



Relationship between personality and health symptoms: Use of the MMPI-2 in medical assessments

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ABSTRACT. The Minnesota Multiphasic Personality Inventory-2 is a broadband measure of psychopathology and personality that has a long tradition in assessment of medical patients. Beginning in the 1940's the MMPI was used in the study of psychological factors in medical conditions and an extensive research base for the MMPI, and its successor the MMPI-2, in medical applications has developed. The current theoretical study will review that history of the MMPI for assessment of medical patients with an emphasis on cross national application of the MMPI-2 in medical assessments and the international use of the MMPI-2 in the identification of personality factors important in the identification and treatment of medical conditions. The types of medical problems addressed will include: the differentiation between functional and organic conditions, assessment of chronic organic conditions, asthma, chronic pain, coronary heart disease, headache, eating disorders, and others. Additionally, information regarding the use of the MMPI-2 in screening for organ transplant and the identification of personality traits that lend a vulnerability to the development of coronary artery disease will be presented.

KEYWORDS. Personality. MMPI-2. Medical assessments. Theroretical study.

RESUMEN. El Inventario Multifásico de Personalidad de Minesota-2 constituye un importante instrumento de medida de psicopatología y personalidad con una larga

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tradición en pacientes con trastornos médicos. A principios de los años cuarenta el MMPI fue utilizado en el estudio de los factores psicológicos asociados a enfermedades médicas, desarrollándose una extensa base de investigación para el MMPI y su sucesor el MMPI-2 en aplicaciones médicas. Este estudio teórico analiza la historia del MMPI en la evaluación de pacientes con enfermedades médicas, enfatizando su aplicación transcultural en evaluaciones médicas y el empleo internacional del MMPI-2 en la identificación de factores importantes de la personalidad en la evaluación y tratamiento de condiciones médicas. Los tipos de problemas médicos incluirán la diferencia entre condiciones funcionales y orgánicas, la evaluación de condiciones crónicas orgánicas, asma, dolor crónico, enfermedad cardíaca coronaria, dolor de cabeza, trastornos alimentarios y otros. También se presenta información acerca del uso del MMPI-2 en el cribado para trasplantes de órganos y en la identificación de los rasgos de la personalidad con vulnerabilidad al desarrollo de enfermedad arteriales coronarias.

PALABRAS CLAVE. Personalidad. MMPI-2. Evaluación médica. Estudio teórico.

RESUMO. O Inventário Multifásico de Personalidade de Minnesota-2 constitui um importante instrumento de medida de psicopatologia e personalidade com uma larga tradição em pacientes com perturbações médicas. No início dos anos quarenta o MMPI foi utilizado no estudo dos factores psicológicos associados a doenças médicas, desenvolvendo-se uma extensa base de investigação para o MMPI e o seu sucessor o MMPI-2 em aplicações médicas. Este estudo teórico analisa a história do MMPI na avaliação de pacientes com doenças médicas, enfatizando a sua aplicação transcultural em avaliações médicas e o uso internacional do MMPI-2 na identificação de factores importantes da personalidade na avaliação e tratamento de condições médicas. Os tipos de problemas médicos incluíram a diferença entre condições funcionais e orgânicas, a avaliação de condições crónicas orgânicas, asma, dor crónica, doença cardíaca coronária, dor de cabeça, perturbações alimentares e outros. Também se apresenta informação acerca do uso do MMPI-2 no rastreio para transplantes de órgãos e na identificação dos traços de personalidade com vulnerabilidade para o desenvolvimento de doenças arteriais coronárias.

PALAVRAS CHAVE. Personalidade. MMPI-2. Avaliação médica. Estudo teórico.

Introduction

The MMPI and now the MMPI-2 have been extensively used in the assessment of medically ill patients both to assess the impact of medical illness on the emotional and psychological well-being of the individual, but also to predict compliance with treatment and suitability for interventions such as organ transplants or participation in rehabilitative treatment programs. As a result of the extensive use of the instrument in medical settings a tremendous amount of descriptive and prospective data on the MMPI/MMPI-2 across a broad spectrum of medical conditions has accumulated. The accumulated empirical data on the MMPI and MMPI-2 in medical settings provides the clinician with an objective context for MMPI based inferences regarding the emotional reaction, psychological features, and personality traits of a particular medical patient. These

inferences can aid the medical team in tailoring some interventions to the patient's needs and capacities.

Since the beginning, the MMPI's potential to aid the clinician in understanding the emotional causes and consequences of medical conditions was recognized. Initially the hope was that the MMPI with its' capacity for broad band assessment of personality and psychopathology would identify emotional factors that led to the development of some physical complaints and illness (Hanvik, 1951; Imboden, Canter, and Cluff, 1961). Indeed, the MMPI was used in attempts to prospectively identify emotional factors that produced a vulnerability to disease and illness (Canter, Imboden, and Cluff, 1966; Cluff, Canter, and Imboden, 1966). Attempts to identify and describe personality factors or traits that would predispose individuals to a prolonged recovery from illness or to identify patients who presented medically with functionally based somatic complaints were often hard to replicate and criticized for over pathologizing a normal response to medical illness (Keller and Butcher, 1991; Love and Peck, 1987). More recently with the availability of large prospective data sets, the attempt to identify MMPI-2 assessed personality factors related to somatic preoccupation and subsequent disability as well as the development of medical conditions are beginning to bear fruit (Bigos *et al.*, 1991; Kawachi *et al.*, 1998; Siegler *et al.*, 2003; Yan, Liu, Matthews, Daviglus, Ferguson, and Kiefe, 2003). In this theoretical study (Montero and León, 2002) the clinical utility of the MMPI-2 in assessment of patients in medical settings starting with a description of the interpretive approach adopted when assessing the medical patient with the MMPI-2 will be presented. This presentation is followed by the illustration of the use of the MMPI-2 in making decisions regarding chronic pain treatment, suitability for medical intervention, prediction of health related behavior and development of coronary artery disease (CAD). Finally a review of the cross national and cross culture use of the MMPI-2 in the assessment of medical patients will be presented.

Use of the MMPI-2 in medical settings: Differentiation between functional and organic complaints

Before a discussion of interpretive guidelines for the MMPI-2 in medical settings can take place, it is important to establish the utility of the MMPI-2 in assessing medical patients. The MMPI has been criticized for over predicting psychopathology in medically ill or neurologically impaired patients because the items contained on MMPI-2 scales reflecting somatization or depression reflect genuine symptoms experienced as a result of the medical condition (Gass, 1991, 1992; Love and Peck, 1987). Consequently, attempts to develop MMPI scales that accurately differentiate individuals with genuine organic somatic complaints from those who present somatic complaints with an emotional or functional overlay were generally unsuccessful and the use of the MMPI to predict whether there was a physical basis for a somatic complaint was discouraged (Keller and Butcher, 1991; Love and Peck, 1987; Rosen, Frymoyer, and Clements, 1980).

The failure to identify personality variables and develop interpretive guidelines for MMPI-2 interpretation in these cases is in large part due to the difficulty untangling cause and effect of psychological or emotional factors in susceptibility to illness and

recovery from disease. For example, although a large percentage of patients with chronic pain and serious medical illness display elevations on MMPI/MMPI-2 clinical scales suggestive of somatic preoccupation, it is difficult to determine if these elevations contribute to or are the result of reported pain and functional impairment (Vendrig, 2000). Elevations on MMPI scales 1, 2, and 3 decrease after successful treatment of chronic low back pain (Barnes, Gatchel, Mayer, and Barnett, 1990). Nevertheless, MMPI profiles of acutely medically ill patients and those with chronic conditions including non-malignant pain show distinctive responses to the experience of medical illness and pain (Love and Peck, 1987). Indeed most contemporary pain experts view the psychological response to medical illness and subjective experience of pain as multidimensional processes (Gatchel, Polatin, and Mayer, 1995). An emerging consensus regarding the relationship between psychopathology and pain is the acceptance of a diathesis stress model that specifies preexisting unexpressed individual characteristics which become activated by the experience of medical illness and the associated stress of chronic pain (Banks and Kerns, 1996; Dersh, Polatin, and Gatchel, 2002).

Prospective studies of psychological factors in the recovery from physical illness or injury viewed within the context of the diathesis stress model suggest that MMPI/MMPI-2 assessed psychological dimensions provide useful information for the clinician in medical settings (Fordyce, Bigos, Batti'e, and Fisher, 1992; Imboden *et al.*, 1961). In other words, given the multidimensional nature of the emotional response to medical illness and subjective experience of pain combined with the growing evidence that personality factors influence this response, the MMPI-2 can provide clinicians working in medical settings with important information regarding a patient's adaptive emotional response to his or her medical condition and identify individual characteristics that may impede or promote recovery and adaptation to medical illness and disability.

General issues in MMPI-2 interpretation in medical settings

Attitude toward evaluation

A significant advantage of the MMPI-2 over other self-report and observer rating scales is that it provides valid and reliable estimates of response bias. That is the clinician can objectively identify the candor and openness adopted by the patient while undergoing the evaluation. The presence of effective validity scales on the MMPI-2 is one reason why the instrument is one of the most widely used objective measure of personality in both clinical and forensic settings (Lally, 2003; Piotrowski, Belter, and Keller, 1998). The ability of the clinician to determine how the patient approached self-revelation and estimate the probability that self-report as reflected by item responses on the MMPI-2 is an accurate representation of the individuals clinical state at the time of the evaluation is a distinct advantage over unaided clinical interview. Indeed, it is critical that the clinician have an objective basis to determine the accuracy of the clinical inferences derived from the MMPI-2 when reaching diagnostic or treatment decisions. The MMPI-2 validity scales allow for a probabilistic assessment of the accuracy of the patients self-report and subsequently provide confidence in the resulting clinical decisions based on that information.

Approach to the MMPI-2 as determined by validity scale score configuration can provide particularly useful information to the clinician working in a medical setting. For example, the Variable Response Indicator Scale (VRIN) and True Response Indicator Scale (TRIN) both indicate how well the individual was able to attend to the content of the individual items and respond consistently throughout the test. Extreme elevations on the VRIN indicate a random response. Consequently, a medical patient with adequate education and resources who cannot respond consistently to the MMPI-2 suggests that concentration and attention is compromised. This level of impairment warrants further evaluation since such a level of inattention would seriously compromise the ability to comprehend and adhere to after care instructions or comprehend the description of medical intervention or treatment.

There are two other broad categories of threats to validity assessed by the MMPI-2. The first is associated with a deliberate attempt to feign or exaggerate psychopathology. The infrequency (F, FB, and F(p)) family of scales on the MMPI-2 assess a common strategy used by individuals to malingering psychopathology by endorsing unusual or rare symptoms or symptom combinations. The latter scale, the F(p), has been shown to be particularly useful in identifying malingering of psychiatric illness across a wide range of settings because the scale is less influenced by severe psychopathology (Arbisi and Ben-Porath, 1995; Rogers, Sewell, Martin, and Vitacco, 2003). Unfortunately, despite claims to the contrary, an effective scale for the detection of malingering or exaggeration of somatic or medical symptoms has not been developed. The Fake Bad Scale (FBS) a scale rationally derived and developed to identify individuals feigning physical injury and disability has not lived up to these claims (Lees-Haley, English, and Glenn, 1991). The FBS has an unacceptably high rate of false positives especially among woman and patients with psychiatric illness (Butcher, Arbisi, Atlis, and McNulty, 2003). An MMPI-2 scale that would approximate the accuracy of the F and F(p) scales in identifying malingering of psychiatric illness is sorely needed to facilitate identification of individuals who are likely feigning or exaggerating somatic illness.

Rather than exaggerating of feigning pathology, the opposite, denial or minimization of psychopathology is a frequently adopted response set in medical settings especially when the evaluation is a part of a screening procedure for an organ transplant (Ruchinkas, Broschek, Crews, Barth, Francis, and Robinson, 2000). Individuals who wish to present themselves as favorable candidates for the receipt of scarce medical recourses such as organ transplants or access to specialized treatment, may attempt to minimize or deny aspects of their behavior or personality that would diminish their chance of gaining access to these resources. The MMPI-2 contains validity scales (L, K, S) that assess the degree to which claims of excessive virtue and minimization of problems are influencing the patients self-report. Given that psychological well being and the absence of substance abuse or dependence problems are considered good prognostic indicators for recovery from arduous medical procedures, it seems reasonable to expect individuals who are being evaluated for an organ transplant to present themselves in the most favorable light. On the other hand, this tendency to put one's best foot forward can be so extreme as to preclude any decisions regarding access to treatment based on self-report. Further, the presence of a defensive response style as evidenced by elevation on the Lie (L)

scale on the MMPI-2 is a poor prognostic indicator of outcome after participation in a multidisciplinary treatment program for chronic pain (Burns, 2000). Consequently the tendency to present as overly virtuous and without fault interferes with the process of recovery while engaged in a chronic pain treatment program. Similarly elevation on the L scale is also associated with failure of chronic pain patients to benefit from a work hardening program and return to work (Alexy and Webb, 1999). On the other hand, individuals who reported chronic pain and who tended to minimize emotional problems or difficulties as identified by higher scores on the MMPI-2 K scale, were rated as having fewer psychological features that would contribute to their chronic pain complaints (McGrath, Sweeney, O'Malley, and Carlton, 1998).

In sum, in medical settings, the MMPI-2 can provide important information regarding the patient's approach to the evaluation that has clear implications for compliance with recommendations for medical intervention and can influence the outcome of medical treatments for non malignant pain.

A standardized objective measure of psychological adjustment to medical illness

Once the validity of the MMPI-2 is established, the MMPI-2 profile is then examined to determine the presence or absence of scale elevations associated with psychopathology that would hinder recovery from a medical condition. Briefly, the eight MMPI-2 clinical scales that constitute the MMPI-2 profile are as follows: Scale 1 (Hypochondriasis); Scale 2, Depression; Scale 3 Hysteria; Scale 4 (Psychopathic Deviance); Scale 6, (Paranoia); Scale 7 (Psychasthnia); Scale 8 (Schizophrenia); and Scale 9 (Mania). Issues frequently addressed when a psychological evaluation is requested in medical settings often are related to how well the patient is coping with his or her medical condition and whether psychological or personality factors are influencing the medical presentation. Does the patient have a primary or secondary psychiatric condition that will affect his or her ability to cope with his or her medical condition and is the patient's report of pain and/or physical symptoms is accurate or does the report of physical pain and discomfort reflect a tendency to focus on somatic stimuli when under stress? The MMPI-2 can provide information that objectively allows the clinician to make judgments regarding these issues. With regard to the latter issue, a more detailed discussion is required.

Somatization vs accurate self report: The function of the MMPI-2 1 and 3 scales

Of the eight clinical scales from the MMPI-2, two scales, Hypochondriasis and Hysteria are comprised, in part, of items related to physical complaints and concerns as well as items related to general distress and unhappiness (Graham, 2000; Tellegen, Ben-Porath, McNulty, Arbisi, Graham, and Kaemer (2003). Consequently, it is not unusual to find elevations on these scales when patients are effectively grappling with a serious medical condition or procedure. Elevations on Scale 1 and 3 do not necessarily mean that the patient is somatically preoccupied or is converting emotional distress into physical complaints and pain. On the other hand, extreme elevations on these scales can increase the probability that a psychological or emotional component is influencing the presentation of the somatic complaints and pain (Larrabee, 1998). Elevations on scales

1 and 3 of at least one standard deviation above the mean ($T=60$) in medical settings are not uncommon and nearly one-third of chronic pain patients participating in multidisciplinary chronic pain treatment programs produce MMPI-2 profiles that are within normal limits (Graham, 2000; Keller and Butcher, 1991; Slesinger, Archer, and Duane, 2002). Therefore, some elevation on scales 1 and 3 in medical setting is to be expected, however as the relative elevation on the scales increase beyond what is normally seen for medical patients, the possibility that the patient is somatically focused or preoccupied increases as well.

In a large study of men and women who had taken the MMPI and subsequently underwent a diagnostic angiography an inverse relationship was found between the severity of coronary artery disease and the magnitude of the 13/31 profile on the MMPI (Barefoot, Beckham, Peterson, Haney, and Williams, 1992). Importantly this relationship was not mediated by anxiety since scale 7 and an independent measure of anxiety were unrelated to the severity of coronary artery disease. A factor derived from the MMPI associated with somatic preoccupation and not a general measure of neuroticism was most strongly related to the absence of coronary artery disease. These findings are particularly important since patients undergo angiography (a procedure which carries some risks) based on either a history of coronary events, specific lab findings, or the presentation of clinical symptoms consistent with coronary artery disease such as chest pain (Barefoot *et al.*, 1992). Consequently the independence of neuroticism or anxiety from the presence of coronary artery disease and the relationship between somatic preoccupation and negative angiographic results suggests that MMPI identified personality factors influenced the presentation of medical complaints and concerns in a clinical meaningful way. Indeed, the finding that the risk of coronary death after diagnosis with uncomplicated angina was negatively associated with the 13/31 profile on the MMPI provides support for a relationship between 13/31 profiles and amplification of the report of physical symptoms (Shekele, Vernon, and Ostfeld, 1991).

Assessment of psychopathology secondary to primary medical conditions

A major advantage to the use of the MMPI-2 in medical settings is the utility of the instrument in identification of co-morbid psychiatric conditions. Scales associated with general distress and maladjustment as well as scales associated with symptoms delineating specific conditions such as depression, anxiety, and psychosis are contained within the inventory. The presence of a co-morbid psychiatric condition can impede recovery and limit participation in rehabilitative services for the medically ill patient. In pain patients, depression as reflected by MMPI-2 scale score was associated with the report of pain at the beginning of treatment and a decrease in Scale 2 score after treatment in a pain program reflected a similar decrease in reported pain (Burchiel, Anderson, Wilson, Denison, Olson, and Shatin, 1995; Hasenbring, Marienfeld, Kuhlendahl, and Soyka, 1994; Kleinke and Spangler, 1988). This finding suggests that depression can often result from the pain experience itself and, untreated, can serve to limit recovery from an injury or medical condition (Gatchel *et al.*, 1995). Both anxiety and thought disorder will also impact a patient's ability to participate in rehabilitation or comply with treatment recommendations and the assessment of those conditions through use of the MMPI-2 is valuable in treatment planning with the medically ill patient.

A more insidious problem for the clinician working in the medical setting is undetected substance abuse or dependence. Pain is often under treated because physicians are appropriately reluctant to prescribe analgesics with a high potential for abuse to individuals who have chemical dependency histories for fear of precipitating a relapse (Rosenblum, Joseph, Fong, Kipnis, Cleland, and Portenoy, 2003; Schnoll and Weaver, 2003). On the other hand, unrecognized active chemical dependency can confound treatment in medical settings and limit recovery from medical conditions. The MMPI-2 scales related to substance abuse (MAC-R and the Addiction Acknowledgement Scale) can provide information related to acknowledged use of substances that can be critical in identifying medical patients who are currently chemically dependent and who are abusing non prescribed intoxicants (Rouse, Butcher, and Miller, 1999; Stein, Graham, Ben-Porath, and McNulty, 1999; Weed, Butcher, McKenna, and Ben-Porath, 1992). Further, specific MMPI-2 profiles are more likely to be associated with the potential to abuse drugs or alcohol than others (profiles accompanied by significant elevations on scale 4) (Butcher and Williams, 2000). Therefore, the use of pain medication in individuals who produce MMPI-2 profiles marked by elevations on scales associated with thrill seeking and impulsivity should be carefully monitored and these individuals provided with support and education to prevent misuse of needed analgesic medications.

Personality and the response to medical illness

Chronic pain

Needless to say acute, active psychiatric illness or chemical dependency clearly interferes with an individual's ability to cope with disease or medical condition. However, how do personality factors or enduring personality traits influence the medical patient's response to disease or the ability to benefit from medical interventions? As mentioned above the use of the MMPI in the identification of personality factors associated with treatment outcome among medical patients has a long history (Hanvik, 1951; Vendrig, Derksen, and De Mey, 2000). Over the years there have been mixed findings with respect to the utility of MMPI assessed personality factors in prediction of response to medical interventions. In support of the role of MMPI assessed personality dimensions, longitudinal studies have demonstrated that elevations on MMPI-2 scale 3 are associated with poorer outcomes in treatment of chronic low back pain. In one study a specific subset of the items on Scale 3 related to the report of lassitude and malaise (Hy3) was related to failure to return to work after participating in a chronic pain program in the Netherlands (Vendrig, 1999). In a large group of individuals treated for acute low back injury (within six weeks of the initial injury), elevation on scale 3 predicted continued disability and the failure to return to work a year after initiation of treatment (Gatchel *et al.*, 1995). The elevation on the MMPI 3 scale was felt to indicate that the injured patient had developed a passive acceptance of disability (Gatchel, Polatin, and Kinney, 1995). Based on the results of this study, it was concluded that psychosocial variables associated with elevations on scale 3 played a significant if not preeminent role in the development of disability due to low back injury.

In a ground breaking prospective study, the MMPI scale 3 was predictive of uninjured Boeing workers who subsequently went on to develop low back pain and go out on disability (Bigos *et al.*, 1991). Unfortunately, other studies have not confirmed this finding at least with respect to older individuals. In a 20 year prospective study of Danish men and women, elevations on MMPI scales 1 and 3 at the age of 50 were not associated with the development of low back pain at the age of 70 (Hansen, Biering-Sorensen, and Schroll, 1995). However, elevations on MMPI scales 1, 2, and 3 were present in individuals who had a history of low back pain at the time of initial assessment. This observation suggests that low back pain can precede the elevations on these scales. In another longitudinal study from Sweden, 80 patients who suffered from disabling low back pain were referred for an extensive medical and psychological evaluation. The relationship between MMPI scale elevation and subsequent disability pension status 6 to 12 years later was examined. The absolute number of MMPI scales elevated into the clinical range combined with elevations on scales 1 and 3 was associated with poorer functional levels as evidenced by increased disability 6 to 12 years later (Akerlind, HornQuist, and Bjurulf, 1992).

Overall, even considering the contradictory studies, the weight of the findings suggest that personality factors associated with the MMPI scale 3 such as somatic preoccupation and a naïve denial of emotional or interpersonal difficulties lends a vulnerability to the individual toward the development of a chronic pain condition and becoming disabled.

In general, the population of patients who report chronic non-malignant pain can be grouped into distinctive clusters based on their MMPI profiles. Using clustering procedures, the MMPI-2 profiles of patients with chronic low back pain form four groups: a depressed pathological group (multiple MMPI-2 clinical scale elevations), a neurotic triad with elevations on the 1, 2, and 3 scales, a conversion V group with elevations on scales 1 and 3; and a within normal limits (WNL) group where no MMPI-2 scales clinical scales are elevated above a T score of 65 (Keller and Butcher, 1991; Slesinger *et al.*, 2002). These findings have been replicated cross-nationally with the same MMPI profile clusters found in a large group of Australian chronic pain patients (Strassberg, Tilley, Bristone, and Oei, 1992). Further, there is strong evidence to support differential outcomes across these groups after treatment in chronic pain programs. In general, the WNL group shows the best outcomes and the "pathological" group, marked by multiple MMPI scale elevations, the poorest (McCreary, 1985; Naliboff, McCreary, McArthur, Cohen, and Gottlieb, 1988). At follow up after completion of a behaviorally oriented inpatient chronic pain program, individuals with multiple scale elevations reported higher levels of pain and higher degree of functional disability (Naliboff *et al.*, 1988). Elevations on MMPI scales associated with depression and general distress predicted level of self-reported disability independent of pain intensity ratings in chronic pain patients (Millard and Jones, 1991). With respect to outcome after surgical intervention, the WNL and neurotic triad group reported better outcomes including decreased pain, increased physical activity and a return to work (Riley, Robinson, Geisser, Wittmer, and Smith, 1995). However the relationship between MMPI profile and outcome may be complicated by the timing of the surgery. The impact of psychological factors on the

outcome of spinal surgery may be more important in the prediction of outcome in less well defined injuries or in surgeries that have been delayed. Severe emotional distress is not necessarily a poor prognostic factor if the disc herniation is well defined and surgery intervention occurs shortly after injury or diagnosis (Carragee, 2001). Consequently, the degree of emotional distress as reflected by the overall MMPI-2 profile is a poor prognostic indicator for successful completion of chronic pain programs and the presence of such a profile points to the need for more intensive psychological or psychiatric intervention.

Beyond the obvious impact of psychopathology or emotional distress on the medical patients response to intervention, what does the MMPI-2 assess that is relevant for the clinician regarding the pain experience? Although the MMPI-2 is associated with outcomes, it does not appear to be directly predictive of improvement in physical parameters after injury as much as improvement in the emotional response to the physical injury. That being said, emotional factors clearly impact recovery from injury (Carragee, 2001). Reported stress at the time of a work related injury predicted poorer outcome and lower self reported recovery even after controlling for the extent of the injury (Oleske, Andersson, Lavender, and Hahn, 2000). Consequently behavioral and emotional factors are important in predicting recovery. Importantly, the MMPI-2 assesses these factors in a manner that is specifically related to recovery from injury and development of a chronic pain condition. In a study conducted in the Netherlands of chronic pain patients undergoing a four week out-patient treatment program, the MMPI-2 scores on admission were found to be unrelated to physical measures of outcome, but did reflect the emotional response to the treatment program (Vendrig *et al.*, 2000; Vendrig, 1999). The MMPI-2 was unrelated to categorical variable associated with objective physical function or return to work, but emotional distress on the MMPI-2 was reflective of less improvement on self-report measures of improvement (Vendrig, 1999). More specifically, a personality trait measure of positive emotionality and extraversion was predictive of the emotional aspects of treatment outcome such as satisfaction with the treatment program and emotional improvement, but unrelated to perceived pain intensity (Vendrig *et al.*, 2000).

Psychosocial and personality factors associated with litigation in medical conditions can also play a role in outcome and return to work after injury. Post treatment reduction in MMPI scales 1 and 3 was less for patients treated for chronic low back pain with pending litigation (Trief and Stein, 1985). On the other hand, pain patients involved in workers compensation claims had higher pain scores and MMPI scale 3 elevations than those who were not involved in compensation seeking. However, patients involved in litigation demonstrated significant improvement in these measures on discharge from treatment. Nonetheless, patients who produced higher scores on scale 3 complained of higher levels of pain after completing treatment and were more likely to be seeking compensation for their injury (Kleinke and Spangler, 1988). In another study, involvement in litigation along with the patients age were negative predictors of return to work for participants in a rehabilitation program for chronic-low back pain. In contrast the MMPI was found to have no value in the prediction of outcome in that sample (Fredrickson, Trief, VanBeveren, Yuan, and Baum, 1988). Finally, psychosocial variables were found to influence improvement after participation in an inpatient cognitive behaviorally based

treatment program for chronic low back pain. Individuals who were involved in litigation produced higher elevations on scale 3 and produced less change in MMPI profile on follow-up (McArthur, Cohen, Gottlieb, Naliboff, and Schandler, 1987). Involvement in compensation seeking and litigation after work-related injuries clearly influences response to treatment and in some cases can be reflected by minimal change in MMPI scale scores associated with somatic preoccupation.

Appropriateness for medical intervention

Transplant

The MMPI and MMPI-2 have long been used to evaluate candidates' emotional and psychological suitability for organ transplant. The presence of significant emotional distress, emotional instability, certain personality traits, and ongoing substance dependence or abuse can influence quality of life, need for adjunctive treatments and medical compliance in patients awaiting organ transplants (Singer, Ruchinskas, Riley, Broschek, and Barth, 2001). Non-compliance is a major cause of late post-transplant mortality and morbidity. Non-compliance with post-operative medical care is predicted by lack of social support, maladaptive coping patterns, and postoperative psychiatric problems. Further, non compliance leads to more frequent postoperative hospitalizations and, consequently, increased medical costs (Stilley, Miller, Gayowski, and Marino, 1998). Thus, evaluation of distinctive personality traits and overall emotional distress in patients awaiting organ transplants in order that patients who are in need of specialized or more intensive psychological intervention are identified will, in the long run, improve success rates and quality of life for patients undergoing transplant.

Emotional distress and depression can be a significant problem for a subset of patients awaiting transplants. Ninety patients with end-stage obstructive lung disease who were referred for a psychological evaluation to determine suitability for lung transplant produced a mean MMPI-2 profile with elevations on scales 1 and 3 (Crews *et al.*, 2003; Ruchinskas *et al.*, 2000; Singer *et al.*, 2001). Interestingly 23% produced an elevation on the L scale ≥ 65 and 6.7% produced a L scale score ≥ 75 . Forty percent of the group reported significant depression as reflected by an elevation on the MMPI-2 2 scale ≥ 65 (Ruchinskas *et al.*, 2000). In a combined sample including the previous sample, 243 patients with end-stage pulmonary disease who received an MMPI-2 as part of a pre-transplant evaluation produced a mean elevation above $T=65$ on scales 1 and 3. Again, 22% produced elevations on the L scale >65 and 37% produced elevations on scale 2 $> T$ score of 65 (Singer *et al.*, 2001). The above studies illustrate the fact that although mean profiles of profoundly medically ill patients awaiting lung transplants reflect an understandable degree of somatic focus and concern with physical health, a significant subset are reporting serious depressed mood and a sense of demoralization that should become the focus of intervention to improve quality of life and coping capacity. Moreover, a significant percentage of those candidates awaiting a lung transplant produced defensive MMPI-2 profiles suggesting a tendency to put their best foot forward in an adaptive attempt to obtain a life extending medical procedure. Although nearly

8% produced profiles that reflected such a high degree of defensiveness as to preclude any MMPI-2 based inferences regarding the presence or absence of psychopathology.

In a controlled study of veterans awaiting liver transplants, 51 patients who had taken an MMPI-2 as part of a pre-transplant evaluation were compared with 26 veterans who had other medical conditions and had been referred for a psychological evaluation. The subjects awaiting liver transplants were less distressed and reported less psychopathology in general than the controls who were referred for psychological evaluations. Nonetheless, the transplant candidates produced elevations on the MMPI-2 scales that form the neurotic triad (scales 1, 2, and 3) (Stilley *et al.*, 1998). Finally men and women awaiting cardiac transplants appeared significantly more distressed on the MMPI-2 than did the patients detailed above who were awaiting lung or liver transplants. A large group of men (234) produced mean MMPI-2 scale elevations above 65 on scales 1, 3, 7, and 8. Based on the mean scales scores the well-defined code type for the group of men awaiting cardiac transplant was a 37/73 (Trunzo, Petrucci, Carter, and Donofrio, 1999). Women awaiting cardiac transplant produced elevations above a T-score of 65 on scale 1, 7, and 8 where the average score on scale 1 was significantly elevated above the scores on 7 and 8 (Trunzo *et al.*, 1999). These findings again point to the presence of clinically significant distress and demoralization in patients awaiting cardiac transplant that could very likely have an impact on recovery and compliance with post-transplant medical care.

Gastric bypass

With the increased incidence of morbid obesity in the United States, there has been an increase in surgical interventions to effect weight loss. Individuals who are seeking gastric bypass surgery demonstrate a high prevalence of psychopathology as reflected by the MMPI-2 (Glinski, Wetzler, and Goodman, 2001). The mean MMPI-2 profile of 1027 individuals evaluated for surgical intervention to treat morbid obesity was marked by elevations on scales 1, 3, and 2 (Maddi, Khoshaba, Persico, Bleecker, and VanArsdall, 1997). Of those individuals awaiting surgery, 13.2% produced L and K scale scores above 65. Forty-five percent of the sample produced elevations on scale 1, 40.6% on scale 3 and 32.5% on scale 2. Additionally, 23% produced elevations on scale 4, 21.5% produced elevations on scale 7 and 19.4% produced elevations on scale 8 (Maddi *et al.*, 1997). These findings indicate that a large percentage of morbidly obese patients presenting for evaluation prior to a surgical intervention are experiencing a significant level of distress marked by anxiety and depression. On the other hand, following surgical intervention, the level of psychopathology as assessed by the MMPI-2 appears to significantly decline indicating an improvement in emotional status (Maddi, Fox, Khoshaba, Harvey, Lu, and Persico, 2001). A group of 52 primarily female morbidly obese patients were administered an MMPI-2 prior to undergoing bariatric surgery and again within one year after surgery. Statistically significant declines occurred for six out of the eight MMPI-2 clinical scales (excluding Masculinity-Femininity and Social Introversion). More to the point, the percentage of patients with pre-surgery elevations on MMPI-2 scales 2 and 7 decreased from 17.3% to 9.6% and 21.2% to 1.9% respectively (Maddi *et al.*, 2001). Thus the MMPI-2 demonstrates a sensitivity to change in emotional status and distress after weight reduction surgery for treatment of morbid obesity.

Health related behaviors

Coronary artery disease and associated risk factors

In a return to the early promise of the MMPI in the prediction of disease proneness a renewed interest in personality factors that either directly or indirectly lend risk to the development of medical illness has developed over the last 15 years. With the creation of several large prospective data sets, questions relating to the causal link between personality traits and the development of medical disease are being examined (Barefoot *et al.*, 1989b; Kawachi *et al.*, 1998; Kubzansky, Sparrow, Vokonas, and Kawachi, 2001; Siegler, Zonderman, Barefoot, Williams, Costa, and McCrae, 1990). Coronary Artery Disease (CAD) has received the most attention and a number of personality factors and traits measured by the MMPI/MMPI-2 have been implicated in the development of CAD. These MMPI/MMPI-2 derived personality factors include, Hostility, Anger, Type A personality, Depression, Dominance, and Optimism/Pessimism and have all been shown to be related to longer term survival and the risk for the development of CAD (Barefoot, Dodge, Peterson, Dahlstrom, and Williams, 1989a; Barefoot *et al.*, 1989b; Kawachi *et al.*, 1998; Kawachi, Sparrow, Spiro, Vokonas, Pantel, and Weiss, 1996; Kubzansky *et al.*, 2001; Sesso, Kawachi, Vokonas, and Sparrow, 1998; Siegman, Kubzansky, Kawachi, Boyle, Vokonas, and Sparrow, 2000).

Hostility as assessed by the MMPI Cook-Medley Hostility Scale (Ho) and Type A behavior were first implicated the development of CAD back in the late 70's (Williams, Haney, Lee, Kong, Blumentahl, and Whalen, 1980). This observation led to active research directed toward confirming this relationship and explicating the mechanism linking the personality trait with the pathophysiology of CAD. The Ho Scale was initially developed to predict the relationship between classroom teachers and students (Cook and Medley, 1954). Individuals who received high scores on the Cook-Medley Hostility Scale experience higher levels of anger in interpersonal situations, are more likely to be overtly hostile and appear unfriendly, are suspicious, cynical, and untrusting (Graham, 2000). The scale appears to tap aspects of anger, cynicism, hostility, and neuroticism (Blumenthal, Barefoot, Burg, and Williams, 1987; Han, Weed, Calhoun, and Butcher, 1995). Hostility as measured by the MMPI-2 Cook-Medley Hostility Scale was prospectively associated with increased risk for coronary artery disease and overall mortality in groups of attorneys, physicians, older adults, and younger adults (Barefoot, Dahlstrom, and Williams, 1983; Barefoot *et al.*, 1989a).

Recently, attempts have been made to specify the causal mechanisms by which the Hostility leads to cardiovascular mortality. One approach is to identify whether individuals who are more prone to hostile expression have greater exposure to cardiovascular risk factors that thereby lead to increased mortality. In support of the exposure to independent risk factor hypothesis, high Hostility scores of individuals while in college or an increase in Hostility scores from college to midlife were found to predict the presence of health related risk factors such as social isolation, obesity, and a high fat diet (Siegler *et al.*, 2003). The relationship between CAD and hostility is apparently complex. Hostility scores were positively related to lower education, higher total caloric intake, Body Mass Index, the ratio of hip size to waist size, and higher serum triglycerides (Niaura

et al., 2000). However, Hostility did not have a direct effect on the physiological variables because the effect was mediated by Body Mass Index and the Waist to Hip ratio.

Interestingly, Hostility appears to have a direct effect on sustained elevation of blood pressure after exposure to stressful or anger evoking stimuli. Individuals who were categorized as high hostile or low hostile on the basis of their scores on the Ho Scale were exposed to an interpersonally challenging task where they were asked to solve an anagram while being interpersonally harassed. Participants who scored higher on Ho were more likely to produce sustained increases in blood pressure, heart rate, and cortisol response under the harassment condition than did the low Ho participants (Suarez, Kuhn, Schanberg, Williams, and Zimmermann, 1998). In a separate study, subjects who were high on Ho produced sustained increases in blood pressure after exposure to a film clip depicting racial discrimination when compared with subjects who scored low on Ho (Fang and Myers, 2001). Of note, the absolute increase in blood pressure experienced by the high and the low Ho groups was equivalent. However, the high Ho group maintained the increased blood pressure for a more sustained period than did the low Ho group (Fang and Myers, 2001). Consequently, hostility as assessed by the MMPI-2 may lead to increase in blood pressure under stressful conditions that ultimately results in cardiovascular pathology.

This relationship between hostility and the risk of developing cardiovascular disease is likely dynamic and involves an interaction between the personality trait of hostility and affective emotional states. Interleukin-6 plays a central role in the development or atherosclerotic cardiovascular disease (ASCVD) through the stimulation of processes contributing to plaque build up and has been shown to be a predictor of the onset and development of ASCVD in healthy individuals (Suarez, 2003). An interaction was observed between depression and hostility and plasma levels of interleukin-6 in healthy nonsmoking men. Men who were high on the Cook-Medley hostility scale and who scored above a 10 on the Beck Depression Inventory had higher plasma interleukin-6 levels than men with lower scores (Suarez, 2003).

Hostility related psychological factors tapped by the MMPI-2 scales Type A personality and Anger are also related to the risk for coronary artery disease (CAD) (Barefoot *et al.*, 1989b; Siegel *et al.*, 1990; Siegel *et al.*, 1989; Williams *et al.*, 1988). Indeed, the Cook-Medley Ho scale shares six items in common with the MMPI-2 content scale Type A personality indicating a degree of shared variance. The MMPI-2 Type A Content scale contains sets of items related to time urgency, anger, and competitiveness (Butcher, Graham, Williams, and Ben-Porath, 1990). Individuals high on TPA are described by their spouses as acting bossy, being critical and irritable, and becoming upset by unexpected events (Butcher *et al.*, 1990). The TPA scale contains two components: impatience and competitiveness (Ben-Porath and Sherwood, 1993). In comparison the Anger content scale (ANG) is more associated with direct expression of anger and loss of control associated with significant interpersonal maladjustment (Butcher *et al.*, 1990). Both MMPI-2 content scales ANG and TPA have been implicated in increasing the risk of developing CAD. TPA as assessed by the MMPI-2 was found to be associated with increased risk of coronary heart disease independent of anger,

cynicism, and hostility (Kawachi *et al.*, 1998). The MMPI-2 TPA scale, time urgency, competitiveness, and hostility taken together increased the risk for coronary heart disease (Kawachi *et al.*, 1998). Others have argued that Type A personality in and of itself does not directly increase the risk of atherosclerosis and coronary heart disease, but increases exposure to behaviors that serve as independent triggers for that process (Gallagher, Sweetnam, Yarnell, Elwood, and Stansfeld, 2003). However, a more recent study found that two components of Type A behavior, time urgency and hostility, assessed in young adulthood were directly associated with a dose response increase in long-term risk of the development of hypertension 15 years later (Yan *et al.*, 2003). This relationship was independent of other risk factors including age, gender, race, alcohol consumption, and level of physical activity. The mixed findings related to risk for hypertension and TPA behavior was felt to be related to the failure in other studies to clearly isolate and identify the components of Type A behavior, time urgency and hostility, that were most important in directly lending an increased risk for CAD (Yan *et al.*, 2003).

As mentioned above a component of Type A behavior and hostility is anger. The MMPI-2 Anger (ANG) content scale is defined by the expression of overt anger and hostility. Individuals who are high on ANG become angry easily, yell, and appear grouchy and irritable. They are described as moody and become annoyed easily (Butcher *et al.*, 1990). In a longitudinal study of 1,881 community dwelling male veterans elevations on the ANG content scale was associated with a two to threefold increase in the risk of coronary heart disease and angina pectoris on average 7 years after the administration of the MMPI-2 (Kawachi *et al.*, 1996). This relationship remained significant even after adjusting for risk factors such as cigarette smoking. Of note, the long term increased risk of coronary heart disease afforded by high ANG scores may be independent of the risk afforded by increased scores on MMPI-2 Hostility since these scales share only one item in common. In the same cohort, MMPI-2 items whose content was judged to include feelings of anger, hostile attitudes, aggressive behavior and dominance were identified. These items were then subjected to a factor analysis. A four-factor solution was obtained that included an anger and a dominance factor. The dominance factor was associated with assertiveness, argumentativeness, and seeking a leadership role. The MMPI-2 defined dominance factor emerged as an independent risk factor for CHD in men (Siegman *et al.*, 2000). Since the MMPI-2 dominance factor was found to be independent of anger driven aggression and more related to a deliberate and instrumental aggression, it would be of particular interest to look at the relationship between the MMPI-2 personality scale Psy-5 Aggression and risk for CHD since Psy-5 Agg is a more direct measure of instrumental aggression (Harkness, McNulty, Ben-Porath, and Graham, 2002; Siegman *et al.*, 2000).

The above studies, particularly the more recent prospective studies, provide compelling evidence for the role of personality in the development of coronary heart disease. These personality factors, including Type A behavior, anger, and hostility, are assessed on the MMPI-2. Given the interaction between personality traits such as anger and hostility with risk related behaviors (e.g., smoking, alcohol abuse) information related to an individual's pre-morbid personality risk factors can be used in developing early preventative interventions to modify behavior and/or learn more effective coping strategies to thereby decrease the chance of developing CHD.

Cross cultural/cross national use of MMPI-2 in medical settings

International adaptation of the MMPI and its successor MMPI-2 has a long tradition that began a few years after the test was first published in the 1940's. Early translations by Bernal del Riesgo in Cuba (Quevedo and Butcher, in press), Reda in Italy (Reda, 1948), and Abe in Japan (Abe, 1959) were among the translations of the test that gained a large following in the 1950's. Space limitations in this article does not permit a full discussion of MMPI adaptations in other languages and cultures since there has been a substantial accumulation of research on the different translations—there were over 150 translations of the original MMPI and there have been over 26 translations of the MMPI-2. Several recent publications have documented the work on the numerous test adaptations (Butcher, 1996; Butcher, Derksen, Sloore, and Sirigatti, 2003; Butcher, Cheung, and Lim, 2003; Butcher and Pancheri, 1976; Quevedo and Butcher, in press).

Research on personality factors associated with medical problems has been one of the most active areas of international MMPI-2 research. The original MMPI and MMPI-2 have been widely used in research on far ranging medical conditions or evaluating various treatment approaches such as transplant operations or treatment compliance. In this psychologically based medical research, there is typically a theoretical connection made between personality factors and symptoms experienced in medical conditions that are being evaluated. To illustrate the broad range of studies we cite the following examples of studies in several medical problem areas: Alzheimer's disease (Pruneti, Rota, and Rossi, 2000); Cancer (Cai, Qiao, Li, Jiao, and Lu, 2001; Kirkcaldy and Kobylinska, 1987); Colitis (Costa, Papa, Gentili, and de Maria, 1998); Cardiovascular disease (Delle Chiaie *et al.*, 1995; Hao, Zhang, Zhang, and Wang, 1999; Nordby, Ekeberg, Knardahl, and Os, 1995); Diabetes (Pasqualini, Albrigo, and Borri, 1999); Disability (Zhao *et al.*, 1993); Fibromyalgia (Ellertsen, Vaeroy, Endresen, and Forre, 1991; Landro, Isdal, Lillegard, and Winnem, 1992; Trygg, Lundberg, Rosenlund, Timpka, and Gerdle, 2002); Head trauma (Andreetto and De Bertolini, 1999; Cattelani, Gugliotta, Maravita, and Mazzucchi, 1996; Ellertsen, 1989; Gao, 1991; Solbakk, Reinvang, and Nielsen, 2000); Headache (Ellertsen, 1988; Fan, Gu, Zhou, 1995, 1999; Kirkcaldy, Kobylinska, and Furnham, 1993; Mongini, Defilippi, and Negro, 1997; Pisani, Colangeli, and Popolla, 1996; Vilming, Ellertsen, Troland, Schrader, and Monstad, 1997; Zwart, Ellertsen, and Bovim, 1996); Paralysis (Jia *et al.*, 1999); Hyperemesis (Huang, Zhenrong, and Guo, 2000); Ulcer (Jin and Wu, 1993; Levenstein, S. Prantera, Varvo, and Arca, 1996); Insomnia (Hong, Pan, Lin, and Li, 1997); Organ transplant (Andreetto and De Bertolini, 1999; Bressi *et al.*, 1995; Franzese and Gentili, 1999;).

One of the most active areas of international MMPI-2 medical problem research, and one that has a central place in the topic of this paper, has been in the area of personality factors in the assessment of chronic pain. Research on personality factors in chronic pain patient has shown that essentially the same patterns of chronic pain patients occur cross-culturally: Australia (Strassberg *et al.*, 1992); China (Wang, Wu, and Wu, 2000); Holland (Vendrig, 1999); Italy (Meldolesi, Picardi, Accivile, di Francia, and Biondi, 2000; Mongini, Ibertis, Barbalonga, and Raviola, 2000); Norway (Kvale,

Ellertsen, and Skouen, 2001; Monsen and Havik, 2001); Sweden (Sivik, 1991; Sivik, Gustafsson, and Olsson, 1992).

Another area of medical/health behavior research with the MMPI in international health care settings that has received broad attention has been research into eating disorders. Much of the research was conducted in Italy, however, this topic of research has been noted in Germany, Norway, and Japan as well (Gundersen, 1989; Morosin and Riva, 1997; Manara, Caruso, Caprioli, and Consolati, 1996; Molinari, Valtolina, Peri, and Pedrabissi, 1991; Molinari, Morosin, and Riva, 1995; Murotsu, Tachi, and Suzuki, 2000; Ragazzoni and Riva, 1996; Riva and Molinari, 1995, 1998; Rosenvinge and Moulund, 1990; Valtolina, 1996; Walitza, Schultze, and Warnke, 2001.)

The broad base of medical psychological research that is accumulating internationally at a steady pace indicates that the MMPI-2 item pool and scales are well suited for health behavior research in other cultures. The body of health behavior research across diverse cultures shows a clear commonality of personality variables for many similar clinical applications. However, most of the research to date has involved within rather than cross-cultural studies. Yet, having a widely used and comparable objective assessment instrument, such as the MMPI-2, available for use in many different cultures provides a great opportunity for cross-cultural comparisons in health behavior. It is hoped that, as health psychology grows internationally, more cross cultural collaborative research (for example, comparisons of similar populations and problems across cultures) can address health behavior and psychological factors in physical disorders in cultural context.

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