) suggested the profile of a respondent with suspected psychopathology provides evidence of "denial or hysteroid defenses" (p. 117).

A dichotomous variable was created to represent the presence or absence of each of the 10 patterns, and a multivariate analysis of variance (MANOVA) was computed using the 25 items as dependent variables to determine whether each pattern was significantly related to the linear combination of the ratings (see Table 4). None of the MANOVAs was significant unless *K* was included in the pattern.

The MANOVAs for the first six patterns in Table 3 did not reach significance, whereas the MANOVAs for the last four were all significant.

Discriminant function analyses (DFAs) were conducted for the four significant patterns to examine whether higher *K* scores indicated greater or less psychological involvement in pain complaints. Table 5 provides the canonical loadings for each item, as well as classification rates.

TABLE 5  
Loadings and Classification Rates From Discriminant Function Analyses

	<i>Elevated K</i>	<i>Elevated K-1</i>	<i>Elevated K-1-3</i>	<i>Coded K-1-3</i>
<b>Item loadings</b>				
1	-.253	-.183	-.065	-.064
2	.049	-.024	.094	.034
3	-.030	.051	.125	.076
4	-.147	-.142	-.202	-.118
5	-.019	.021	.135	.094
6	-.120	-.065	-.096	-.206
7	-.379	-.328	-.246	-.293
8	-.042	-.033	-.136	-.083
9	.076	.106	.091	.145
10	-.105	-.079	-.082	-.114
11	-.032	-.001	.039	-.019
12	-.323	-.267	-.138	-.172
13	-.220	-.209	-.127	-.159
14	-.248	-.194	-.151	-.225
15	-.148	-.083	.006	-.045
16	.049	.038	.103	.139
17	.088	.096	.052	.049
18	.046	.055	.100	.067
19	-.318	-.295	-.160	-.274
20	.104	.086	.072	.049
21	.065	.098	.081	.093
22	-.037	-.038	-.055	-.015
23	-.152	-.156	-.097	-.069
24	-.170	-.132	-.093	-.218
25	-.199	-.161	-.079	-.176
<b>Correctly classified (%)</b>				
Positives	75	83	88	83
Negatives	78	82	81	85
Overall	78	82	82	85

*Note.* Positive loadings suggest individuals with that MMPI profile pattern received higher ratings on the descriptor; negative loadings suggest they received lower ratings. Positives = percentage of patients meeting the criterion who were correctly classified using discriminant function analysis; Negatives = percentage of patients not meeting the criterion who were correctly classified; Overall = percentage of all patients who were correctly classified. MMPI = Minnesota Multiphasic Personality Inventory.



Classification accuracy hovered around 80% for each pattern involving *K*, with roughly equivalent accuracy in the classification of positives (individuals exhibiting the relevant MMPI sign) and negatives. The results suggest that if Scale *K* is used to predict the presence or absence of a psychological contribution to pain complaints, whether used in combination with Scales 1 and 3 or not, one would expect to classify about 80% of cases accurately.

The canonical loadings in Table 5 may be used to address the final question: Is an elevated *K* score a positive or negative indicator of psychological features that can intensify physical complaints? Using loadings greater than or equal to .20 for at least two of the test patterns as the basis for interpreting the latent variable that maximally discriminated between the groups, the results suggest that individuals with higher *K* scores demonstrate superior psychological adjustment in light of their chronic pain, and are less likely to demonstrate characteristics suggesting a psychological contribution to their pain complaints. Individuals with relatively elevated scores on Scale *K* were seen as less self-concerned, less sad, less insecure, less needy, and dependent; less avoidant of psychological issues; and less likely to use physical complaints to avoid psychological issues than patients with lower *K* scores.

An unplanned comparison was also conducted to determine whether a similar pattern would emerge when patients with relatively low scores on Scale *K* were compared to patients with intermediate scores. Respondents with *K* scores below 56 *T* were dichotomized depending on whether their *T* score fell below 37, approximately 1 *SD* below the sample mean. The MANOVA was not significant,  $F(25, 67) = 1.031, p = .44$ , suggesting no difference in the linear combination of ratings for patients with intermediate and low *K* scores.

## DISCUSSION

The use of MANOVA and DFA rather than independent groups *t* tests represents a departure from prior practice in MMPI high-point code studies, and warrants justification. Previous studies have generally been atheoretical and exploratory, focusing on bivariate relations between each of a series of test signs and each extra-test criterion taken individually. It is because of such exploratory studies that the 1-3/3-1 code has come to be seen as an indicator of psychological contributions to physical complaints.

Our goals were somewhat different. Rather than focusing on the discovery of relations between test patterns and individual extra-test criteria, we were interested in confirming the effectiveness of preselected test patterns as predictors of the stylistic tendency to exaggerate physical complaints for psychological reasons. Given the goals of our study, we thought it was appropriate to focus on the linear combination of our criterion variables as an overall indicator of clinical presentation rather than on the individual descriptors.

The results support previous findings that the traditional signs used to identify psychological factors contributing to physical complaints, involving Scales 1 and 3, are ineffective in a chronic pain population. However, the *K* scale emerges as a useful predictor of the individual's emotional response to the development of chronic pain. Patients with relatively elevated scores on the *K* scale seem to have demonstrated better psychological adjustment to their pain. Individuals with low or normal *K* scores were more likely to be seen as psychologically avoidant, dependent, and self-concerned by program staff, suggesting that the intensity of their pain complaints are more likely to be exacerbated by psychological factors.

The classification analysis suggests a second conclusion, that as the pattern criteria are made more restrictive the relation becomes stronger. Although the overall hit rate was 78% when classification was based on Scale *K* alone, it increased to 82% when Scale 1 was considered as well, and to 85% when the respondent also had to meet criteria for the 1-3/3-1 code type. McGrath and O'Malley (1986) similarly recommended the combination of Scale 1 with Scale *K* when predicting psychological factors contributing to physical complaints, and they found that including Scale 3 added slightly to their hit rate. However, the pattern of canonical correlations in Table 4 is only partially consistent with this conclusion. The combination of an elevated *K* scale with elevated scores on Scale 1 and 3 was associated with the highest canonical correlation in the table, but the canonical correlation for the Code *K*-1-3 pattern was lower than that for an elevated score on the Scale *K* alone. Even so, the preponderance of the evidence suggests a reliable improvement in hit rate when Scales 1 and 3 are considered in addition to Scale *K*.

The direction of the relation between *K* and the ratings is opposite to the prediction based on Little and Fisher's (1958) original research, however. The study highlights the importance of considering context when interpreting the *K* scale. The tendency to assume that higher scores on the *K* scale imply a defensive response style may be overly simplistic, although it is encouraged by the association of the *K* scale with the ambiguous term *denial*. An elevated score on the *K* scale in itself indicates nothing more than a greater-than-average tendency to deny correlates of emotional distress or a negativistic attitude. Whether it is probabilistically appropriate to infer pathological denial or dissimulation from this behavioral denial, whether the positive attitude suggested by a high *K* score should be viewed as admirable or suspicious, seems to depend on the population. For individuals from nonpathological backgrounds, behavioral denial on the MMPI may best be interpreted as evidence of a higher level of psychological functioning. For respondents from a pathological population, behavioral denial is instead evidence of an inaccurate self-portrayal.

Of course, it is important to keep in mind that the term *elevation* when used in describing the results of this study refers to relative elevation of the *K* scale, rather than its clinical elevation. The mean *T* score on the *K* scale among those identified as having elevated *K* scale scores was only 60.9 ( $SD = 4.9$ ). Unfortunately, group

sizes were insufficient to allow for reliable examination of outcomes associated with clinically elevated *K* scale scores. It would not be surprising to find that when the *K* scale achieves the level of clinical elevation, the interpretation changes again, and suggests both psychological and behavioral denial even in pain patients.

These findings have implications for the use of the *K* scale with chronic pain patients, and potentially in any setting where relatively nonpathological individuals receive psychological intervention. The *K* scale may be suggested as an indicator of the extent to which the respondent has been able to cope adaptively with the demands of the stressor. An interesting question for future research is whether this relation would exist because normal individuals with relatively elevated *K* scores prior to trauma cope more effectively, or because the *K* scores of those who cope more effectively are more likely to remain stable or even increase.

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