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DEVELOPMENT OF AN MMPI SUBSCALE
PREDICTING OUTCOME OF MULTIDISCIPLINARY
TREATMENT FOR CHRONIC LOW BACK PAIN

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GERALD DENNIS JUHR

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1980

DEVELOPMENT OF AN MMPI SUBSCALE PREDICTING OUTCOME OF MULTIDISCIPLINARY TREATMENT FOR CHRONIC LOW BACK PAIN

By

Gerald Dennis Juhr

A DISSERTATION

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ABSTRACT

DEVELOPMENT OF AN MMPI SUBSCALE
PREDICTING OUTCOME OF MULTIDISCIPLINARY TREATMENT
FOR CHRONIC LOW BACK PAIN

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The primary intent of this study was to explore the feasibility of developing a subscale of items from the Minnesota Multiphasic Personality Inventory for use in predicting outcome of treatment for chronic low back pain. Previous use of the MMPI in personality assessment of chronic low back pain patients repeatedly has confirmed the presence of psychoneurotic involvement among a majority of such patients and strongly indicated that higher levels of pre-treatment involvement are positively correlated with unsuccessful treatment outcome. Here the attempt was made to develop an MMPI subscale enabling more effective screening, diagnosis, and matching of these patients with treatment strategies and resources.

Subjects for the study were 185 former in-patients of a multidisciplinary back pain clinic, whose treatment had consisted of neurosurgical (facet injection and facet rhizotomy), psychological (EMG biofeedback and other muscular relaxation procedures), and physical therapy.

Subjects were assigned treatment outcome status based on their responses to a mailed questionnaire, the Pain Survey, which had been constructed and piloted expressly for this research.

Of these subjects, two-thirds were randomly selected to comprise a scale-development subsample, and the remaining one-third became the cross-validational subsample. The former subjects' MMPI records were analyzed by chi-square to determine which items best discriminated between successful and unsuccessful subjects. The 24 best items constituted a tentative Back Treatment Success Scale, whose ability to discriminate among members of the cross-validational subsample was then tested by comparing mean scale scores of successful and unsuccessful subjects with a one-way analysis of variance. This test proved statistically non-significant.

This result was at least partially attributable to the size of the scale-development subsample. Therefore, to provide as comprehensive a basis as possible for future research, the two subsamples were pooled and the chi-square test of item-discrimination was applied to the total sample population. This yielded a total of 45 items discriminating at the .05 and .10 levels; these were examined for standard MMPI-scale membership, categorized on the basis of content, and statistically factor analyzed.

The majority of the items belonged to just four of the standard MMPI scales, the Depression, Psychopathic Deviate, Schizophrenia, and F scales, though all scales were represented by at least two items. Item-categorization based on content permitted identification of the following factors related to unsuccessful outcome: (1) denial of social non-conformity, (2) self-deprecatory attitudes tending to guilt and paranoia, (3) health complaints and disease phobia, (4) impaired faculties of concentration, coordination, and awareness, (5) depressed affect and behavior, (6) repressed hostility and authority problems, (7) non-affirmation of fundamentalist religious beliefs, (8) attraction by members of same sex, and (9) excessive use of alcohol. Statistical factor-analysis of the 45 items led to identification of eight response-profiles that appeared similar to personality profiles frequently associated with chronic low back pain patients. Among these were hypochondriasis, reactive depression, somatization, manipulation for secondary gain, family conflict, and relative freedom from psychopathology (low rate of item-endorsement in unsuccessful direction).

These findings were not cross-validated on another sample. The coincidence of the content- and factor-analyses with previous research findings, however, suggests that the 45 items here selected and examined may provide a valid basis for the eventual development of such a sub-scale as was here intended.

To my forthright and loving parents,

Hans and Anita,

who have dedicated so much

to my growth and education

and

To my dear wife,

Janneke,

beneficent helpmeet

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Tibetan therapeutic lore maintains that there are three pre-requisites to any successful treatment -- the belief of the patient, the belief of the healer, and the right relationship between patient and healer. This dictum was at least in part substantiated by the research reported in the following pages. At this point, however, I wish to acknowledge the "right relationships" -- the favorable disposition and actions of many persons other than myself -- which proved vital to the successful treatment of this dissertation. I am truly grateful to them.

The conception and design of this research resulted from conversations with John Jerome, Ph.D., psychologist of the Ingham Low Back and Pain Clinic. He and James Bullock, M.D., the clinic's orthopedic surgeon, encouraged me to undertake this project and did much to make it possible. They solicited their patients' co-operation, and allowed me access to their records. I was made to feel welcome in their offices and given timely assistance by their clerical staff.

Many chronic pain patients whom I have never met responded to the survey. Some shared their continuing

pain; others shared their relief. Their willingness to communicate was indispensable, and is sincerely appreciated.

The guidance of Dr. James Engelkes greatly improved the quality of this undertaking and assured its successful completion. Likewise, Drs. Gregory Miller and Bob Winborn gave generously of their time to serve on my guidance committee and review my research.

My special thanks to Lee Burkhardt for her competent, efficient preparation of the manuscript.

Friends and colleagues at the University Centers for International Rehabilitation with their daily interest and assistance made this work more enjoyable and sustained my spirits. I shall especially remember the wit and patience of Jim Mullin, who taught me to speak without expletives to the computer, and the personal warmth and camaraderie of Madan Kundu, Denise Tate, Bill Frey, Ron Wolthuis, Paul Schneider, Bob Jarvis, and Owen Dailey.

I remain indebeted to Don Melcer, friend and mentor, who valued the differentness of the educational paths I have taken, and whose steadiness and example helped me negotiate the path through graduate school. During this time Don's wife, Eleanor, watched over my family's welfare and contributed often to our happiness.

Our growing friendship with David and Peggy Rolfe added a stimulating, much appreciated dimension to my

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Most of all I wish to acknowledge the devotion and understanding of my wife, Janneke, and our children, Niels and Fiona. We have come this far together, and I intend to share with you more completely, joyfully, the adventures still before us.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

THE PROBLEM

Americans spend more than 100 billion dollars per year on health care. Of this amount, nearly 13 billion dollars is spent by persons seeking relief from chronic low back pain (Fordyce, 1976a), while the national yearly cost of related compensation, lost wages, and lost potential tax revenue conservatively may be estimated at an additional 25 billion dollars (Leroux, 1979). It is evident that in the United States, the reported frequency of low back injuries is increasing decade by decade (Sternbach, Wolf, Murphy, and Akeson, 1973b). There is an evergrowing population of chronic low back pain patients who have failed to respond to medical, physical, and psychophysiological treatments for relief of pain (Bonica, 1976; Kraus, 1976; Melzack, 1973; Shealy, 1976), and disproportional payments for this one syndrome are seriously jeopardizing the functioning of employment compensation programs (Finneson, 1976).

Russek (1955) reported that in 1955 chronic low back pain sufferers accounted for 12.4% of all industrial injuries and 16% of all compensation payments in the State

of New York. Statistics from the State of Washington Department of Labor and Industries (McGill, 1968) revealed that back injuries constituted 5% of industrial claims, 12% of contested settlements, and 24% of days lost. In the State of California in 1970, 37.8% of all newly filed industrial claims were based on low back pain, and this percentage of back settlements had steadily increased from 29% in 1961 to 39.3% in 1969 (Osterloh, 1971, cited in Sternbach et al., 1973b). Comparatively, from 1971-1973 in the Commonwealth of Pennsylvania only 9% to 11% of industrial injuries were classified as low back injuries, but 30% to 40% of all compensation payments were for low back pain (Bureau of Vocational Rehabilitation, Commonwealth of Pennsylvania, cited in Finneson, 1976). More recent statistics cited in the Rehab Brief (University of Florida Rehabilitation Research Institute, 1978) showed that claims related to low back pain account for 85% of California's workmen's compensation medical budget. According to Department of Labor Statistics of the State of Michigan (Pinto, 1979), lower and upper back injuries comprised the largest single class (24.5%) of industrial injuries.

Such findings also point to the significance of chronic low back pain as a rehabilitation problem. Finneson (1976) reported that 281 low back pain patients receiving employment compensation and successfully treated

by nonsurgical means averaged 36 days of total disability per episode. White (1969) found that 4 years after surgical treatment, only 39.5% of low back pain patients had returned to work comparable to that performed prior to surgery.

Despite the frequency and persistence with which this syndrome has been presented to the medical profession, and despite its enormous consequences to the individual sufferer and to society, chronic low back pain "...remains a baffling, frustrating, and elusive problem to clinical practitioners" (Blumetti and Modesti, 1976). A recent important response to this problem has been the upsurge of interest in a multidisciplinary pain clinic approach to complex chronic pain problems (Bonica, 1976). These clinics combine in an inpatient setting several treatment modalities such as orthopedic surgery and neurosurgery, chemotherapy, relaxation therapy, individual and group counseling, withdrawal of analgesic medication, exercise, physical therapy, and regulation of diet (e.g., Sternbach, 1974; Shealy, 1976; Pheasant, 1972).

Increasingly, as part of this development, the discipline of psychology has been called upon to explain chronic low back pain as a psychophysiological condition with substantial psychological components. Treatment programs have incorporated such diverse approaches as operant conditioning (Fordyce, 1976b), psychoanalytic counseling

(Sarno, 1976), biofeedback and relaxation techniques (Shealy, 1977; Bullock, Jerome and Pool, 1975), life-situational counseling (Sternbach, 1974), and family-oriented treatment (Hudgens, 1979) in the attempt to ameliorate chronic pain. Reported success rates of 60 to 75% have confirmed the efficacy of these interventions. Nevertheless, even with intensive screening to eliminate the especially poor candidates, 25 to 40% of patients seen in these clinics failed to achieve significant relief from pain (Shealy, 1977; Sarno, 1976; Bullock, 1977). These "low back losers" as one clinical team (Sternbach et al., 1973b) has termed them, continued to seek treatment, but consistently failed to find relief from their pain; moreover, each subsequently unsuccessful treatment further complicated their problem (Shealy, 1976; White, 1966) and further reduced the odds for recovery (Wilfling, Klonoff, and Kokan, 1973). Clearly, there is a growing pool of chronic low back pain sufferers who have failed and who continue to fail to respond to the available resources of the healing profession. Further investigation of factors related to failure, and to success, appeared warranted.

Purpose

The purpose of this study was to investigate the psychological (personality) characteristics of those persons who succeed, and those who fail, in multidisciplinary

inpatient treatment for chronic low back pain. Patients' pre-treatment responses to The Minnesota Multiphasic Personality Inventory (hereafter: MMPI) were statistically analyzed to determine which items significantly differentiated between patients with successful and those with unsuccessful outcomes. These significantly differentiating items comprised a Back Treatment Success Scale, a subscale of MMPI items designed to predict success or failure in treatment for chronic low back pain. Additionally, the items selected were examined on the basis of content to facilitate identification and discussion of factors related to success or failure in treatment.

Importance of the Research

The past four decades have witnessed a growing awareness by health care professionals that the onset of, reaction to, and outcome of treatment for chronic low back pain are in many cases highly dependent upon psychological factors (e.g. Fetterman, 1937; Sargent, 1946; Sullivan, 1955; Yochelson, 1966). The need for an empirically developed psychological test predictive of individual outcome of treatment for this syndrome has been recently discussed (Waring, Weisz, and Bailey, 1976). These authors reviewed and attempted to validate extant treatment studies in which outcomes were correlated with patients' psychological characteristics, and stated that results were inconclusive and of doubtful clinical validity. Indeed, few

such studies have been published. One major study in this review (Wiltse and Rocchio, 1975) and one not included (Lippincott, 1976) were unfortunately conducted on a sample of patients whose low back pain had been treated by chemonucleolysis, a chemo-surgical procedure later proven ineffective except as a placebo (Martins et al., 1978). The purpose of Lippincott's (1976) study, the development of an MMPI subscale predictive of treatment outcome, was synonymous with that of the present research. The fact that the treatment enjoyed by her sample later proved to be a placebo, is definitely of interest, and her study is worthy of reinterpretation in light of this finding. Nevertheless, an important need remained to be met through the development of such a scale based on treatments of proven effectiveness. The medical and psychological treatments administered to patients in this study (EMG biofeedback with or without facet rhizotomy) are of proven effectiveness (Shealy, 1977; Bullock, Jerome, and Pool, 1975; Bullock, 1977; Jerome, 1978).

Several potential clinical applications of such a scale have been suggested. First, multidisciplinary teams could utilize such an assessment tool in their evaluation of patients for treatment. McGill (1968, p. 176) has stated that improper evaluation of the "subjective complaints of compensation patients with low back pain creates great adverse psychological effect on the already anxious,

apprehensive patient, with the result being prolonged absenteeism." Hoover (1968) of the Mayo Clinic has stated that psychiatric illness may prevent a patient from obtaining the intended relief from surgery.

> "Evaluation of the contribution of emotional instability to the patient's pain is by far the most difficult problem and the source of greatest error in making a decision to fusion." (p. 192)

White (1966) has maintained and Wilfling et al. (1973) systematically have demonstrated that each successive unsuccessful surgery reduces the probability that a patient will ultimately experience relief from chronic low back pain. This correlation may be due to somatic complications (irritating scar tissue, post-operative pain) as mentioned by Shealy (1976), or to the psychological consequences of failure (learned helplessness, somatic preoccupation) as suggested by Sternbach (1974), or to a learned life-style (White, 1966), or simply to the intractability of the physical condition, a suggestion which no one has made except in certain categories of clearly identifiable organic pathology (e.g. infection, neoplasm, rheumatoid diseases); the fact remains that practical identification of crucial psychological factors would assist a pain specialist in the decision to recommend surgery or not.

Second, the identification of psychological factors associated with treatment failure may lead to the

recommendation that a patient undergo intensive counseling prior to re-application for surgical procedures (Sternbach, 1974). Either the counseling component of the regular treatment program may be expanded to accommodate certain individuals, or extramural referrals can be made. Such a procedure emphasizes the best matching of patient with treatment and facilitates the optimum use of available rehabilitation resources.

Third, the collection of psychological data may provide an opportunity for realistic discussion with the patient of factors which could impede efforts to seek relief from pain (Sternbach, 1974). Many chronic pain patients have little or no conception of psychosomatic dysfunctions and easily assume that any mention of emotional factors is an attempt to convince them that their pain is "imaginary," "all in their heads," or "just nerves." Reference to patients' scores on an objectively scored, normed personality inventory may provide a bridge to the discussion of cognitive, emotional, and motivational factors affecting the experience of pain. When this occurs, patients can begin to accept responsibility for their role in the maintenance or eradication of pain, an aspect of treatment deemed highly important under the holistic or "whole person" approach to treatment espoused by numerous pain clinics (Shealy, 1976; Jerome, 1978).

Fourth, an expeditious evaluation may enhance the likelihood that patients will return to productive activity before becoming massively conditioned to pain. Lamaze (1970) has described the work of Pchonick and of Rogov, who in separate experiments were able to condition subjects to experience a neutral stimulus as painful, and a painful stimulus as pleasant. In sufferers of chronic pain, such conditioning eventually contributes not only to the pervasiveness of the experience of pain, but also to the increasing attempts to withdraw from activities associated with pain (Fordyce, 1976b). Effective reinforcement in such cases is forthcoming from secondary gains either in the form of compensation payments (Finneson, 1976) or in the form of sympathy or other considerations shown a "sick" person (Foster, 1964). A quickly administered test allowing timely diagnosis to interrupt or prevent the adoption of such a lifestyle may be considered a worthwhile contribution to the fields of pain treatment and research.

The challenge and the importance of devising such an instrument has been well summarized by Thomas and Lyttle (1976). These authors have noted that

> "...certain patient personality profiles on the MMPI appear closely associated with chronic complaints of low back pain [and that] predictions made from psychological data were more accurate than predictions based solely on the physical conditions of the patients...[O]ne would expect psychological assessment to be well integrated into the diagnostic procedures of medical therapy programs that involve

> patients with complaints of low back pain. However, psychological evaluation is not a routine part of diagnostic procedures, probably because there is no single reliable and easily identifiable psychological variable that predicts prognosis with as much accuracy as the clinical judgement of a psychologist based on multiple psychological tests and an interview. The problem then is the fact that many orthopedists in general practice do not have easy access to a psychologist's evaluation of their patients." (p. 125)

The attempt was made in this study to develop a diagnostic scale based on reliable psychological variables. Whether or not this attempt was entirely successful, the empirical derivation of factors related to treatment outcome may be viewed as a worthwhile contribution toward the development of such a diagnostic tool.

Definition of Terms

Chronic low back pain - Operationally is pain described by the patient as moderate to severe, that has been persistent for six months or longer, and has failed to respond to medical, physical or psychological treatment (Jerome, 1978). Nosologically is pain situated in the lumbosacral region at the level of the third, fourth and fifth lumbar vertebrae and the sacrum, which is not the result of fractures, neoplasms, infective lesions, congenital anomalies, or diseases referred from other organic systems (Thomas and Lyttle, 1976).

Facet Rhizotomy - Is a technique which involves thermocautery to produce denervation at the facet joint. Facet denervation attempts to block neural transmission at the origin of the pain.

Psychological variables - Refers to cognitive, affective/evaluative, and motivational factors residing within the individual that can be perceived, objectively described, and measured, the organization of which modulates the individual's experience of pain and differentiates him/her from other persons.

Summary and Overview

This study has been designed to explore the relationship between relief from chronic pain and individual psychological variables. Clinical research and practice suggest that such variables play an important role in modulating the human experience of pain and in affecting the outcome of treatment for relief of chronic pain. A more thorough understanding of this relationship is warranted. The procedures followed in this study have been intended not only to lead to an identification of such critical modulating variables, but also to result in the development of an MMPI subscale capable of practical application in the prediction of treatment outcomes for chronic low back pain.

This chapter has presented evidence of the potential viability and practical utility of such a study. Chapter II reviews current theory ascribing a decisive role to psychological variables in the human experience of pain. Findings resulting from the previous use of personality inventories with chronic low back pain patients are reviewed, with primary attention to those studies incorporating the MMPI, the inventory used in the present study. The majority of such studies have demonstrated the validity and reliability of the MMPI as an indicator of psychophysiological involvement and treatment prognosis of patients having chronic low back pain.

The sample population, research procedures and design of this study are the topic of Chapter III, the statistical results of the research the topic of Chapter IV. These results are then discussed in Chapter V, with particular attention to their implications for treatment and future research.

CHAPTER II

REVIEW OF LITERATURE

That psychological variables play a significant role in the origin and longevity of the syndrome known as chronic low back pain has been reported with increasing frequency in the literature of the past four decades. The particular action and interaction of these variables has been the subject of considerable recent research. A more complete understanding of these processes and the application of this knowledge to clinical practice is the subject of the present study.

To better understand the role of psychological factors in the human experience of pain, it is necessary to review the various theories of what pain really is. The review leads to the Melzack and Wall (1965) formulation of the Gate Control Theory of Pain, which described a physiological basis for the role of psychological (cognitive, affective, and motivational) variables in the pain process.

The first section of this chapter therefore recapitulates the Melzack and Wall conceptualization as a basis for understanding pain as a multidimensional experience, involving both physical and psychological domains.

The second section summarizes the research relating chronic pain in general and chronic low back pain specifically to individual personality factors. The final section reviews previous studies which have utilized standardized personality inventories to investigate the interaction between personality variables and the outcome of treatment for chronic low back pain.

The Human Experience of Pain

The common view of pain is that it is a biologically useful sensation informing the organism of potential or actual damage or harm. The neural links between an organism's sensory capacity and its motor capacity enable the transmission of pain signals to activate the organism to respond, either by defensively removing itself from the noxious stimulus or by aggressively dealing with its source.

Pain has traditionally been conceptualized by scientific investigators as an objective stimulus related to noxious levels of warmth, pressure, etc., which is transmitted by neural pathways to the subjective potential (brain) of the organism. In fact, the traditional approach of science has sought to explain all human perception in terms of direct linear causality and to investigate it by the increasingly refined dissection of the neurological systems responsible for the transmission of sensation from sensing organ to perceiving brain (Steiner, 1962). Man

has thus been considered a passive recipient of impressions from an objective world external to him. Within such a framework, pain has been viewed as a strictly physiological sensory experience.

Typical of such conceptualizations of pain were the specificity theories, which defined pain as a primary sensation with special peripheral receptors, neuronal transmitters, and receivers in the central nervous system. The pathway from periphery to center was seen as an uninterrupted transmission system, with the intensity of perceived pain in direct proportion to the intensity of the stimulus applied. The relevant peripheral receptors were believed to be specialized for the sensation of pain and distinct from other main groups of sensory receptors, for instance those for mechanical or thermal stimuli.

The specificity theories cannot account for the vast individual differences in subjective perception of a constant noxious stimulus. The subjective report of pain is a notoriously unreliable measure of objective stimulation (Sternbach, 1974). Even though these theories have proved to be of heuristic value in research on the mechanics of pain transmission, the deficiencies of the theories are serious. Melzack and Wall (1965) have placed specificity theory in the following perspective:

> Physiological specialization is a fact that can be recognized without acceptance of the psychologic assumption that pain is determined entirely by impulses in a straight-

> through transmission system from the skin to a pain center in the brain. (p. 972)

Pattern theories arose in response to the deficiencies of specificity theory. These theories stated that information generated by peripheral receptors is coded in the form of patterns of nerve impulses. The peripheral receptors are sensitive to pain, a separate system of neuronal fibers transmits the information to the brain, and the brain interprets the patterns of impulses as pain (Head, 1920; Lewis, 1942; Noordenboos, 1959). Essentially, pattern theories attempted to account for the complexity of the pain experience by referring to the encoding and decoding of neural impulses. Despite the complexity of the theory, man in this model remained a passive recipient of the pain sensation. With both the pattern and the specificity theories, the psychology of experience was reduced to the physiology of stimulation and transmission.

Medical practice has long been based on these models. Treatment has attempted to relieve pain by eradicating the "painful" stimulus, either by treating directly the injured or diseased organ, or by blocking the transmission of sensation by means of analgesic medication. An example of the compelling power of such models in the interpretation of basic data has occurred in conjunction with the practice of administering morphine to persons suffering from severe pain. For decades it was assumed that morphine acted directly upon the neural capacity by inhibiting the

transmission of painful stimuli. Not until the late 1950's did Beecher (1959) conclusively demonstrate that morphine inhibited the subjective reaction related to anxiety about pain, and not the function of neural transmission.

This and other research contributed to the growing recognition that, psychologically, man is not a passive but an active participant in the experience of pain. Anticipation of pain, anxiety and attention (Hill, 1952), cultural background (Chapman, Finesinger, Jones, and Cobb, 1947), early experience (Melzack, 1973) and prior conditioning (Pavlov, 1927) were all shown to have a profound effect on both pain experience and response. From a strictly phenomenological viewpoint, it would seem obvious that human beings play an active role in responding to pain. Common responses include the cognitive effort to identify the noxious stimulus, emotional reactions such as anguish or indifference, and the motivational response of fight or flight. On the other hand, basic evidence exists that man plays an active role not only in the response to pain but also in the perception of pain. Much of this evidence was incorporated by Melzack and Wall (1965) in their formulation of the Gate Control Theory of Pain.

The Gate Control Theory of Pain proposed by Melzack and Wall (1965) provided a basis for considering the active role played by cognitive, affective, and motivational factors in the actual <u>perception</u> of pain. In so doing, it

made an important distinction between the perception of pain and the sensation of pain, by insisting that all perception is an active response to sensation. Sensation is an available "given," while the act of perception is interpretive, creative.

The perception of pain, according to Melzack and Wall (1965), has three active dimensions, each of which is associated with a particular neural organization or system: Sensory-discriminative activity enables a person to locate the painful stimulus in time and space. The motivational-affective system relates to the responsiveness to noxious stimulation and to emotional input such as fear and anxiety. The cognitive-evaluative system has the capacity to act very rapidly in identifying, evaluating, and selectively modifying the sensory input; through this system past experience, disposition, and attention all exert their influence in evaluating the input as threatening or not. This analysis of input rapidly interacts with the motivational-affective and sensory-discriminative functions to compare the stimulus with other input and with memory, and to bring into action response strategies. As a result, the cognitive-evaluative system has the capacity directly to modulate sensory input before it is transmitted to the sensory-discriminative and the motivational-affective systems. The temporal priority of this system is an important aspect of the Gate Control Theory, as it

implies that cognitive activity can intercept and either minimize or exaggerate sensory input before a person has an opportunity to make an affective/motivational response to the input as "painful."

The probability that "higher central nervous system activity" plays a critical role in the perceived intensity, duration, and significance of pain, a position now firmly supported by experimental evidence (Wall, 1976), may justifiably be said to have been anticipated by the phenomenological movement in twentieth-century philosophy. The phenomenologists have insisted that all human perception is determined by each individual's total disposition toward the object of perception. This disposition involves a set of cognitive, affective and conative functions subsumed in the concept of "intentionality" (Husserl, 1962), which may be characterized as an active orientation toward sensory experience. All perception is an act of not only focusing and identifying but also interpreting the nature of the world in individually relevant terms which reveal personal intent toward the objects of perception.

Stated most simply, perception is an act of problem-solving (Gregory, 1970, cited in Brady, 1976) of active attempts to cope with life and find it meaningful. This concept of perception as active coping has been given expression in psychological terms by Sternbach (1968):

> By "perceptual" is not meant a passive reception of stimuli, if indeed that ever occurs, but an active process of searching, discriminating, and distorting that reflects an adaptive, need-satisfying, motivated perception. By "coping" is meant the comparable process in overt behavior. We hyphenate perceptual-coping styles to point up the obvious interaction: coping is in part a function of perception, which in turn is a function of the same motives which underlie overt behavior. (p. 157)

This conceptualization of perceptual-coping as an act of problem-solving adds vital dimensions to the study and treatment of human pain. Pain-as-an-answer-to-a-problem-in-living becomes as important a concept as pain-as-response-to-a-noxious-stimulus.* What a patient says or does about his pain may no longer be viewed as mere subjective reactions to an objectively quantifiable pain stimulus, but must be appreciated as an integral feature of the pain itself (Fordyce, 1976b) so that stimulus, perception, and response are viewed as interrelated aspects of the entity-in-pain to be treated. As Merskey has noted:

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*To view pain as a consciously contrived attempt to solve problems in living is to assume far too simplistic a perspective. Merskey (1976) has also noted that the interaction between psyche and soma must lie beyond conscious control. It is actually rather difficult to imagine a pain, or even to recollect vividly the experience of severe pain.

> If patients have pain for psychological reasons, and many do, this must usually occur because of the operation of mental mechanisms that produce it independently of the patient's conscious wishes. (p. 711)

> It is easier to honor the patient's experience if we keep in mind that whatever the physical basis for pain it can be known to an individual only through his consciousness. Thus pain is always and only a psychological experience. (p. 712)

Personality Inventories and Sufferers of Chronic Low Back Pain

The measurement of personality characteristics associated with low back pain has most often been undertaken with the MMPI. MMPI profiles have been compared to discriminate between patients with physical findings (organic) versus without physical findings (functional), between sufferers of acute versus chronic low back pain, between back pain patients versus other orthopedic patients, between those receiving and those not receiving employment compensation, and between patients successful in treatment and those unsuccessful.

Investigating clinical findings that many cases of chronic low back pain could not be related to physical deficits, Hanvik (1951) attempted to differentiate the MMPI profiles of back patients designated functional (no physical findings) versus organic (positive physical findings). His sample consisted of two groups of thirty veterans equated for age, socioeconomic class, marital status, and intelligence. The functional group's composite profile demonstrated a higher "neurotic triad," i.e., the Hypochrondriasis, Depression, and Hysteria scales of the

MMPI. Additionally, the Depression scale was significantly lower than the two adjacent scales, thus yielding a V-shaped profile known as the psychosomatic-V or "conversion-V," so called to indicate that patients with this profile are likely to repress or deny their emotions (high hysteria, low depression) and instead focus on somatic concerns (hypochondriasis). These functional patients have been described (Lachar, 1974) as having a strong need to interpret their circumstances in a logically and socially acceptable manner, and as resisting suggestions of any weakness or unconventionality in their character. In general they are described as egocentric, immature, and dependent. Their complaints of pain appear to allow them to avoid awareness of anxiety and conflict, albeit at considerable cost in emotional control and repression.

The organic group's composite profile, by contrast, had non-significantly elevated and approximately equal standard scores (i.e., no conversion-V) on the scales of the neurotic triad, and the profile in its entirety was essentially normal. The functional group, in addition to the conversion-V, also recorded significant elevations on the Psychopathic Deviate, Psychasthenia, and Schizophrenia scales, further indicating the presence of psychological factors involved in these patient's experience of pain.

Apparently Hanvik's (1951) results, suggesting conversion hysteria as an etiological factor in functional

low back pain, were of sufficient face validity as to generate little controversy. It was not until 1964 that another MMPI study of low back pain was reported, this time comparing 58 low back pain patients with a group of 72 patients with limb fractures (Phillips, 1964). As the low back patients in this study were not given functional/ organic diagnoses, it may be assumed that they represented a mixed group in this respect. The profile of this mixed group of back patients had a significantly elevated neurotic triad, both above the mean and above the group with fractures; however, there was no evidence of a conversion-V. Such a profile indicates neurotic involvement with an existing physical condition, rather than a conversion of emotional conflict into physical symptoms although, from the perspective of Hanvik's (1951) earlier findings, it may be argued that this non-V composite profile was a direct result of Phillip's failure to discriminate between functional and organic conditions among his subjects. An additional noteworthy finding of Phillip's (1964) study was that the amount of neuroticism, as measured by the MMPI, was negatively correlated both with prompt completion of a rehabilitation program and with symptomatic improvement in the medical condition, indicating that affective and motivational variables may play a decisive role not only in task achievement but also in the chronicity of pain.

Further research utilizing the functional/organic dichotomy was undertaken by Haven and Cole (1972). Composite MMPI profiles revealed no significant differences among organic, functional, and malingering male veterans (N = 44) with chronic low back pain.

Gentry, Shows, and Thomas (1974) studied 56 male and female patients whose chronic low back pain had persisted despite at least one surgical intervention. Both males and females had significant elevations on the neurotic triad, with the males scoring slightly higher. This between-sex difference is consistent with the report of Sternbach et al. (1973a).

Beals and Hickman (1972) studied 180 industrially injured patients treated in a physical rehabilitation center, and found that the group of back-injured patients evidenced an elevated neurotic triad on the MMPI, with acute patients tending to peak on the Depression scale and chronic patients tending toward a conversion-V. The chronic patients also had elevations on the Psychasthenia and Schizophrenia scales. In general Beals and Hickman found greater psychopathology in back-injured patients than in extremity-injured patients and in chronic, multiply-operated than in acute patients. In addition, patients with higher elevations on the Hypochondriasis and Hysteria scales were less likely to return to work. In this study the chronic patients most closely resembled Hanvik's (1951) functional

group, indicating that chronicity of pain may have been a confounding variable in Hanvik's study.

Recent studies by Sternbach and associates (1973a,b) have contradicted Hanvik's findings of MMPI differences between functional and organic patients. In a sample of 68 patients, 44 of whom had physical findings and 24 of whom did not, no significant group differences were found (Sternbach et al., 1973b). The same researchers (1973a) reviewed the MMPI profiles of another sample of pain clinic patients, 81 with positive findings and 36 without. Again, no significant differences were found. In both studies the composite profile for all patients revealed neurotic triad elevations that were two standard deviations above normal, or higher than would be obtained by 96% of the normal population. There was no evidence of a conversion-V. The authors therefore discounted the diagnosis of conversion hysteria and gave preference to the diagnosis "psychophysiological reaction with depression." They concluded that the organic/functional dichotomy is of questionable value in the evaluation and treatment of patients with chronic low back pain, and pointed out that once a patient's pain has passed from the acute to the chronic stage, and thus begun to dominate the patient's emotional and social life, chances are slight that the patient will get well, benefit from surgery, or successfully adapt to permanent disability, without appropriate

intervention. Successful intervention depends heavily on treating the depression and helping the patient to meet "those needs which, unmet, have resulted in excessive somatic concern and bodily pre-occupation" (1973b, p. 229).

This concept of an adopted life-style based on pain has been supported by research (Sternbach et al., 1973b) into the differences between acute and chronic low back patients. Pain of more than six months' duration was defined as chronic, of less than six months, as acute. Acute patients had neurotic triad elevations one standard deviation above normal, chronic patients had neurotic triad elevations two standard deviations above normal. Additionally, acute patients had slightly higher elevations on the Paranoia and Hypomania scales, indicating a greater sense of urgency and apprehension about their pain. In the transition from the acute to the chronic state, this anxiety evidently tends to be replaced by depression.

Finally, in attempting to identify differences between low back patients with compensation action pending (n = 36) and those with such action settled or never initiated (n = 81), Sternbach et al. (1973b) discovered that both groups had significant elevations on the neurotic triad, with the litigants significantly higher than the non-litigants. Also, the former group scored significantly higher (T-score = 70 vs. T-score = 61) on the Psychopathic Deviate scale, which typically reflects anger, rebelliousness,

and resentment against authority figures. The authors suggested that this profile of "compensation neurosis" was inauspicious for improvement in condition, at least until the litigation was settled.

While the majority of evidence supported Sternbach and his co-workers in their suggestion that all chronic low back pain patients had significant neurotic involvement, their findings that the MMPI did not significantly differentiate between functional and organic patients, as earlier indicated by Hanvik (1951), has in turn been contradicted by two more recent studies. Clinicians at the Seattle Veterans' Administration Hospital (Freeman, Calsyn, and Louks, 1976) classified 36 patients as either organic, functional, or "mixed" on the basis of physical findings, the "mixed" group comprising those patients who had some organic basis for their pain, but insufficient to explain the full degree of their reported pain. The patients were matched for age and educational level, 12 to a group. Each patient was administered the MMPI as part of a routine evaluation at admission. All three groups obtained composite profiles with significant elevation on the neurotic triad, but the organic group scored significantly lower on all three of the scales, and the functional group slightly higher than the mixed. The functional and mixed groups showed clear psychosomatic-V patterns, the organic group had none. Consistently, the Psychasthenia and

Schizophrenia scales were significantly elevated, but only for the mixed and functional groups. These results were clearly supportive of Hanvik's (1951) findings that the MMPI did in fact differentiate between low back patients with and without positive physical findings. However, these results also supported the conclusions of Sternbach et al. (1973b) that even patients with a clear organic basis for their reported pain were significantly neurotically reactive to their pain. Hanvik had found minimal or no neuroticism among organic patients in his sample.

In a further study the Seattle authors (Calsyn, Louks, and Freeman, 1976) contrasted the MMPI profiles of 31 organic with 31 mixed patients. Virtually identical comparisons prevailed between these groups as on the previous study. Again the conversion-V was present for the mixed but not for the organic group, with the organic group nevertheless evidencing a neurotic profile. Here, as before, the mixed group scored significantly higher on the Psychasthenia scale. Unlike the previous organic group the patients here classified as organic obtained a significant elevation on the Schizophrenia scale, as did the mixed group.

It is important to ask why some research has determined that the elevation and configuration of the MMPI neurotic triad does differentiate functional from organic pain patients, while other research has not found this

result. Two possibilities should be considered. Swartz and Krupp (1971) have found that older medical patients tend to have elevations on the Hypochondriasis and Hysteria scales, and that these scales are therefore less useful in making a functional vs. organic diagnosis among older patients. The research of Sternbach et al. (1973b) concerned patients in their early forties while Hanvik (1951) did not report the ages of his patients. One might suspect that Sternbach's patients were older, based on the fact that Hanvik's sample consisted exclusively of veterans likely to have served in World War II, his research having been conducted shortly after the war (1949-1950). The average age of his subjects was likely to have been closer to 30 than to 40 years. The second reason for the contradictory evidence is likely to involve the criterion for evidence of positive physical findings. Hanvik's criterion - protruded intervertebral disc - was especially stringent, and was confirmed both by X-ray and upon removal of the disc at time of surgery. Sternbach's criterion included such manifest behavior as impairment in gait, reflexes, and range of movement, findings which some investigators would consider to be of potentially psychogenic etiology, and not necessarily indicative of disc pathology.

In summary, the majority of MMPI studies of chronic low back pain patients have provided evidence that such patients are neurotic. Elevations on the Hypochondriasis,

Depression, and Hysteria scales consistently are found in group profiles. These elevations tend to be greater among patients who have minimal or no detectable organic basis for their pain, indicating the possibility of psychosomatic pathology. They are also likely to have an elevated score on the Psychasthenia and Paranoia scales, and occasionally on the Schizophrenia scale. It has been suggested by Sternbach et al. (1973b) that regardless of the extent of physical findings, chronic low back pain patients are likely to be neurotically involved with their pain, and that treatment of the neurosis is important for any recovery from or adjustment to back-related disability.

Treatment Studies

A smaller body of research has attempted to identify personality factors associated with outcome of treatment for chronic low back pain. In an analysis of the relationship between demographic, medical, and psychological factors and successful outcome in a rehabilitation program for patients with low back disabilities, Nagi, Burk, and Potter (1965) studied the case records of 125 admissions to the Ohio Rehabilitation Center. The outcome criteria consisted of achieved improvement in activities of work and daily living, as compared with the expectations of the clinical team. Psychological factors were measured by psychiatric ratings and unspecified psychological testing.

These researchers found that emotional and personal problems were more prevalent among non-achievers, and concluded that emotional and motivational factors must be assessed and addressed in physical rehabilitation programs.

Wilfling, Klonoff, and Kokan (1973) administered the MMPI to 26 male veterans who were to have spinal fusion for low back pain relief. Post-operatively (no indication is given of elapsed time), a success/failure rating of good, fair, or poor was assigned to each patient on the basis of a combined score for employment status, presence of pain, range of movement, the patient's rating of the value of surgery, and the physician's rating of the degree of disability. The three outcome groups were successfully differentiated by the MMPI: The poor and fair groups both had high elevations on Hypochondriasis, and both were significantly higher than the good group. Both the poor and fair groups scored high on the Depression scale, with the poor group nearly three, the fair group nearly two, and the good group less than one standard deviation(s) above normal. On the Hysteria scale, both fair and poor groups showed significant elevations. Additionally, the poor and fair groups scored significantly lower than the good group on the Ego Strength scale.

MMPI comparisons were also reported for a grouping based on number of previous surgeries. The multiply - operated group showed significant elevations on all three

scales of the neurotic triad, with Hysteria and Hypochondriasis scores significantly higher than the singly operated group. Also, no previously multiply-operated patient achieved a good outcome.

These results were partially supported by another treatment outcome study conducted by Wolkind and Forrest (1972). The Middlesex Hospital Questionnaire, a self-rating measure of neurotic behavior and symptoms, was administered to 50 male patients prior to treatment for low back pain. After six sessions patients evaluated their own outcomes by means of another self-rating questionnaire. The good versus poor outcome groups showed significant differences on the depression, somatic concomitants of anxiety, and obsessionality scales, with the poor outcome group in each case scoring higher in the neurotic direction.

Pheasant and Holt (1973) attempted to determine personality correlates of response to treatment for low back pain at an orthopedic hospital. An initial sample of 95 and a second, cross-validational sample of 94 patients were administered a battery of psychological tests and then assessed daily for response to treatment, the outcome criterion being improved functioning in the activities of daily living. In evaluating their data the authors found that poor response to treatment was positively correlated with neurotic symptomatology as interpreted from the MMPI. Support for this relationship, however, was minimal, and

another inventory of health concern, the Cornell Medical Index, provided non-confirmatory data.

Blumetti and Modesti (1976) compared 42 patients' pre-treatment scores on the MMPI with the outcomes of their neurosurgical treatment for intractable back pain. The unsuccessful group, as determined by their report of non-significant relief of pain at six-month follow-up, scored significantly higher than the successful group (n = 19) on both the Hypochondriasis and Hysteria scales. Viewing these results together with patients' performance on the Rorschach, the authors concluded that

> those patients who responded favorably to neurosurgical intervention for chronic low back pain are relatively less pathologically pre-occupied with overall bodily concerns, less dependent, and more capable of a higher level of individuation. They are also less rigid and constricted in terms of defense mechanisms and can rely on more than just somatic complaints to deal and interact effectively with the world around them. (p. 324)

A similar study of 34 consecutive admissions to a general hospital orthopedic surgery department was conducted by Waring et al. (1976). Pre-treatment administration of the MMPI, however, was unable to uncover any differences between the poor and good outcome groups, which were determined on the basis of physicians' post-operative ratings of operative success. The discrepancy between these and previous findings, suggested the authors, may have been a result of the small sample size. More likely, they believed,

it was due to the thorough pre-admission screening by the surgeon, who had excluded many patients with poor surgical prognoses. Those who had been excluded were most likely those with disproportionate neurotic involvement, i.e., precisely those who in other studies (Calsyn et al., 1976; Freeman et al., 1976) have been designated "functional" or "mixed" and who obtained significantly higher elevations on the neurotic scales of the MMPI and achieved poor treatment outcome (Wilfling et al., 1973).

Another treatment outcome study by Wiltse and Rocchio (1975) attempted to identify "good surgical risks." Their sample comprised 130 surgical candidates with low back pain, who had not had previous surgery but had also not achieved significant relief of pain from extensive conservative treatment. Prior to surgery each patient was interviewed and administered three psychological tests, the MMPI, the Cornell Medical Index, and the Quick Test of intelligence. The determination of surgical outcome was based on the surgeon's rating, one year after treatment, of improvement in physical condition and symptomatology. Analysis of data revealed that the single best predictor of the outcome criterion were the scores on the MMPI Hypochondriasis and Hysteria scales. Of patients with very low scores (54 and below), for example, 90% showed good or excellent improvement, while only 10% of the patients scoring above 85 were able to attain this degree of improvement.

Using another pair of cut-off points, scores of 75 and above portended only a 25% chance of achieving good or excellent results. A full 32% of the 130 patients scored 75 and above, while 44 percent scored 64 and below.*

A different use of the MMPI in predicting treatment outcome has been proposed by Sternbach (1974). Based on his experience in pre-treatment evaluation, inpatient counseling, and post-treatment follow-up at a pain rehabilitation clinic, he has suggested that the usual dichotomous classification of MMPI profiles in terms of high and low elevation on the neurotic triad be expanded to a four-fold

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*Although this study confirms earlier findings that the degree of neurotic involvement is significantly correlated with treatment outcome, its findings are subject to question. The effectiveness of chemonucleolysis, the surgical treatment employed in this study, was not confirmed by the results of a recent double-blind study (Martins et al., 1978) conducted under the auspices of the federal Food and Drug Administration. In this study a control group injected with a placebo had a 46% recovery rate, while 55% of those receiving the normal procedure (intervertebral injection with chymopapain) showed significant improvement. This difference in improvement rates is not significant, but because of criticisms of their study on methodological grounds, Martins and co-workers deemed their research inconclusive and advocated conducting a more definitive double-blind study. This has not occurred to date (Stromberg, 1979).

The 46% of patients achieving good or excellent results in the Wiltse and Rocchio (1975) study, however, was within the same range of improvement recorded in the double-blind study. If chemonucleolysis as administered by Wiltse and Rocchio was an active, effective procedure, then their MMPI results clearly are in line with other findings that neuoticism is correlated with outcome of treatment for low back pain. If, on the other hand, chemonucleolysis has no value except as a placebo, then one must infer that among low back patients, neuroticism plays the same role in response to a genuine as in response to a placebo treatment, i.e., regardless of treatment, less neurotic persons get better and more neurotic persons do not.

approach. It will be remembered that Sternbach and associates (1973a,b) consistently have found that various types of low back pain patients (organic and functional, chronic and acute) all have significant elevations on the neurotic triad. Consequently, Sternbach (1974) advocated a more configural approach to interpretation and evaluation, based on four typical clinical profiles representing hypochondriasis, reactive depression, somatization reaction, and manipulative reaction, respectively. Of these, the hypochondriacal profile characteristically has hypochondriasis as the peak score, with an elevation more than two standard deviations above normal. The Depression, Hysteria, Psychasthenia, and Schizophrenia scales are also significantly elevated. This pattern can only be achieved by endorsement of a great number and variety of pain complaints, including many that would be totally unrelated to chronic low back pain. Prognosis for this patient group is poor, as they continue to seek medical help after discharge, their pain remaining the central factor in their lives.

The "reactive depression" profile consists of an elevated neurotic triad, with the Depression score as peak. The Psychasthenia scale is also elevated. This configuration reflects the subjective experience of depression, which the patient acknowledges and views as a reaction to living with pain. Premorbid adjustment was likely good, as

are response to treatment and post-treatment adjustment. For many of these patients, treatment results in significantly reduced pain, and they subsequently cease to seek medical help.

The "somatization reaction" is equated with the classical conversion-V or psychosomatic-V profile, where the Hypochondriasis and Hysteria scales are significantly elevated, and the Depression score forms a valley between them. The depressive component of this syndrome is not absent, but latent, obscured because the patient focuses on physical symptoms. This pattern may reflect such a psychophysiological condition, or it may also indicate among medical and surgical populations that the patient has learned to live with pain by deriving satisfaction from the invalid role. These patients can usually be assisted in treatment to enrich their lives and become less symptom-centered.

The profile for "manipulative reaction," a term coined by Sternbach, resembles closely that for hypochondriasis, with the addition of a high score on the Psychopathic Deviate scale. This scale reflects anger, manipulativeness, and acting out, and its elevation with the neurotic triad is a sign that the patient is likely to use his symptoms to get what he wants, whether this be satisfaction in frustrating the physician or a pay-off through favorable settlement of a compensation claim. These

patients are not malingerers in the usual sense, but are consummate game players, and Sternbach recommended excluding them from treatment programs. Sternbach (1974) cautioned that these results were based only on a small-scale retrospective study and have not been systematically confirmed.

Implications and Summary

Previous research repeatedly has demonstrated the effectiveness of the MMPI in evaluating the psychological characteristics of chronic low back pain patients. Such patients consistently have recorded pathologically high scores on the Hypochondriasis, Depression, and Hysteria scales of the MMPI, indicating that their condition may best be viewed as psychophysiological in nature. In addition to elevations on this "neurotic triad" of scales, low back patients often record significant elevations on the Psychopathic Deviate, Psychasthenia, and/or Schizophrenia scales, further indicating the presence of factors such as secondary gain, acute anxiety, and thought disorders.

Less frequent use of the MMPI has been made in attempting to correlate patient psychological characteristics with treatment outcomes. Researchers have most often found an inverse relationship between increasing elevations on the neurotic triad and favorable prospects for treatment. Sternbach (1974) has suggested that greater accuracy in

predicting treatment outcome may result from a configural approach to interpretation. Standard interpretation of the MMPI combines the elevational and configural approaches.

The present research has attempted to further improve the accuracy of the MMPI as a diagnostic instrument for use with chronic low back pain patients. Although such patients have shown a consistent pattern of responding to the MMPI in terms of both configuration and elevation of scales, the standard clinical and validity scales of the MMPI were constructed without reference to chronic pain patients as a nosological group. A need exists to determine whether the personality characteristics of low back pain patients, in this case patients successful and those unsuccessful in treatment, can be more precisely defined by means of the MMPI.

To accomplish this, the current study has addressed the hypothesis that analysis of responses of these patients to individual items on the MMPI may be more revealing of patient personality variables than the analysis of response to scales per se. By using empirical techniques essentially similar to those employed in the original development of the MMPI scales, the attempt has here been made to develop a new scale of MMPI items with maximum potential to discriminate between successful and unsuccessful chronic low back pain patients. Examination of the content of these items should result in a more specific identification of

factors necessary to consider in the pre-treatment screening of patients, in determining their prognosis, and in devising treatment programs which may aid in their improvement.

CHAPTER III

METHOD OF RESEARCH

To test the major hypothesis of this study -- that patients successful in treatment for chronic low back pain responded differently than unsuccessful patients to items on the MMPI -- it was necessary to determine the outcome of treatment for a sample of low back patients and to correlate this outcome with patients' pre-treatment responses to the MMPI. To accomplish this a self-rating questionnaire, the Pain Survey, was developed and mailed to a large number of former low-back patients. The questions measuring outcome status concerned degree of pain relief obtained, ability to return to normal work and activities, (dis)continued search for medical assistance for pain relief, and overall subjective rating of satisfaction with treatment. Responses to these questions formed the basis for assignment of subjects to successful vs. unsuccessful treatment outcome groups.

Treatment outcome was then correlated with pre-treatment MMPI records taken from the respondents' (N = 185) medical files. MMPI responses of a randomly selected subsample of two-thirds (N = 51) of the successful and two-thirds (N = 72) of the unsuccessful respondents were

analyzed to identify items which significantly discriminated between the successful and the unsuccessful patients. Those items significant at the .10 level comprised a Back Treatment Success Scale, which was then compared in a cross-validational procedure to the MMPI responses of the remaining one-third (N = 62) of the total sample, in the attempt to determine the reliability and potential usefulness of the scale.

This chapter begins with a description of the major medical and other demographic characteristics of the sample population. Salient features of the measurement devices used in the study, the MMPI and the Pain Survey, are discussed. The survey procedures and response data for the piloting and administration of the Pain Survey are presented. The chapter concludes with the statement of the research hypothesis and an outline of the statistical analyses by which the null hypothesis was tested.

Experimental Sample

Subjects of this study were former patients of the Ingham Low Back and Pain Clinic, Lansing, Michigan, all of whom had terminated treatment between six and forty-two months prior to the inception of the study. Their pain had been defined as chronic, i.e., of more than six months' duration, prior to treatment. All of the subjects had experienced failure with one or more types of

conservative treatment (massage, manipulation, thermal packs, bed rest, etc.) and many had experienced failure with one or more surgical treatments. All were determined by their referring physicians and by the Clinic's orthopedic surgeon to have pain and disability severe enough to warrant intensive, inpatient treatment.

Patients who had been pregnant at time of treatment were excluded from the study, on the premise that their pain had been caused or exacerbated by their temporary condition. Patients who had been discovered during or after treatment to have cancer or multiple sclerosis as a primary or complicating cause of pain were also excluded. Illiteracy and senility, previously found by Jerome (1979) to reduce the likelihood of treatment success among patients at this clinic, were also a basis for exclusion.

For the total sample of 185 subjects, average age at the time of the present study was 44.4 years with a range of 22 to 72 years. There were 48.1% males and 51.9% females in the sample. A total of 19.5% of the subjects were employed in semi-skilled or unskilled labor, and 24.9% in skilled occupations, while 39.5% of the subjects were unemployed. Housewives constituted 9.7% of the sample, students 3.4%, and non-disabled retirees 2.2%. High school education had been completed by 65.8% of all subjects, while 11.4% had completed four years of college.

With respect to age, sex, and employment these figures are very similar to data obtained by Jerome (1978) in a previous study of patients from the same clinic. For his sample, mean age was 41.5, with a range of 19 to 77 years; 45% were females and 55% males; and the number of skilled workers in the sample equalled 27%. Supplementary data from that study are therefore also likely to be highly representative of the current sample: In Jerome's study the average number of prior surgeries per patient was .98 and the typical patient had been hospitalized twice previously for back pain treatment at other facilities. Upon admission 93% of Jerome's sample were taking narcotic analgesics, 28% major tranquilizers, and 56% muscle relaxants. On a five-point pain intensity scale (0 = no pain, 5 = horrible/unbearable) the average pain intensity reported by patients was 4.03. Jerome (1978) further noted that at time of referral, 80% of his sample were not working due to pain. Such data appear characteristic of the typical low-back patient involved in in-patient treatment at other clinics (cf. Sternbach, 1974; Wilfling et al., 1973).

Instrumentation

MMPI. This study utilized the Minnesota Multiphasic Personality Inventory (MMPI) and a self-rating questionnaire entitled "Pain Survey" (see Appendix A), which was

developed specifically for the study. These instruments will be discussed individually.

MMPI. The availability of MMPI records for the majority of former patients of the Clinic was a primary factor in its selection as a measure which would allow a broad basis for comparison of patient personality factors. Originally designed to identify and diagnose persons with psychiatric disorders, it is currently used to provide a personality description of patients in a wide variety of counseling, medical, and employment settings. It has also emerged as a preferred instrument in evaluating candidates for low back treatment, so that the body of extant research into the personality characteristics of low back pain patients refers far more often to the MMPI than to any other single personality measure.

The scales of the MMPI were empirically developed by contrasting normal groups with carefully studied clinical cases. Scale construct validity was based on the usefulness of the diagnostic groups represented by the clinical cases. The greater the number of items a person answered the same as a given criterion group, the more likely he/she was to share other characteristics of the group (Dahlstrom and Welsh, 1960).

Each item consisted of a statement to which respondents answered either "True" or "False", a format which allowed item-for-item comparison of response between

two groups, as was intended in the present study. The 566 items comprising the ten clinical and four validity scales cover

> ...areas such as health, psychosomatic symptoms, neurological disorders, and motor disturbances; sexual, religious, political, and social attitudes; educational, occupational, family, and marital questions; and many well-known neurotic or psychotic behavior manifestations, such as obsessive and compulsive states, delusions, hallucinations, ideas of reference, phobias, and sadistic and masochistic trends. (Anastasi, 1976, p. 497)

In constructing the test, the literal meaning of the item did not necessarily determine its inclusion in a specific scale. The primary criterion for including an item was its ability to discriminate between a sample of the normal population and a sample of patients already diagnosed as belonging to a criterion group.

Eight of the clinical scales were developed in this manner and consist of items differentiating between a control group of nearly 700 persons and a specific clinical group, usually numbering 50 persons. Of the other two clinical scales, the Masculinity-Femininity Scale items were selected for their ability to discriminate between normal women and normal men, a high score on this scale typifying interests of the opposite sex. The Social Introversion Scale was developed subsequent to the other scales, based on item responses of two contrasting groups of college students. These scales are supplemented by

four validity scales, which monitor the protocol for carelessness, malingering, misunderstanding, and test-taking attitudes (Anastasi, 1976).

For this study the Form-R of the MMPI was used, which permits all 14 basic scales to be scored from the first 399 items. Only these 399 items were scored and analyzed. The test was administered individually in the standard manner described by Hathaway and McKinley (1967) prior to or at admission to the Low Back and Pain Clinic.

Pain Survey. The patients' self-report Pain Survey (Appendix A) was developed specifically for the purpose of evaluating long-term treatment outcomes among subjects in this study. It consisted of two groups of questions which subjects were requested to answer at least six months after termination of treatment. The first group of four questions was based on criteria suggested by the literature and by the clinic staff as representing desirable outcomes of treatment. These criteria included relief from low back pain, return to work and normal activities, cessation of medical treatment for back pain, and subjective rating of benefit from treatment. Each of the four forced-choice questions had two foils (in each case labeled (a) and (b)) that were considered indicative of successful outcome and between one and four foils intended to denote an unsuccessful outcome.

Patients were requested to affirm only the one best answer to each question. It was thus possible to score from a maximum of four, to a minimum of zero, answers indicative of success on the four questions. For this study, subjects marking either three or four successful foils were deemed to have achieved a successful treatment outcome. Patients marking either two, one or zero answers indicative of success were considered to have achieved an unsuccessful treatment outcome.

Part II of the Pain Survey consisted of a group of ten questions, designed to measure the impact of pain on patients' lives; these were included as a validity control for the first four questions. It was hypothesized that patients achieving a successful treatment outcome, as indicated by a total score of three or four on the first group of questions, would be significantly less affected by pain in their activities of daily living, and that this would be reflected by their answers to Part II. The activities represented were evident in the questions reproduced on the second page of Appendix A.

Two additional items, not intended for analysis in this study, were included to provide feedback for the clinic staff. Under each of the headings "SUGGESTIONS FOR IMPROVING THE CLINIC" and "OTHER COMMENTS" several blank lines were provided to allow for unstructured response.

Procedure

Four hundred ninety former patients of the Ingham Low Back and Pain Clinic who had been administered the MMPI prior to or at outset of their treatment and who had terminated treatment at least six months prior to this study were identified as potential respondents. Of these an initial sample of 79 were mailed questionnaires (Appendix A) accompanied by cover letters (Appendix B) explaining the purpose of the study and soliciting their cooperation. Potential respondents were informed that the purpose of the questionnaire was "to obtain new knowledge that will be of help in treating patients coming through the program." They were assured that their responses were confidential, would not become part of their medical records, and would in no way influence their future treatment. A stamped, self-addressed envelope was enclosed for the return of the questionnaire.

Of this sample of 79, 33 respondents returned valid questionnaires and met the medical criteria for inclusion in the study. Valid MMPI's were on file for 28 of these respondents, who as a group comprised the total pilot sample. Of these 28 respondents, 15 answered either three or four of the four criterion questions in the direction intended to indicate successful outcome of treatment, while 13 answered either three or four of the criterion questions in the opposite direction. No

respondent marked two of the four questions in one direction and the other two in the opposite direction. It was thus apparent that the questions as piloted differentiated quite decisively between two groups of respondents.

Confirmation that these two groups did in fact represent the successful and the unsuccessful patients, respectively, was provided in part by the orthopedic surgeon and the psychologist of the clinic, who to the extent possible verified that individual responses and implied treatment outcome were congruent with respondents' treatment experiences at the clinic. In these deliberations the unstructured responses and comments by patients were also consulted, as many of the respondents were very definite in expressing their satisfaction or dissatisfaction with their treatment and its outcome.

A statistical comparison of the two identified groups provided additional evidence of the validity of the Pain Survey and the criteria for assigning outcome status. Patients of the two groups were compared on the basis of their responses to the ten questions measuring impact of pain on their life activities. For each of these questions a "YES" response, acknowledging the presence and deleterious impact of pain, was scored 1 (one), while a "NO" response was scored 0 (zero). At one point per question, higher total scores for the ten questions would indicate

considerable impact of pain on the respondent's life, while lower total scores would indicate minimal impact.

Individual and mean scores were computed for each of the two groups. Among the 15 respondents belonging to the group tentatively identified as successful, individual scores ranged from 0 to 7, with a mean of 3.7. Among the group tentatively designated unsuccessful, individual scores ranged from 0 to 9, with a mean of 6.2. A t-test (two-tailed, pooled variance, 26 df) revealed the difference in means to be significant at the .005 level. This significant difference in the impact of pain on former patients' lives permitted positive identification of the two groups as successful and unsuccessful beneficiaries of treatment.

A further statistical analysis of the response by pilot subjects to the four criterion questions was conducted to determine the ability of each foil to discriminate among successful and unsuccessful respondents. Results of a 2 × 2 chi-square, appropriate for this non-interval data (Nie, Hull, Jenkins, Steinbrenner, and Bent , 1975), comparing individual vs. group-appropriate response to each foil, are shown in Table 3.1. Given the relatively small number of subjects in the pilot sample, the majority of the foils successfully discriminated between the two groups of respondents. It was considered likely that those foils which failed to discriminate to

TABLE 3.1. Pilot Study of Pain Survey; Ability of Individual Foils to Discriminate between Successful and Unsuccessful Former Patients

	S (%) n = 15	U (%) n = 13	Significance
Question 1. (affect on pain)			
a. major pain relief	7 (46.7)	0 (0.0)	.016
b. some pain relief	8 (53.3)	2 (15.4)	.090
c. no lasting pain relief	0 (0.0)	11 (84.6)	.000
Question 2. (work and activities)			
a. return to normal	7 (46.7)	0 (0.0)	.016
b. return to less strenuous	8 (53.3)	2 (15.4)	.090
c. unable to return	0 (0.0)	11 (84.6)	.000
Question 3. (continued medical help)			
a. no, no more pain	2 (13.3)	0 (0.0)	.528
b. no, less bothered by pain	8 (53.3)	0 (0.0)	.007
c. want to, can't afford	2 (13.3)	0 (0.0)	.528
d. no, lost faith in doctors	0 (0.0)	2 (15.4)	.401
e. currently in care	3 (20.0)	9 (69.2)	.024
f. searching for help	0 (0.0)	2 (15.4)	.401
Question 4. (benefit from treatment)			
a. helped very much	5 (33.3)	0 (0.0)	.072
b. helped enough	10 (66.7)	3 (23.1)	.054
c. helped very little	0 (0.0)	7 (53.8)	.005
d. no help	0 (0.0)	3 (23.1)	.175

a statistically significant degree (e.g., 3a, 3c, 3d, 3f, 4d) evidently failed to do so because of the small sample size. This was obviously the case with 3a and 4d. The three remaining foils in question (3c, 3d, 3f) were all intended to indicate an unsuccessful outcome of treatment, and appeared to provide necessary response alternatives for potential unsuccessful subjects, i.e., alternatives which might reflect most accurately actual post-treatment status and activities with respect to continued use of the health care system. All foils were therefore retained, and the questionnaire was used without modification for the study proper.

The Pain Survey with accompanying letter was then sent to the remaining 411 former patients. After two weeks, when it appeared that fewer than the desired 40% of potential subjects would respond, 24 non-respondents were contacted and administered the questionnaire by telephone. A total of 182 valid questionnaires were obtained from this combined second mailing and telephoning, of which 157 could be matched with valid MMPI's. Of those responding by mail, 39.1% had achieved a successful treatment outcome, and of those responding by telephone, 37.5%. Response by telephone was therefore considered not to have been a confounding factor, and the data gathered in this manner were included in all subsequent analyses.

It was considered desirable to include the pilot data with the research data for the purpose of developing the Back Treatment Success Scale, as the addition of 28 subjects would increase the stability and statistical power of the item-for-item analysis. To determine the appropriateness of including the pilot data, a comparison was made of the questionnaire data obtained from the research sample and the pilot sample (Table 3.2). This comparison indicated that the demographic characteristics of the two samples were essentially similar, with the exception of sex and employment. In examining the possible biasing effect of sex on treatment outcome, however, a 2×2 chi-square analysis revealed no significant interaction ($p = .393$, research sample; $p = .829$, pilot sample). In examining the significant difference in the rate of unemployment between the pilot sample (25.0%) and the research sample (42.0%), a 2×6 chi-square crosstabulating the six employment categories with treatment outcome revealed that unemployment was significantly related ($p = .001$) to failure in treatment. This indicated that the research sample likely contained a greater percentage of treatment failures. The data presented in Table 3.3 document this difference in percentage but also show that this difference was not significant ($p = .146$). In other words, although the research sample contained a greater percentage of unemployed and correspondingly un-

TABLE 3.2. Comparison of Demographic Data Obtained from Pilot and Research Samples

Demographic Variables	Pilot N = 28	Research N = 157	Significance (T-TEST: Pooled Variance)
Mean Age in Years	43.89	44.51	ns
Sex % Males	25.0	52.2	.01
% Females	75.0	47.8	.01
Mean Years Education	11.25	11.76	ns
Employment			
Unemployed %	25.0	42.0	.05
Unskilled, Semi-skilled	25.0	24.8	ns
Skilled, Managerial, Prof.	17.9	19.7	ns
Housewife	25.0	15.9	ns
Student	3.6	4.5	ns
Non-disabled retiree	3.6	1.9	ns

TABLE 3.3. Endorsement of Criterion Questions by Pilot vs. Research Samples

Questionnaire Response	% Endorsing Pilot (N = 28)	% Endorsing Research (N = 157)	Significance
Q1. Pain Relief			
a. major	25.0	19.1	.475
b. some	35.7	28.7	.455
c. none	39.3	52.2	.209
Q2. Employment, Recreation			
a. return to normal	25.0	15.9	.244
b. partial return	35.7	40.8	.618
c. minimal or no return	39.3	43.3	.693
Q3. Return to Medical Care			
a. no, no more pain	7.1	3.8	.429
b. no, less pain	28.6	22.9	.521
c. no time or money	7.1	10.2	.168
d. no faith in doctors	7.1	8.3	.840
e. currently in care	42.9	43.3	.965
f. looking for help	7.1	8.9	.760
Q4. Satisfaction with Treatment			
a. very satisfied	17.9	18.0	.991
b. mostly satisfied	46.4	34.0	.208
c. not very satisfied	25.0	23.1	.826
d. disappointed	10.7	23.7	.126
Success in Treatment (3 or 4) × (a or b)	53.6	38.9	.146

successful former patients, this difference was not great enough to justify the conclusion that the pilot and the research samples were non-homogeneous.

Based on the assumption of homogeneity of the research subjects and the pilot subjects, the two samples were pooled to constitute a total sample population of 185 subjects. It was with respect to this total sample population that all subsequent statistical analyses were performed.

Statistical Analysis

The null hypothesis under consideration in this study was as follows:

> Items on the MMPI do not differentiate to a statistically significant degree between patients who achieve success and patients who experience failure in multidisciplinary treatment for chronic low back pain.

To test this hypothesis two-thirds of those subjects identified by means of the Pain Survey as successful were assigned to a Treatment Success Group (n = 50) and two-thirds of those identified as unsuccessful were assigned to a Treatment Failure Group (n = 73), while the remainder of the subjects (n = 62), consisting of one-third of all successful and one-third of all unsuccessful subjects, were retained as a cross-validational subsample.

The MMPI responses of the Treatment Success Group and the Treatment Failure Group were compared on an item-for-item basis. This comparison of the two groups on the

true/false dimension of item response was accomplished through a 2 × 2 chi-square analysis of each of the first 399 items on the MMPI Form-R. Items significant at the .10 level were selected for inclusion in the Back Treatment Success Scale.

The MMPI records of the cross-validation subjects (N = 62) were then examined for response to items on the Back Treatment Success Scale. To obtain a scale score for each subject, any scale item answered in the "failure" direction (i.e., the direction -- TRUE or FALSE -- which had been endorsed with greater relative frequency by the Treatment Failure Group) received a score of zero; those scale items answered by cross-validational subjects in the opposite direction received a score of one. The total scale score (sum of 0's + 1's) for each subject was then divided by the number of items which the subject had answered either TRUE or FALSE, a procedure which prevented non-response (CANNOT SAY) to any scale item from being a source of measurement error.* Individual scores thus ranged from 0 to 1, with relatively higher scores indicative of success as measured by the scale.

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*The standard procedure for administration of the MMPI permits a testee to leave blank up to 30 items without invalidating the profile. This presents a potential source of measurement error, capable of vitiating the significance test in the present cross-validation procedure, since any subject may have failed to respond to a number of items on the scale. For this reason the above-described proportional scoring procedure was adopted to control for error introduced by blank items.

Mean scores were then generated for two subgroups of the cross-validational subjects, consisting of those subjects previously defined by the Pain Survey as treatment successes and treatment failures, respectively. The mean scores were compared with a one-way analysis of variance to determine the degree to which the Back Treatment Success Scale differentiated between the two groups. The results of these analyses are presented in Chapter IV.

CHAPTER IV

ANALYSIS OF RESULTS

Subjects' responses to the Pain Survey indicated that the questionnaire accurately discriminated between successful and unsuccessful former back clinic patients. These responses provided the basis for assignment of subjects to successful or unsuccessful treatment outcome status.

A tentative Back Treatment Success Scale was developed, based on the MMPI-items which discriminated between members of a randomly selected subsample of two-thirds of all successful and unsuccessful subjects. The attempt to cross-validate this scale on the remaining one-third of the sample population proved statistically non-significant. The null hypothesis, that MMPI items do not discriminate to a statistically significant degree between successful and unsuccessful back clinic patients, was not rejected.

In order to identify discriminating items with greater statistical power, the scale development and cross-validational subsamples were pooled and the test of item-discrimination was applied to the MMPI records of the

total sample. By this procedure 45 MMPI-items were identified as best discriminating between successful and unsuccessful subjects. These items were subjected to several analyses: they were categorized according to traditional MMPI-scale membership, grouped into seven content-related factors, and also statistically factor-analyzed. These analyses yielded a number of personality characteristics and profiles which appeared to be positively correlated with treatment outcome. On this basis it was concluded that these 45 MMPI-items did discriminate meaningfully between successful and unsuccessful former patients of the back clinic, even though it was not possible to establish the items' statistical significance through cross-validation on another sample.

This chapter will present an analysis of the research data. First, subjects' responses to the Pain Survey will be summarized. Second, the attempt to develop the Back Treatment Success Scale will be discussed, including selection of items and cross-validation of the scale. The third and concluding section of this chapter contains the several analyses of the 45 MMPI-items best discriminating between successful and unsuccessful subjects of the total sample.

Pain Survey. As piloted, the Pain Survey had effectively discriminated between successful and unsuccessful subjects (Table 3.1). Analysis of the response to the Pain Survey

by the combined Treatment Success and Treatment Failure groups (N = 123), which together comprised two-thirds of the total 185 subjects in the study, indicated the questionnaire's continued effectiveness in differentiating between the two outcome groups. A 2 × 2 chi-square analysis was used to crosstabulate outcome of treatment with response to each foil of the survey's four criterion questions (Table 4.1). All but three of the foils discriminated between successful and unsuccessful respondents at the .002 level. These foils (3c, 3d, 3f), however, had the three lowest response frequencies of all fifteen foils. Because the three foils were all intended to indicate unsuccessful treatment outcome, the sum of successful respondents (3c + 3d + 3f = 4) was compared with a 2 × 2 chi-square to the sum of unsuccessful respondents (3c + 3d + 3f = 29) in the attempt to more closely approximate the true statistical power of Question 3. This comparison attained significance at the .001 level.

Back Treatment Success Scale. A 2 × 2 chi-square analysis was performed comparing MMPI-item response (TRUE/FALSE) with treatment outcome (successful/unsuccessful) for the combined population (N = 123) of the Treatment Success and Treatment Failure groups. By means of this analysis, 10 items were identified as significant at the .05 level and an additional 18 at the .10 level. In a preliminary attempt to eliminate items with the least stability,

TABLE 4.1. Response to Pain Survey of Treatment Success and Treatment Failure Groups

Question[a]	Success (N = 50) n	%	Failure (N = 73) n	%	Significance
Q1. Pain Relief					
a. major	28	56.0	1	1.4	.000
b. some	22	44.0	12	16.4	.002
c. none lasting	0	0.0	60	82.2	.000
Q2. Work and Activities					
a. return to normal	21	42.0	2	2.7	.000
b. some restrictions	29	58.0	16	21.9	.000
c. minimal return	0	0.0	55	75.3	.000
Q3. Return to Medical Care					
a. no, no more pain	9	18.0	0	0.0	.002
b. no, less pain	28	56.0	1	1.4	.000
c. no, can't afford	3	6.0	11	15.1	.196
d. lost faith in medical help	1	2.0	8	11.0	.123
e. currently in care	10	20.0	43	58.9	.000
f. still looking for help	0	0.0	10	13.6	.020
Q4. Satisfaction with Outcome					
a. very satisfied	22	44.0	4	5.5	.000
b. mostly satisfied	27	54.0	17	23.3	.001
c. not very satisfied	1	2.0	25	34.2	.000
d. disappointed	0	0.0	27	37.0	.000

[a] Full Text in Appendix A.

significance levels for these 28 items were computed for the 185 subjects in the total sample population. Upon comparing the item significance levels for the two groups (N = 185, N = 123), the decision was made to exclude from the scale four of the 28 items which had a greatly reduced significance ($p > .30$) with respect to the total sample population. The 24 items retained for the Back Treatment Success Scale, with the direction of item response endorsed most frequently by successful and unsuccessful subjects, is listed in Table 4.2.

To test the potential usefulness of the 24-item scale in predicting outcome of treatment for a similar group of chronic low back pain patients, a cross-validational procedure was conducted. This procedure involved computation of Back Treatment Success Scale scores for the 62 subjects whose MMPI records had not been included in the chi-square item-analysis. To compute individual scale scores, each scale item answered in the "failure" direction (i.e., the direction which had previously been endorsed by a greater percentage of unsuccessful than successful subjects) was scored 0; each scale item answered in the direction previously endorsed with greater relative frequence by successful subjects received a score of 1. By way of example, for Item 2 in Table 4.2 a subject received a score of 1 for a TRUE response, because this response had been endorsed relatively more often by

TABLE 4.2. Back Treatment Success Scale: Direction of Item Response Endorsed More Frequently by Successful vs. Unsuccessful Subjects (N = 185)

MMPI Item	Direction of Response	Successful S's % Endorsing	Direction of Response	Unsuccessful S's % Endorsing
2	T	94.0	T	81.9
3	F	60.0	F	79.2
23	F	91.7	F	76.4
60	T	98.0	T	74.0
61	F	95.7	F	69.0
72	F	84.8	F	67.2
106	F	93.8	F	79.1
125	F	87.8	F	70.0
142	T	52.1	T	71.8
175	T	71.4	T	54.9
184	F	100.0	F	88.9
185	T	92.0	T	73.6
187	T	89.6	T	66.7
211	F	97.9	F	86.4
213	F	100.0	F	89.6
215	F	83.7	F	66.7
247	F	97.8	F	86.8
248	F	54.3	F	72.7
266	T	51.1	F	69.1
268	T	77.3	T	58.8
272	T	87.5	T	71.8
281	T	83.0	T	64.3
323	F	83.7	F	63.3
392	T	53.7	T	71.7

successful than by unsuccessful subjects. A proportional scale score for each subject was then obtained by summing the item scores (0's + 1's) and dividing the sum by the number of items to which the subject had responded. This procedure prevented items left blank from being scored as 0 or "failure." The resulting scale scores for each subject therefore ranged from 0 to 1 at the hypothetical limits, with relatively higher scores indicative of success.

Mean scale scores were then computed for two subgroups of the cross-validational subjects, one consisting of those subjects identified by the Pain Survey as successful (N = 26) and the other consisting of subjects likewise identified as unsuccessful (N = 36). The comparison of mean scores is presented in Table 4.3.

TABLE 4.3. Analysis of Variance of Back Treatment Success Scale Scores of 26 Successful and 36 Unsuccessful Subjects

Source	SS	df	MS	F	p
Between Groups	.0345	1	.0345	2.90	.094
Within Groups	.7143	60	.0119		
Total	.7489	61			

The difference in mean scores was statistically significant at the .094 level. This comparison indicated some stability of the scale-items across groups, but the

significance level obtained did not warrant rejection of the null hypothesis.

Re-Analysis of Data for Total Sample Population

Despite the failure to reject the null hypothesis, the moderate level of significance achieved in the cross-validational procedure provided some evidence for the homogeneity of the total sample and for the stability of items included in the Back Treatment Success Scale. Consequently, it was decided to increase the statistical power of the chi-square computation by which scale items had been identified; the scale-development sample and the cross-validational sample were pooled in order to re-test the significance of items discriminating between successful and unsuccessful subjects. With the increased cell frequencies for the 2 × 2 chi-square analysis, it was assumed that significantly discriminating items would have greater stability, and would thus provide a more appropriate basis for the attempt to identify personality factors associated with success or failure in treatment.

Recomputation of the chi-square analysis for all 185 subjects yielded 45 items significant at the .10 level. The MMPI scale categorization of these 45 items, with direction of response endorsed relatively more often by unsuccessful than successful subjects, is presented in Table 4.4. (Results of the chi-sqaure analysis for all

TABLE 4.4. Scale Categorization of Items Discriminating at .10 Level between 76 Successful and 109 Unsuccessful Back Clinic Patients (N = 185)

MMPI Item	Scales: Diagnostic Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si	Validity L	F	K
23	T	T	T									T	
46		F											
60											F		
61				T									
69					T								
82				F						f			
91				t[a]						t			
95		F											
104		T						T					
106				T			T						
113												f	
115					F							F	
131		F											
134				F	f				f				F
145		t											
156								T	T			T	
159		T					T	T					
185												F	
186			T										
187					f			F					
211												T	
215				F								F	
220								F				F	
225											F		
230	F		F										
243	f		f										
247												T	
248		F		F									

[a]Lower case f or t denote responses not scored deviant for specific MMPI scale.

Table 4.4 (continued)

Item	Hs	D	Hy	Pd	Mf	Pa	Pt	Sc	Ma	Si	L	F	K
249					F								
251								T	T				
260					f								
266							t	t	t				
268						F			t			F	
272		F											F
278					T					T			
282					t			t					
284				T		T							
292			F							t			
295					t								
323				T				T		f			
343							T						
367										f			
375													f
391										F			
392										f			
Total[b]	2	8	4	8	3	2	3	7	2	2	2	9	2

[b]Does not include lower case responses.

399 items, with endorsement percentages of successful and unsuccessful subjects, are contained in Appendix C). Each of the ten diagnostic and three validity scales of the MMPI is represented by at least two of the 45 items, but the Depression and Psychopathic Deviate scales with 8 items each, the Schizophrenia scale with 7 items, and the F scale with 9, together account for nearly 60% of the item-scale categorizations. Surprisingly, 10 of the 45 items were endorsed with relatively greater frequency by the unsuccessful subjects in a direction which indicated no deviant response on any of the diagnostic or validity scales. This does not indicate that the majority of successful subjects had responded to these items in the opposite, deviant manner; but it does indicate that relatively more successful than unsuccessful subjects answered in the deviant direction with respect to established norms of a specific scale. This, in turn, does not preclude the possibility that unsuccessful subjects were in fact responding with greater relative frequency in the deviant direction with respect to the distinct nosological category here being investigated, namely, back treatment failure.

An attempt was made to identify, by content analysis of the 45 items from the MMPI, clusters of items representative of personality characteristics common to the unsuccessful subjects. A variety of such item clusters

emerged: (1) denial of social non-conformity (items #60, 225, 243, 292, 391 and 392; (2) self-depreciation tending to guilt and paranoia (46, 61, 91, 104, 106, 159, 260, 278 and 284); (3) health complaints and disease phobia (23, 131, 185, 230); (4) impaired faculties of concentration, coordination and awareness (156, 159, 186, 187, 251); (5) depressed affect and behavior (134, 211, 248, 266, 268, 272, 343); (6) repressed hostility and authority problems (82, 145, 375); and non-affirmation of fundamentalist religious beliefs with non-regular church attendance (95, 115, 249). Significant single items included acknowledgement of strong attraction by members of the same sex (item 69) and of excessive use of alcohol (item 215).

To determine whether and how these item-clusters contributed to typical MMPI response patterns of this sample of chronic low back pain patients, a statistical factor-analysis of all 45 items was conducted. The SPSS image factor program computed and retained all factors with eigenvalues greater than 1.0 and listed values for the loading of all items on each factor. With this program the number of factors is usually equal to one-half the number of variables in the set. It is assumed in each case that a number of these factors will be unamenable to interpretation, and will not be retained (Nie et al., 1975).

Image factoring in the present case generated 30 factors with eigenvalues greater than or equal to 1.0. The first ten factors, with eigenvalues ranging from 9.82 to 3.25 and accounting for 58.5% of the variance, were examined for feasibility of interpretation. Subsequently, the first eight factors, with eigenvalues 9.82 - 3.60 and accounting for 51.1% of the variance, were retained for further interpretation. A complete tabulation of the loadings of individual items on each of the eight factors is presented in Appendix D.

In interpreting each factor, between 10 and 16 items were considered. For each factor, interpreted items included all those with a loading greater than or approximately equal to one-half the absolute value of the highest weighted item. These items are arranged in eight tables (4.5.1 - 4.5.8) representing the eight factors, with items arrayed from top to bottom according to decreasing absolute value of loading, without regard to sign. Item responses are labeled T or F according to the direction more frequently affirmed by unsuccessful than successful subjects. Loadings are designated "same" or "opposite" with respect to the response direction. Thus, in Table 4.5.1, item 251 had the highest loading on Factor 1, with an absolute value of .57. The response listed for this item is T, indicating that a higher percentage of unsuccessful than successful subjects responded TRUE to this

item. The loading of .57 is designated "same," to show that the direction of loading coincides with T in the Response column.

Each opposite or same item-loading must also be interpreted in light of the entire response pattern represented by the factor on which that item loads. That is, each factor represents the response pattern of a subset of either successful or unsuccessful subjects, whereby it is extremely unlikely that all items in a given pattern will have been endorsed in either the same or in the opposite direction as the Response-value. It is reasonable to assume, for example, that Factor 1 represents the largest subset of unsuccessful subjects because, first, this factor accounts for a higher percentage of the variance than any other factor and, second, all but one of this factor's thirteen highest weighted itms is weighted in the same direction indicated under Response. However, in interpreting the opposite weighting of this one item (#282, Table 4.5.1), it is necessary to bear in mind that only a 53% majority of unsuccessful subjects (see Appendix C) responded FALSE to this item, leaving 47% of the unsuccessful subjects who responded in a direction opposite to "Response." For this reason loadings designated "opposite" were frequently found on factors apparently representative of unsuccessful subjects.

Interpretation of factors with approximately equal numbers of same and opposite item-loadings is complicated by the fact that for all but 2 of the 45 items, a majority of both successful and unsuccessful subjects responded to a specific item in the same (T or F) direction (see Appendix C). Item 249, for example, discriminated between successful and unsuccessful subjects at the .05 level of significance; to this item 63% of unsuccessful and 78% of successful subjects responded TRUE. Thus, where this item occurs in Factor 4 as the most highly weighted item (Table 4.5.4), and with an "opposite" loading, one cannot at first glance determine whether, in this factor, this particular item-loading is characteristic of successful or unsuccessful treatment outcome, or whether this factor as a whole profiles successful subjects.

Interpreting the significance of individual items on a specific factor is further complicated by the fact that the factor as a whole comprises a response-set. Within this set any given item is therefore part of a configural whole, and must be considered as such with respect to its prognostic value. This phenomenon is consistent with traditional interpretation of item values on the clinical and validity scales of the MMPI, where for a number of items a FALSE response may signify deviance on a particular scale or scales, while a TRUE response connotes deviance on another scale. Similarly, within this context

of the test as a whole, a significant elevation on a particular scale connotes varying degrees and kinds of psychopathology, according to the presence or absence of other significantly elevated scales. An example of this ambiguity in the present research may be seen in the loading of item 248 (sometimes feel happy without reason) on both Factor 3 (manipulative) and Factor 4 (Reactive Depression), which are indicative of opposite treatment outcomes.

A tentative attempt was made to identify each of the eight factors as representative of either successful or unsuccessful subjects, and to characterize the content of the factor. As mentioned above, each succeeding factor proved more difficult to interpret:

Factor 1. Hypochondriasis (unsuccessful)

Characteristics:
1. extreme self-alienation, poor awareness of self
2. poor health and coordination
3. conflicted family relationships
4. repressed hostility
5. attraction by same sex

Factor 2. Organic (successful)

Characteristics:
1. affirmation of fundamentalist religious beliefs with regular church attendance
2. belief in social order (law enforcement)
3. less rigid defense system and more realistic self-appraisal than Factor 1
4. more healthy family and social relationships based on give and take

TABLE 4.5. MMPI-Item Loadings on Factors Related to Successful/ Unsuccessful Treatment Outcome

Table 4.5.1. Factor 1: Hypochondriasis

Item	R[a]	Loading[b]	Content
251	T	same (.57)	no recall of own actions
156	T	same (.53)	blank spells
247	T	same (.49)	jealousy of family members
104	T	same (.46)	lack of concern for what happens to self
23	F	same (.38)	attacks of nausea and vomiting
187	F	same (.38)	hands not clumsy or awkward
230	F	same (.38)	normal circulatory-respiratory activity
186	T	same (.38)	poor hand coordination
282	F	oppos. (.37)	occasionally feel hatred for family members
61	T	same (.36)	have not lived right kind of life
278	T	same (.35)	feel strangers look critically
145	T	same (.34)	feel like picking fist fight
69	T	same (.33)	attracted by same sex
106	T	same (.33)	feel wrong, evil
284	T	same (.32)	sure I'm being talked about

[a] R = response endorsed by higher percentage of unsuccessful than successful subjects.

[b] same or opposite with respect to R.

Table 4.5.2. Factor 2: Organic

Item	R	Loading	Content
249	T	oppos. (.54)	believe there is Devil and Hell
278	T	same (.46)	feel strangers look critical
113	T	same (.44)	belief in law enforcement
115	F	oppos. (.41)	belief in life hereafter
134	F	oppos. (.36)	thoughts sometimes outrace speech
220	F	oppos. (.31)	loved my mother
91	T	oppos. (.31)	don't mind being made fun of
391	F	oppos. (.29)	remember playing sick
185	F	oppos. (.28)	can hear as well as most people
282	F	oppos. (.28)	occasionally feel hate for family member
82	F	oppos. (.28)	easily downed in arguments
225	F	oppos. (.28)	occasionally gossip a little
95	F	oppos. (.27)	regular church attendance

Table 4.5.3. Factor 3: Manipulative

Item	R	Loading	Content
323	T	same (.39)	had peculiar, strange experiences
113	T	same (.37)	belief in law enforcement
392	T	same (.36)	talk to strangers in public places
215	T	same (.35)	excessive alcohol use
248	F	oppos. (.32)	sometimes happy with no reason
375	T	same (.31)	experts no better than I
82	F	same (.29)	easily downed in arguments
106	T	oppos. (.29)	often feel wrong or evil
134	F	oppos. (.28)	thoughts sometimes outrace speech
145	T	same (.28)	feel like picking fist fight
284	T	same (.27)	sure I'm being talked about
104	T	oppos. (.27)	don't care what happens to me
131	F	same (.26)	don't worry about diseases

Table 4.5.4. Factor 4: Reactive Depression

Item	R	Loading	Content
249	F	oppos. (.44)	believe Devil and Hell exist
248	F	oppos. (.40)	feel happy without reason
292	F	same (.39)	don't speak till spoken to
367	T	same (.33)	not unusually self-conscious
115	F	oppos. (.32)	belief in life hereafter
106	T	same (.31)	feel wrong, evil
113	T	oppos. (.30)	belief in law enforcement
46	F	oppos. (.29)	trusts own judgement
392	T	same (.24)	talk to strangers in public
211	T	same (.24)	can sleep in day, not at night
95	F	oppos. (.23)	weekly church attendance
272	F	oppos. (.22)	sometimes full of energy
61	T	same (.22)	haven't lived right life

Table 4.5.5. Factor 5: Familial Conflict

Item	R	Loading	Content
272	F	oppos. (.43)	sometimes full of energy
266	F	oppos. (.37)	very excited at least once a week
186	T	oppos. (.28)	poor hand coordination
247	T	same (.28)	jealous of family member
46	F	oppos. (.27)	judgement better than ever
260	T	same (.26)	slow learner in school
268	F	oppos. (.25)	excitement ends depression
230	F	oppos. (.25)	normal circulatory-respiratory activity
215	T	oppos. (.24)	excessive alcohol use
69	T	same (.24)	attracted by same sex
220	F	oppos. (.24)	loved my mother

Table 4.5.6. Factor 6: Somatization

Item	R	Loading	Content
243	T	same (.38)	few or no pains
95	F	oppos. (.36)	regular church attendance
225	F	same (.29)	sometimes gossip a little
156	T	same (.28)	poor recall of own activity
23	T	same (.28)	attacks of nausea and vomiting
60	F	oppos. (.26)	don't read all editorials daily
343	T	same (.23)	stop and think before acting
106	T	same (.21)	feel wrong or evil
113	T	same (.20)	belief in law enforcement
104	T	oppos. (.20)	don't care what happens to me
367	T	same (.20)	not unusually self-conscious
247	T	same (.18)	jealousy of family member
248	F	same (.18)	sometimes feel happy - no reason
284	T	oppos. (.18)	sure I'm being talked about
220	F	same (.17)	loved my mother

Table 4.5.7. Factor 7: Hypochondriasis

Item	R	Loading	Content
131	F	same (.36)	no worry about catching disease
106	T	same (.31)	often feel wrong, evil
251	T	oppos. (.30)	blank spells
392	T	same (.28)	talk to strangers in public places
82	T	same (.27)	easily downed in argument
323	T	same (.24)	peculiar, strange experiences
343	T	same (.24)	stop and think before acting
156	T	oppos. (.23)	poor recall of own activity
95	F	same (.20)	regular church attendance
61	T	same (.18)	have not led right life

Table 4.5.8. Factor 8: General Neurotic

Item	R	Loading	Content
220	F	oppos. (.34)	loved my mother
46	F	same (.26)	judgement better than ever
134	T	oppos. (.25)	thoughts may outrace speech
145	T	same (.25)	at times feel like picking fight
23	T	same (.24)	attacks of nausea and vomiting
295	F	same (.24)	liked "Alice in Wonderland"
104	T	same (.21)	don't care what happens to me
248	F	same (.22)	can feel happy without reason
325	F	oppos. (.19)	gossip a little
284	T	oppos. (.16)	sure I'm being talked about
159	T	same (.15)	can't understand so well what I read
272	F	oppos. (.15)	sometimes full of energy
282	F	oppos. (.15)	at times feel hatred for family member

Factor 3. Manipulative (unsuccessful)

Characteristics:
1. self viewed as in control, without guilt, aggressively mastering situations
2. world viewed as hostile, threatening
3. strange experiences, excessive alcohol use
4. manic mood swings

Factor 4. Reactive Depression (successful)

Characteristics:
1. religious beliefs with regular church attendance
2. self experienced as wrong, evil, guilty
3. trust in own judgment and ability to interact

Factor 5. Family Conflict(equivocal)

Characteristics:
1. ability to overcome depression
2. non-acknowledgement of poor health or excessive alcohol use
3. conflicted family relationships
4. attraction by same sex

Factor 6. Somatization (unsuccessful)

Characteristics:
1. depression, poor recall, guilt
2. regular church attendance
3. denial of social non-conformity, denial of pain
4. nausea, anxiety
5. conflicted familial relationships, including maternal

Factor 7. Hypochondriasis (unsuccessful)

Characteristics:
1. disease phobia
2. self-alienation, low self-esteem
3. compulsive, good recall, no blank spells
4. non-regular church attendance
5. peculiar experiences

Factor 8. General Neurosis (unsuccessful)

Characteristics:
1. love mother, hate some other family member
2. depression, repressed hostility
3. declining powers of judgement and comprehension
4. nausea, vomiting
5. disliked "Alice in Wonderland"

Summary of Results

The analyses presented in this chapter pertained to the major research hypothesis, which was as follows:

> Items on the MMPI do not differentiate to a statistically significant degree between patients who achieve success and patients who experience failure in multidisciplinary treatment for chronic low back pain.

Significant findings relevant to this hypothesis included:

1. With a chi-square analysis of the MMPI-item responses of 123 former back pain patients, it was possible to identify only 28 items discriminating at the .10 level, 10 of which were significant at the .05 level.
2. The best 24 of these items were incorporated into a Back Treatment Success Scale, which did not have statistically significant predictive validity in a cross-validational procedure with an additional sample of 62 former back pain patients.
3. The cross-validational procedure, however, did indicate considerable similarity of response among successful versus unsuccessful subjects, respectively, of the research and cross-validational samples. These samples were pooled for further data analysis.

4. The statistical power of the chi-square item analysis was enhanced by this pooling of subjects. For the total 185 subjects, 18 items were significant at the .05 level and an additional 27 at the .10 level.

5. By examining the content of these 45 items, it was possible to identify several personality characteristics apparently related to outcome of treatment for chronic low back pain.

6. A statistical factor analysis confirmed the previous content analysis, and indicated the possibility of configural relationships among identified personality characteristics.

The implications and limitations of these findings will be discussed in Chapter V.

CHAPTER V

DISCUSSION OF RESULTS

Summary

The past three decades have witnessed an accelerating rate of recognition and investigation of the psychological dimensions of pain. Most recently, these activities have culminated in the establishment of multidisciplinary clinics as an approach to treatment of persons suffering from chronic low back pain. In such clinics psychologists have assumed a major role on the treatment team, providing a variety of counseling, behavioral management, and stress reduction and muscular relaxation techniques, all of which aim to cure by impacting upon cognitive, affective, and motivational variables associated with the personal experience of pain.

Personality testing conducted in these and similar settings has repeatedly confirmed the presence of psychoneurotic disturbance among a majority of sufferers of chronic low back pain. Moreover, the preponderance of evidence gathered in such situations indicates that higher levels of pre-treatment psychoneurotic involvement are positively correlated with unsuccessful treatment outcomes.

The MMPI consistently has detected such involvement and has therefore emerged as a preferred instrument in the evaluation of chronic low back pain patients.

The primary intent of this study was to explore the feasibility of further refining the diagnostic power of the MMPI by developing a subscale of MMPI-items for use in predicting outcome of treatment for chronic low back pain. A scale facilitating the identification of patients with poor prognosis could provide a valuable diagnostic tool and also improve the matching of treatment resources and patient needs.

In working toward this end, the first phase of research required the development of a measure to assess long-term treatment outcome. The Pain Survey was constructed expressly for this purpose, then successfully piloted. According to their response to this questionnaire, a total of 185 former pain clinic patients were assigned either successful or unsuccessful treatment outcome status.

From this sample population, two-thirds of the subjects were randomly selected to comprise a scale-development subsample, and the remaining one-third became the cross-validational subsample. The former subjects' MMPI records were analyzed by chi-square to determine which items significantly discriminated between successful and unsuccessful subjects. The items thus identified

constituted a tentative Back Treatment Success Scale, whose ability to discriminate between successful and unsuccessful subjects in the cross-validational sample was then tested. This test proved statistically non-significant.

It was determined, however, that the small size of the scale-development subsample was likely to have been a major factor in the non-significant outcome of the test. Therefore, to provide as comprehensive a basis as possible for future research, the two subsamples were pooled and the chi-square test of item-discrimination was applied to the total sample population. A total of 45 items, all those discriminating at the .05 and .10 levels, were examined for standard MMPI-scale membership, then categorized on the basis of content, and finally factor-analyzed.

Discussion

This section will discuss conclusions drawn from the results of the statistical analysis, and limitations of the study.

A major conclusion tentatively drawn from this research is that the use of the MMPI in diagnosing and screening chronic low back pain patients may be considerably enhanced by an analysis of specific item responses. By means of traditional MMPI analysis based on interpretation of scale scores and their configural

interrelationships, previous research has established several guidelines for the prediction of treatment outcome among such patients. Two investigative teams (Wilfling, Klonoff, and Kokan, 1973; Pheasant and Holt, 1973) found poor response to treatment to be positively correlated with significant elevations on all scales of the neurotic triad -- Hypochondriasis, Depression, and Hysteria. Two other teams (Wiltse and Rocchio, 1975; Blumetti and Modesti, 1976) identified the Hypochondriasis and Hysteria scales as so correlated. Sternbach (1974) obtained similar findings, and also identified elevations on the Psychopathic Deviate, Psychasthenia, and Schizophrenia scales as important predictors for back pain patients with particular MMPI profiles. Partial corroboration of these findings had previously been obtained by Wolkind and Forrest (1972) with the Middlesex Hospital Questionnaire; they found that poor outcome was positively correlated with neurotic scores on the depression, somatic concomitants of anxiety, and obsessionality scales.

A direct comparison of these findings with the present results would require the computation of mean scale scores from the records of subjects participating in this study. However, since these subjects were not atypical of back pain patients participating in previous studies, the assumption can be made that mean MMPI scale scores for successful and unsuccessful subjects are essentially

equivalent for this and other studies. The more pertinent analysis has to deal with the content and factor loadings of the particular items selected as discriminating.

It should be noted here that the two types of analysis (traditional scale configuration versus item analysis) complement one another, but are not directly comparable. For example, the fact that in the present study two items on the Hypochondriasis scale were significant discriminators does not mean that unsuccessful subjects as a group scored an average of 2 points (raw score) higher than successful subjects on this scale. The true difference in scale elevation would be a function of the differential in successful and unsuccessful subjects' percentage of endorsement of all items on this scale, not merely these discriminating at a pre-set level. A generally valid rule of thumb, however, would indicate a positive correlation between mean elevation of a given scale and the number of significant items belonging to that scale.

With this in mind, results of the item analysis do suggest both similarities and differences with respect to previous outcome studies -- similarities, insofar as numerous items from the Depression, Psychopathic Deviate and Schizophrenia scales proved to be significant predictors, and differences insofar as numerous items from the F scale proved significant. Why this particular

difference should exist is at least partially explicable by referring to previous publications concerning the F scale. This is a validity scale monitoring test-taking attitude, and high scores on this scale may indicate either a deliberately distorted self-description which claims fictitious mental symptoms in the attempt to escape responsibilities or "an exaggeration of existing difficulties to gain attention and assistance" (Lachar, 1974, p. 2). These interpretations can be reasonably discounted among chronic pain patients, the great majority of whom are notorious for their denial of psychological problems. Attention must therefore be directed to Blumberg's (1967) finding that the degree of F scale elevation is a good indicator of the severity of psychiatric disturbance. Where this finding applies, according to Lachar (1974), the testee is likely to be extremely self-deprecatory and suffering from severe stress. This appears to be the best interpretation of the data obtained here, as these are often-documented elements of the typical pain-patient profile. However, since no previous research has cited the F scale as a clinical predictor for this population, further interpretation of this finding should await independent confirmation by future research.

Another apparent anomaly in the present findings is the relative paucity of discriminating items belonging to the Hypochondriasis (two items) and Hysteria (four

items) scales. In fact, the two items belonging to the first scale also comprise two of the four items on the second. This appears contradictory to previous findings that high elevations on these scales are the most significant and consistent predictors of poor treatment outcome. Assuming that results of the current research are valid and that they are congruent with previous findings, the only possible explanation is that, even though a considerable number of items on these scales may have been endorsed more frequently by unsuccessful than successful subjects, thus yielding higher mean scores for unsuccessful subjects, for only a very few items did difference in rate of endorsement reach statistical significance. This explanation is completely plausible and, as stated above, simply illustrates that scale analysis and item analysis provide complementary results.

In this respect suggestions by Sternbach (1974) regarding a more refined approach to configural interpretation are worthy of some attention. He suggested that analysis of personality differences between successful and unsuccessful subjects could best proceed from an examination of four MMPI profiles frequently obtained by low back patients, which he designated as typical of hypochondriasis, reactive depression, somatization, and manipulative reaction. These four profiles were reviewed at length in Chapter III. They are of relevance to this

study because their main features bear some correspondence to the profiles obtained by statistical analysis of the 45 discriminating items. Direct comparison of these profiles and the factors obtained in this study is difficult because, as mentioned above, the presence of significant items does not directly translate into elevations on a particular scale. Nevertheless, each factor does suggest a response set, whose equivalent is the configuration of several scale scores.

The most obvious profile-to-factor relationship is between the manipulative reaction profile and Factor 3. The manipulativeness, aggression, guile, and hostility of the sociopathic personality typify the two response sets. There is strong reason to suspect that these are, in fact, health-system sociopaths, the work-weary, legally involved, secondary-gainers, and/or those who simply derive satisfaction from frustrating the clinical team's attempts to relieve their pains.

The hypochondriasis profile appears most closely related to Factor 1. Health complaints not typically associated with low back pain are present. Dependency conflicts with the family and the health care system appear likely with each. Schizophrenic elements of self-alienation indicate the severity of the condition. Sternbach noted that these patients have a poor prognosis and continue to seek medical help after discharge.

Factor 4 most closely approximates the characteristics of reactive depression. Such a depression has likely resulted from the repeated failure of attempts to cope with and find relief from pain. Patients' pre-pain lives were not symptom-centered. There are indications of social and religious interests and involvement, together with a basic trust in one's own judgment, all of which bode well for such patients developing a life apart from pain. Sternbach contends that prognosis is more favorable for this than for any other group.

The somatization or conversion-V profile bears a striking resemblance to Factor 6. The characteristic elements appear to be a rigid defense system based to a great extent on physical health complaints, denial of any social non-conformity, and elements of dependency. Especially interesting in Factor 6 is the occurrence of Item 243 as the highest loading item: though admitted to a clinic for chronic pain, patients affirming this item steadfastly maintain that they have few or no pains. This appears to be an absurd and contradictory assertion to deny pathology and to protect precarious self-esteem.

The correspondence of these four factors with generally recognized profiles characteristic of low back pain is an encouraging aspect of this study, and lends a certain credibility to the results. It also indicates that other factor-profiles may be typical of this population

and worth attempting to interpret. The items loading on Factor 2 do not seem evident of psychoneurotic involvement. There are few, if any, indications of an abnormal profile. In this respect one is reminded foremost of the "organic" classification of back pain patients first established with the MMPI by Hanvik (1951) and recently partially supported by Freeman, Calsyn, and Louks (1976). Hanvik found no evidence of neuroticism among these patients, while Freeman et al. found minor elevations on the neurotic triad scales.

Factor 5 indicates conflicts in familial relationships and sexual identification. Whether or not for the patients profiled in this factor such conflicts are indicative of poor treatment outcome is unclear. Nevertheless, the literature on chronic low back pain frequently indicates difficulties within the immediate family, where pain is used as means of manipulating conflict and of meeting unfulfilled dependency needs. One recent study has strongly emphasized the importance of directly treating such pathology within the family in order to best insure treatment progress and a favorable outcome (Hudgens, 1979). Pathology detected by Hudgens in families with either spouse suffering from chronic pain included extreme dependency, indirect communications, narrow social contacts, inability to handle anger appropriately, sexual conflicts, a general power struggle between spouses, and conflict over male-female roles. Such observations support

the plausibility of the item-complex represented by Factor 5.

The most heavily weighted item on Factor 7 concerns disease phobia, even though there are no significant loadings of items dealing with poor health or health complaints. Such a profile strongly suggests hypochondriasis, linking low self-esteem and compulsive attention to one's physical condition. Precisely this aspect of hypochondriasis, in contrast to recital of varied physical complaints, has been delineated in a recent article by Meister (1980). Obviously, even though no major health concerns are evident on the item-loadings, these patients have focused hypochondriacal attention on their musculo-skeletal system, as indicated by their admission to the clinic.

Dependency, depression, and passive agression are the most salient characteristics included in Factor 8. Again one is reminded of the possibility of interpersonal conflict and manipulation. These are general characteristics of low back pain patients often cited in the literature, and they typify the personality functioning of patients scoring high on the neurotic triad of MMPI scales. More specific indications are difficult to interpret from this factor.

These comparisons provide a general confirmation of the results obtained in this and previous research.

Even though no opportunity was available to crossvalidate the 45 items significant for the total sample population, the relevance of the factor analysis to previous research findings supported the validity of the items as predictors of treatment outcome. Whether or not these eventually prove to be the best 45 items for inclusion in a predictive subscale, and how such a subscale can best be used in screening applicants for treatment, remains to be determined by future research. It is apparent, however, that a scale consisting of approximately 45 items would allow not only the computation of a total scale score but also the accurate identification of factors to be considered in the design of individual treatment programs.

Limitations of the Study. Pain is a subjective experience. There are no standardized methods to evaluate or measure pain relief. Lacking such methods, and given the debatable validity of the patient's verbal report, such reports were supplemented with behavioral criteria as measures of treatment outcomes in this study. These, also, were not standardized, but did conform to general clinical consensus.

All subjects in the study were selected from former patients of the Ingham Medical Center Low Back and Pain Clinic, Lansing, Michigan. No attempt was made to control for the sex, age, marital status, educational differences or other demographic variables in the sample

population. Findings of this research are therefore limited to the subjects who took part in the study but can be generalized by the Cornfield, Tukey, Bridge Argument (1956) to populations similar to the group of subjects studied.

Although potential respondents identified for this study were not atypical of chronic low back pain patients participating in treatment programs throughout North America, those actually participating in the study selected themselves by their decision to respond to the mailed questionnaire or telephone inquiry. Given this fact of self-selection, it is not inconceivable that the 185 subjects in the sample population represented a subset of former patients with certain personality characteristics not normally distributed among originally identified potential respondents. For example, successful respondents may have had greater needs for dependency or affiliation than successful non-respondents, while unsuccessful respondents may have been more hostile or more passive-aggressive than unsuccessful non-respondents. Similarly, several former patients still pursuing legal claims expressly declined to respond at risk of jeopardizing their cases, and approximately seven percent of the mailed questionnaires were returned by the postal service as undeliverable, so that legal involvement and mobility also affected response rates. Either of these could have

been associated with personality factors that would have been reflected in patients' MMPI responses and, therefore, in the item analysis.

Another sampling limitation is the number of subjects who participated in the study. The considerable differences in number, content, and significance level of discriminating MMPI items selected from the full sample population's records as opposed to the records of a randomly selected two-thirds of this population, indicate insufficient stability of the chi-square with this sample size and nearly 400 variables. The stability of the 45 items significant for the total sample population remains to be determined by future crossvalidation.

Attention should also be directed to the varying time intervals per subject from completion of treatment to follow-up. For the subjects responding, this interval ranged from six to forty-two months. In the course of three and one-half years many personal and environmental variables may have emerged to mitigate the once positive effects of treatment. Work lay-offs caused by the state of the economy, death or injury to significant others, familial break-up, could all have caused, directly or indirectly, the changes in vocational or health status associated with treatment outcome as measured by the Pain Survey.

A final possible source of invalidity is instrumentation. A major goal of the clinic program is to assist patients to cope with pain that may not be relieved by treatment. Several respondents expressly noted their appreciation of this treatment component when responding to the questionnaire, most often as a rationale for their decision not to seek further medical care. This dimension of treatment, however, was not measured systematically by the questionnaire. Presumably, it could have been incorporated in the third criterion question, concerned with continued efforts to find medical help, or it could have been measured by a fifth criterion question. With favorable response to this dimension considered indicative of successful outcomes such an adjustment might then have resulted in a shift of certain subjects from the unsuccessful to the successful category.

Implications for Future Research

Of major importance in research correlating patient personality characteristics with treatment outcome for chronic low back pain is the establishment of basic criteria for determining success in treatment. Relevant research published in the 1970's, the decade during which the multidisciplinary approach to pain has emerged as a viable treatment concept, has not been based on standardized measures of treatment outcome. The measure developed and employed in the present study, the Pain

Survey, was meant to provide a standardized instrument based on self-reported behavioral and affective/evaluative rating criteria most commonly cited in the literature. In research concerned with the personal experience of pain and the impact of pain on patient lifestyles, it is clear that both the more objective/behavioral and the more subjective/evaluative dimensions of treatment must be measured. Future inclusion of a question concerned with treatment impact on the ability to cope with pain would appear to increase the validity of the outcome measure.

A major issue with respect to standardization of outcome measures concerned the impact of time elapsed after treatment on such factors as pain relief and continuation of vocational and everyday life activities. Assessment of outcome at "one year or more after treatment" appears to be the modal interval among related studies, though selection of this time interval is nowhere defended or explained. It would appear important to determine some norms detailing long-term effect of multidisciplinary treatment which could serve as guidelines in conducting post-treatment studies, in order more sharply to differentiate between treatment effects due to personality characteristics and effects related to the passage of time.

Based on the potential contribution and the limitations of the present study, the following indications for future research are offered for consideration:

1) Further development and standardization of the Pain Survey as an instrument measuring outcome of treatment for chronic low back pain.

2) A study of the effects of time on the outcome of multidisciplinary treatment for chronic low back pain, with a view to clarifying possible interaction between personality factors and the passage of time.

3) Sampling of a larger percentage of identified potential respondents, either through personal interview or repeated mail and telephone follow-up, to control for the possible error introduced by self-selection of respondents.

4) Use of a larger sample to improve robustness of the chi-square test of item discrimination, and comparison of results with the 45 items selected here or, in lieu of this, cross-validation of the 45 items on an available sample. Either procedure would constitute a next step in the development of a scale with sufficient power to accurately predict outcome of treatment for chronic low back pain.

5) A thorough examination and consideration of the resulting content-related item-response factors to determine the extent to which these should be specifically addressed by therapeutic programs attempting to rehabilitate the chronic low back pain patient.

6) An examination of the relationship between socio-economic status/level of employment and the personality profiles of chronic low back pain sufferers. It seems reasonable to hypothesize, for example, that unemployed, unskilled, and semi-skilled members of the work force would be more likely to manifest the manipulative reaction associated with anger, rebelliousness, acting-out, and secondary gain, whereas skilled and managerial employees may typically manifest other profiles (perhaps somatization).

7) Comparison of factors here identified as related to failure in chronic low back pain treatment with factors related to failure in treatment for other chronic syndromes, e.g., migraine and tension headaches, colitis, dysmenorrhea. Findings of similarity among these factors may lead to identification of a general "chronicity profile" associated with resistance to medical and psychological treatment.

Conclusions

The research conducted here may best be considered exploratory. Limitations with respect to sampling procedures and especially sample size did not allow final development of a diagnostic instrument and the ascertaining of its validity, reliability, and practical utility.

The design of research and analyses of the data did, however, permit some progress to be made toward this

goal. An apparently valid treatment outcome measure was developed. A 24-item Back Treatment Success Scale was constructed which proved moderately significant in cross-validation. This result supported the assumption that patients who benefit from chronic low back pain treatment differ from those who do not in their response to specific items on the MMPI, an obvious condition for the development of a predictive subscale.

The test of item-discrimination applied to the MMPI records of the total sample and subsequent analyses of the 45 best discriminating items provided further support for the feasibility of eventual scale-construction. The content of these items to a large extent coincided with psychological characteristics previously identified as critical in determining outcome of treatment for chronic low back pain. Additionally, a statistical factor analysis revealed patterns of response to these items which were congruent with previously identified pain-patient profiles. These results suggest that the 45 MMPI items here selected and analyzed possess considerable validity as indicators of treatment outcome, and may serve as a basis for the construction of a scale as was here intended. A task remains for future research to test the extent of their reliability as a next step in the development of a scale with practical utility.

APPENDICES

APPENDIX A

PAIN SURVEY

APPENDIX A

PAIN SURVEY

NAME _____

DATE OF BIRTH _____

EDUCATION (highest grade completed) _____

CURRENT EMPLOYMENT _____

(CHECK ONLY THE ONE BEST ANSWER TO EACH QUESTION)

1. How did the treatment at the Ingham Low Back and Pain Clinic affect your pain?

____a. relieved all or most of my pain.

____b. relieved some pain.

____c. relieved pain only for a while, or not at all.

2. How did the treatment affect your ability to work and carry on normal activities?

____a. I am able to do my normal work and be just about as active as I like.

____b. I have been able to return to less strenuous work and activities.

____c. Because of continued pain I have not been able to return to work or to many of my normal activities.

3. Since your treatment, have you continued to seek medical help for your back pain?

____a. No, because I have no more pain.

____b. No, because my pain doesn't bother me as much any more.

____c. I want to, but I can't afford the time or money for more treatment.

____d. No, because I have lost all faith in doctors and specialists to cure my pain.

____e. Yes, I am still seeing a doctor or specialist.

____f. I am still looking for a doctor or specialist who can relieve my pain.

4. What effect has the treatment had on your life in general?

____a. helped very much, I'm very satisfied.

____b. helped enough that I'm mostly satisfied.

____c. helped so little that I'm not very satisfied.

____d. did not help at all, I'm disappointed.

Part II

YES NO

___ ___ 1. Does pain keep you from falling asleep at night?

___ ___ 2. Are you awakened by pain during the night?

___ ___ 3. Do you often drink to deaden the pain, or feel like it?

___ ___ 4. Do you have to lie down and rest often because of pain?

___ ___ 5. Are you afraid to be without your pain medicines?

___ ___ 6. Does pain interfere with your marriage or family life?

___ ___ 7. Does pain interfere with your sex life?

___ ___ 8. Are you unable to do the things you want because of pain?

___ ___ 9. Do you find that all you can think about is your pain?

___ ___ 10. Do you have fewer friends or go out with friends less often because of pain?

SUGGESTIONS FOR IMPROVING THE CLINIC _____

_____

_____

OTHER COMMENTS _____

_____

_____

APPENDIX B

COVER LETTER ACCOMPANYING PAIN SURVEY

APPENDIX B

COVER LETTER ACCOMPANYING PAIN SURVEY

Dear Patient:

We are sending out this questionnaire to a small number of patients treated in the past at the Ingham Medical Center, Low Back and Pain Clinic. We are hoping to obtain new knowledge that will be of help in treating patients coming through the program today.

Please complete these questions to the best of your ability and return the questionnaire today in the self-addressed envelope which is provided. Your responses are, of course, confidential and will not be part of your medical record, nor will they, in any way, influence your future treatment.

The goal of this survey is to better understand and effectively treat the chronic pain patient coming through the Clinic.

Thank you very much for your prompt attention to this questionnaire. If you have any questions, please do not hesitate to contact the Low Back and Pain Clinic at Ingham Medical Center. The phone number is:

Once again, thank you for helping us with this questionnaire.

APPENDIX C

ENDORSEMENT PERCENTAGES FOR MMPI FORM-R ITEMS BY SUCCESSFUL VS. UNSUCCESSFUL SUBJECTS (N = 185)

APPENDIX C

ENDORSEMENT PERCENTAGES FOR MMPI FORM-R ITEMS
BY SUCCESSFUL VS. UNSUCCESSFUL SUBJECTS (N = 185)

Item #	More Frequent Response U[a] (%)[b]	S[c] (%)[d]	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
1	F (53)	F (59)	.530	22	F (81)	F (78)	.769
2	T (83)	T (92)	.129	23	F (80)	F (90)	.090
3	F (77)	F (67)	.209	24	F (84)	F (88)	.608
4	F (86)	F (78)	.205	25	F (76)	F (69)	.372
5	T (69)	T (78)	.201	26	F (52)	F (52)	.942
6	F (73)	F (67)	.454	27	F (88)	F (94)	.295
7	T (56)	(50:50)	.503	28	F (83)	F (89)	.351
8	F (62)	T (72)	.178	29	F (64)	F (72)	.397
9	F (87)	F (92)	.385	30	T (79)	T (82)	.794
10	F (86)	F (88)	.832	31	F (76)	F (84)	.266
11	F (75)	F (77)	.965	32	F (72)	F (80)	.304
12	T (58)	T (53)	.670	33	F (63)	F (69)	.429
13	F (52)	F (62)	.256	34	F (83)	F (89)	.365
14	F (75)	F (69)	.440	35	F (95)	F (93)	.843
15	F (55)	F (60)	.617	36	F (64)	F (60)	.664
16	F (86)	F (92)	.396	37	T (86)	T (83)	.769
17	T (92)	T (89)	.798	38	F (59)	F (59)	.897
18	T (54)	T (62)	.380	39	(50:50)	(50:50)	.951
19	F (86)	F (88)	.870	40	F (85)	F (86)	.883
20	T (64)	T (59)	.618	41	T (51)	F (54)	.573
21	F (66)	F (72)	.489	42	F (90)	F (94)	.466

[a] Unsuccessful subjects

[b] Percentage of unsuccessful subjects endorsing this response

[c] Successful subjects

[d] Percentage of successful subjects endorsing this response

Item #	More Frequent Response U (%)	S (%)	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
43	T (57)	T (52)	.584	76	F (74)	F (77)	.742
44	F (72)	F (76)	.692	77	F (55)	F (56)	.903
45	F (58)	F (54)	.684	78	T (52)	T (51)	.983
46	F (56)	T (59)	.080	79	T (53)	F (56)	.304
47	F (72)	F (75)	.784	80	F (85)	F (84)	.942
48	F (90)	F (92)	.807	81	T (51)	T (53)	.885
49	F (95)	F (100)	.147	82	F (76)	F (62)	.057
50	F (91)	F (93)	.854	83	T (96)	T (93)	.583
51	F (81)	F (79)	.920	84	T (54)	F (54)	.364
52	F (85)	F (83)	.975	85	F (97)	F (100)	.377
53	F (85)	F (88)	.726	86	F (73)	F (62)	.155
54	T (92)	T (91)	.998	87	F (76)	F (78)	.319
55	T (60)	T (69)	.273	88	T (92)	T (92)	.862
56	F (85)	F (81)	.606	89	F (63)	F (66)	.812
57	T (70)	T (68)	.858	90	T (90)	T (91)	.839
58	T (65)	T (71)	.604	91	F (51)	F (68)	.034
59	T (56)	T (56)	.892	92	F (77)	F (77)	.945
60	T (80)	T (95)	.009	93	F (54)	F (65)	.191
61	F (70)	F (84)	.044	94	F (58)	F (65)	.367
62	T (76)	T (77)	.994	95	F (71)	F (56)	.064
63	T (55)	T (60)	.707	96	T (77)	T (80)	.856
64	F (64)	F (61)	.802	97	F (76)	F (87)	.110
65	T (89)	T (88)	.932	98	T (72)	T (81)	.245
66	F (84)	F (84)	.918	99	F (59)	F (66)	.427
67	F (54)	F (56)	.871	100	T (57)	T (54)	.876
68	F (68)	F (69)	.929	101	T (77)	T (79)	.890
69	F (88)	F (96)	.103	102	T (74)	T (75)	.945
70	F (67)	F (53)	.149	103	F (53)	F (51)	.896
71	T (65)	T (70)	.532	104	F (87)	F (96)	.069
72	F (74)	F (82)	.264	105	T (88)	T (90)	.917
73	T (67)	T (74)	.441	106	F (80)	F (92)	.057
74	F (60)	F (60)	.905	107	T (80)	T (84)	.633
75	T (93)	T (99)	.189	108	F (78)	F (85)	.328

Item #	More Frequent Response U (%)	S (%)	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
109	F (64)	F (68)	.483	142	T (73)	T (62)	.153
110	F (89)	F (91)	.973	143	F (70)	F (72)	.878
111	F (55)	F (65)	.234	144	F (88)	F (88)	.825
112	T (79)	T (69)	.215	145	F (77)	F (88)	.099
113	T (94)	T (100)	.098	146	F (85)	F (88)	.780
114	F (76)	F (79)	.700	147	F (59)	F (62)	.827
115	T (69)	T (85)	.023	148	F (61)	F (72)	.204
116	F (75)	F (81)	.445	149	F (67)	F (66)	.921
117	F (57)	F (64)	.426	150	T (69)	T (74)	.605
118	F (67)	F (67)	.841	151	F (97)	F (100)	.373
119	T (73)	T (80)	.380	152	F (52)	F (51)	.985
120	F (57)	F (55)	.884	153	F (57)	F (53)	.715
121	F (91)	F (97)	.142	154	T (91)	T (92)	.910
122	T (84)	T (86)	.817	155	F (62)	F (60)	.926
123	F (93)	F (99)	.130	156	F (86)	F (95)	.094
124	T (60)	F (51)	.160	157	F (81)	F (86)	.563
125	F (75)	F (83)	.313	158	F (68)	F (68)	.877
126	F (59)	F (55)	.692	159	F (65)	F (79)	.062
127	50:50	T (60)	.256	160	F (96)	F (95)	.881
128	T (69)	T (66)	.793	161	F (74)	F (71)	.766
129	F (53)	F (55)	.818	162	F (54)	F (54)	.887
130	T (72)	T (78)	.470	163	F (73)	F (74)	.928
131	T (64)	T (78)	.068	164	T (84)	T (84)	.846
132	T (66)	T (72)	.529	165	F (71)	F (67)	.684
133	T (86)	T (78)	.203	166	T (58)	T (56)	.962
134	T (69)	T (85)	.025	167	F (84)	F (74)	.152
135	T (76)	T (85)	.179	168	F (95)	F (94)	.904
136	F (68)	F (73)	.589	169	T (85)	T (89)	.568
137	T (82)	T (85)	.687	170	F (59)	F (58)	.998
138	T (51)	T (53)	.720	171	T (54)	T (64)	.248
139	F (89)	F (96)	.198	172	F (57)	F (58)	.919
140	T (74)	T (78)	.686	173	T (60)	T (73)	.120
141	F (59)	F (55)	.667	174	T (51)	T (58)	.482

Item #	More Frequent Response U (%)	S (%)	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
175	T (56)	T (67)	.199	208	T (52)	F (52)	.755
176	(50:50)	T (51)	.999	209	F (95)	F (96)	.942
177	T (97)	T (99)	.829	210	F (96)	F (100)	.227
178	T (82)	T (90)	.251	211	F (85)	F (94)	.089
179	F (74)	F (79)	.534	212	F (91)	F (96)	.361
180	F (55)	F (62)	.442	213	F (91)	F (97)	.187
181	F (63)	F (63)	.930	214	T (56)	T (53)	.822
182	F (86)	F (89)	.699	215	F (64)	F (83)	.008
183	F (51)	T (56)	.442	216	F (85)	F (84)	.987
184	F (91)	F (97)	.136	217	T (69)	T (64)	.499
185	T (76)	T (90)	.030	218	F (91)	F (97)	.148
186	F (63)	F (77)	.064	219	F (76)	F (69)	.370
187	T (66)	T (87)	.004	220	T (92)	T (99)	.086
188	F (57)	F (51)	.476	221	T (63)	T (63)	.911
189	F (74)	F (72)	.990	222	F (67)	F (68)	.985
190	T (53)	T (53)	.943	223	F (62)	F (74)	.123
191	F (69)	F (63)	.512	224	F (69)	F (76)	.416
192	T (52)	T (58)	.533	225	T (75)	T (91)	.013
193	T (75)	T (85)	.140	226	T (62)	T (66)	.680
194	F (85)	F (91)	.382	227	F (95)	F (92)	.581
195	T (80)	T (84)	.638	228	T (80)	T (83)	.699
196	T (95)	T (91)	.369	229	F (79)	F (78)	.983
197	F (93)	F (99)	.173	230	F (52)	T (61)	.096
198	T (67)	T (66)	.920	231	F (64)	F (60)	.664
199	T (76)	T (81)	.499	232	F (64)	F (59)	.629
200	F (92)	F (91)	.923	233	F (77)	F (67)	.190
201	F (57)	F (55)	.907	234	T (56)	T (51)	.599
202	F (89)	F (93)	.510	235	T (55)	T (59)	.706
203	F (80)	F (82)	.917	236	F (84)	F (77)	.354
204	F (81)	F (84)	.807	237	F (56)	T (51)	.502
205	F (96)	F (100)	.228	238	T (65)	T (64)	.952
206	F (81)	F (81)	.856	239	F (60)	F (65)	.560
207	T (78)	T (77)	.975	240	F (72)	F (78)	.448

Item #	More Frequent Response U (%)	S (%)	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
241	F (73)	F (65)	.336	274	F (51)	T (56)	.480
242	T (60)	T (56)	.766	275	F (90)	F (95)	.338
243	F (91)	F (99)	.084	276	T (90)	T (97)	.129
244	T (51)	F (56)	.528	277	F (70)	F (81)	.134
245	F (88)	F (90)	.792	278	F (76)	F (61)	.037
246	F (94)	F (92)	.770	279	F (88)	F (92)	.499
247	F (89)	F (97)	.092	280	F (71)	F (77)	.473
248	F (73)	F (51)	.005	281	T (68)	T (77)	.250
249	T (63)	T (78)	.052	282	F (69)	F (53)	.048
250	F (63)	F (67)	.654	283	F (61)	F (68)	.500
251	F (89)	F (78)	.072	284	F (65)	F (78)	.065
252	F (92)	F (87)	.313	285	T (93)	T (93)	.947
253	T (79)	T (75)	.727	286	F (92)	F (93)	.938
254	F (75)	F (71)	.728	287	T (52)	T (55)	.751
255	T (63)	T (64)	.950	288	F (84)	F (88)	.578
256	F (93)	F (90)	.703	289	T (82)	T (89)	.252
257	T (89)	T (84)	.498	290	T (52)	F (59)	.222
258	T (97)	T (100)	.377	291	F (94)	F (99)	.261
259	F (65)	F (70)	.514	292	F (78)	F (65)	.074
260	F (58)	F (75)	.035	293	F (91)	F (92)	.967
261	(50:50)	T (54)	.703	294	T (68)	T (74)	.471
262	T (76)	T (73)	.742	295	T (57)	T (71)	.099
263	F (60)	F (63)	.782	296	T (69)	T (74)	.616
264	F (55)	F (56)	.940	297	F (80)	F (86)	.484
265	F (79)	F (84)	.527	298	F (74)	F (83)	.230
266	F (71)	F (53)	.024	299	F (68)	F (60)	.351
267	F (60)	F (58)	.921	300	F (67)	F (64)	.804
268	T (60)	T (77)	.037	301	F (69)	F (78)	.294
269	F (96)	F (97)	.968	302	T (86)	T (85)	.958
270	F (67)	F (54)	.110	303	F (73)	F (75)	.898
271	F (80)	F (85)	.501	304	T (64)	T (71)	.374
272	T (72)	T (87)	.033	305	F (78)	F (75)	.792
273	F (52)	T (55)	.466	306	T (92)	T (93)	.924

Item #	More Frequent Response U (%)	S (%)	Significance	Item #	More Frequent Response U (%)	S (%)	Significance
307	F (67)	F (73)	.487	340	T (54)	T (62)	.345
308	F (64)	F (63)	.964	341	F (89)	F (88)	.852
309	T (83)	T (78)	.546	342	F (82)	F (83)	.969
310	T (65)	T (68)	.881	343	F (59)	F (74)	.076
311	F (60)	F (60)	.874	344	F (93)	F (88)	.474
312	F (91)	F (96)	.369	345	F (84)	F (80)	.661
313	T (65)	T (70)	.650	346	F (81)	F (71)	.188
314	F (66)	F (66)	.923	347	T (79)	T (88)	.183
315	F (94)	F (96)	.833	348	F (57)	F (57)	.930
316	T (56)	F (56)	.180	349	F (85)	F (86)	.962
317	F (62)	F (63)	.913	350	F (91)	F (90)	.953
318	T (72)	T (76)	.745	351	F (85)	F (87)	.831
319	F (58)	F (69)	.221	352	F (83)	F (87)	.602
320	F (83)	F (84)	.952	353	T (57)	T (54)	.823
321	F (55)	F (54)	.962	354	F (94)	F (97)	.534
322	T (60)	T (52)	.373	355	F (98)	F (93)	.218
323	F (66)	F (81)	.055	356	F (63)	F (71)	.415
324	F (96)	F (99)	.576	357	F (71)	F (77)	.474
325	F (59)	F (64)	.574	358	F (87)	F (84)	.775
326	F (85)	F (77)	.263	359	F (57)	F (60)	.840
327	T (74)	T (81)	.383	360	F (89)	F (94)	.397
328	F (75)	F (86)	.144	361	F (52)	T (51)	.844
329	F (68)	F (66)	.971	362	F (63)	F (65)	.897
330	F (66)	F (59)	.431	363	F (95)	F (100)	.161
331	F (95)	F (96)	.910	364	F (86)	F (90)	.690
332	F (74)	F (81)	.390	365	F (88)	F (91)	.664
333	F (95)	F (91)	.528	366	F (81)	F (76)	.518
334	F (83)	F (80)	.719	367	T (74)	T (60)	.081
335	F (82)	F (76)	.402	368	T (58)	T (60)	.990
336	F (63)	F (65)	.885	369	F (56)	F (57)	.978
337	F (73)	F (73)	.862	370	F (62)	F (65)	.890
338	T (56)	F (51)	.515	371	T (58)	T (58)	.920
339	F (93)	F (97)	.401	372	T (56)	T (52)	.646

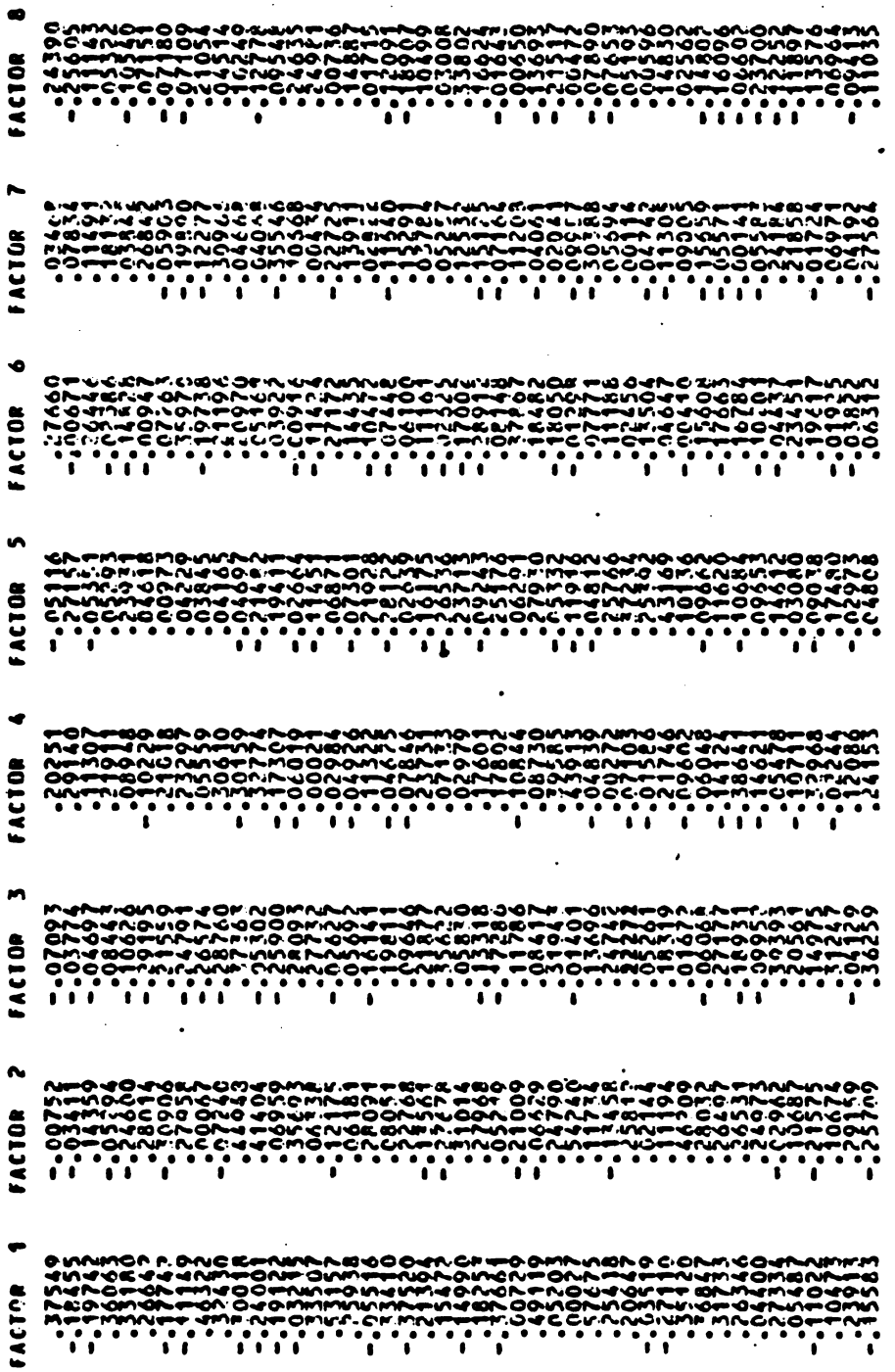
Item #	More Frequent Response U (%)	S (%)	Significance
373	F (77)	F (81)	.661
374	F (54)	T (51)	.644
375	T (74)	T (60)	.104
376	F (81)	F (85)	.692
377	F (59)	F (59)	.928
378	F (63)	F (66)	.862
379	T (72)	T (68)	.699
380	T (74)	T (83)	.237
381	F (66)	F (63)	.757
382	T (62)	T (58)	.740
383	F (57)	(50:50)	.453
384	T (57)	T (64)	.483
385	T (54)	T (53)	.933
386	T (58)	T (54)	.764
387	T (71)	T (69)	.935
388	F (84)	F (79)	.540
389	F (63)	F (67)	.720
390	T (84)	T (77)	.364
391	F (69)	F (54)	.089
392	T (71)	T (55)	.050
393	F (78)	F (78)	.882
394	T (77)	T (68)	.244
395	F (78)	F (84)	.460
396	T (65)	T (56)	.344
397	T (57)	T (59)	.960
398	F (74)	F (76)	.957
399	F (69)	F (58)	.198

APPENDIX D

LOADINGS ON EIGHT FACTORS OF 45 MMPI FORM-R ITEMS DISCRIMINATING BETWEEN 76 SUCCESSFUL AND 109 UNSUCCESSFUL PATIENTS TREATED FOR CHRONIC LOW BACK PAIN

APPENDIX D

LOADINGS ON EIGHT FACTORS OF 45 MMPI FORM-R ITEMS DISCRIMINATING BETWEEN 76 SUCCESSFUL AND 109 UNSUCCESSFUL PATIENTS TREATED FOR CHRONIC LOW BACK PAIN



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