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Alexithymia toward the empirical validation of a construct.

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ALEXITHYMIA: TOWARD THE EMPIRICAL VALIDATION OF A CONSTRUCT

by

Karen Cohen

B.A., McGill University, 1980

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ABSTRACT

The aim of this study was to examine whether the Archetypal $_9$ Test (AT_9) which purports to measure one of the central features of alexithymia -- the inhibition of symbolic function -- could meet the need for a test that adequately measures the alexithymic trait-cluster. Participants in this study included 30 patients drawn from a Pain Management Unit at the Royal Victoria Hospital in Montreal, 31 patients drawn from a Pain Clinic at the Henry Ford Hospital in Detroit, and 30 patients undergoing minor surgery at the Royal Victoria Hospital in Montreal. All 91 subjects took both the AT_9 test and the Clarke Vocabulary Scale. Results indicated that the objectively scored AT_9 test (SAT_9) measured the inhibition of symbolic function in agreement with judgements of this made by projective interpretation of the test; in a multiple regression, $F = (11,32) = 4.79$, $p < .002$. The author also found that the SAT_9 discriminated between patient groups (pain-patients and medical patients) and that scores indicating the absence of inhibition of symbolic function among the combined pain-patient groups were lower than these scores were among the medical patients, $t\ (89) = 3.29$, $p = .001$. The SAT_9 is significantly related to age ($r = -.37$, $t\ (42) = -2.58$, $p < .044$) and to occupational level ($r = -.46$, $t\ (42) = -3.36$, $p < .045$). Finally, scoring weights for the SAT_9 were derived which will enable future researchers to classify patients reliably into alexithymic and non-alexithymic groups; in the present study, this classification was reliable, $\chi^2(7, N = 91) = 28.97$, $p < .001$. The author discussed the theoretical and clinical importance of accurately identifying the alexithymic trait-cluster in psychsomatic patients. In making suggestions

for future research, the author pointed out the importance of appropriate comparison groups, the influence of voluntary participation upon SAT_9 scores, and the impact of the relationship between SAT_9 scores and age and occupational level.

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CHAPTER I

INTRODUCTION

> If any one of these various steps the child is taking in growing up could be viewed in isolation, it might be said that the ability to spin fantasies beyond the present is the new achievement which makes all others possible - because it makes bearable the frustrations experienced in reality. (Bettelheim, 1977, p. 125)

"Alexithymia", a term first coined by Sifneos in 1973, is used to summarize a cluster of behaviours shown by many patients suffering from psychosomatic disorders (Krystal, 1979; Nemiah, 1975, 1977; Nemiah & Sifneos, 1970; Pierloot & Vinck, 1977). Literally it means "no words for feelings" (Sifneos, 1973). The condition, or clinical entity, "alexithymia", was defined at the Heidelberg conference of the European Society for Psychosomatic Research in 1976 (Sifneos, 1982). In the 10 years since Sifneos coined the name, the hypothesis that there is a group of people who cannot name their emotions has received extensive support. These people have difficulty in verbalizing and/or recognizing feelings, have a diminished ability to fantasize and a corresponding inability to symbolize and express affect, and express thought, which is exceptionally concrete (Apfel & Sifneos, 1979; Demers-Desrosiers, 1982; Lesser, 1981; Neill & Sandifer, 1982; Nemiah, 1975; Nemiah & Sifneos, 1970; Sifneos, 1973; Sifneos, Apfel-Savitz, & Frankel, 1977; Thayler-Singer, 1977; Vogt, Burckstummer, Ernst, Meyer, & Von Rad, 1977; Von Rad, Drucke, Krauss, & Lolas, 1979; Von Rad, Lalucat, & Lolas, 1977). People who have these characteristics also rarely dream, rarely cry, and tend to handle conflict in an action oriented manner (Sifneos et al., 1977).

The alexithymic experiences undifferentiated emotion and often cannot determine whether he is sad, tired, hungry, or ill (Krystal, 1979, 1982). This point was well illustrated by Taylor's ("Psychiatric Chore", 1982) statement:

> If you have an argument with your boss and then imagine a confrontation or even a physical fight, you know you're angry,...But these people go home with a headache and don't even know why. (p. 82)

Blumer and Heilbronn (1982) and Krystal (1982) have suggested that emotions which are experienced in an undifferentiated manner are often expressed and experienced somatically. Other authors have reported on the somatic emphasis in alexithymics as well as on their corresponding intolerance to the psychological dimensions of their difficulties (Borens, Gross-Schutle, Jaensch & Koitemme, 1972; Blumer & Heilbronn, 1982; Thayler-Singer, 1977; Von Rad et al., 1977).

Krystal (1982) suggested that the cognitive aspects of affect such as anxiety can be dealt with only if internal symbolization of the conflict is possible. In fact, the capacity for fantasy and symbolization allows for the formation of neurotic defenses. In the absence of fantasizing and symbolizing ability the individual is left only with the physiological aspect of the affective response and is hence predisposed to experience it somatically and as well to develop psychosomatic illness. The alexithymic is therefore unable to use emotion as a signal, and it is consequently only this physiological event that is experienced.

Nemiah and Sifneos (1970) observed that alexithymics associate to external events rather than internal fantasy and that this underlies the concrete nature of their cognitive processes. These authors contend that this patient group is stimulus-bound rather than drive-determined. Typically when pressed for the feelings they have surrounding an event, alexithymics recount further details of the event. In addressing this observation, Krystal (1979) maintains that they are overadapted to reality and in this sense are antipsychotic. Their inability to create neurotic defenses however characterizes them as antineurotic. Nemiah (1975) also maintains this alexithymia neurotic distinction because of the alexithymics' restriction of affect and fantasy. Vogt et al. (1977) maintain that fantasy serves as an intermediary between drive and action and hence allows the id to rehearse a trial action in an internal and representational manner. Therefore, the alexithymic cannot use fantasy to achieve independence from the concrete situation. As a result, they use action to resolve conflict.

It is clear from the foregoing description of the alexithymic trait cluster that it is characterized by a lack of function rather than by a presence of function peculiar to it (Borens et al., 1977). In his review of the 1976 Psychosomatic Research Conference in Heidelberg on alexithymia, Wolff (1977) maintained that alexithymia is not a new entity which was discovered but rather a cluster of certain psychological disturbances which were recognized. Indeed in his work with patients suffering chronic pain, Engel (1959) has long recognized the psychological mechanisms which are extant in chronic somatic disorders. It is particular to alexithymia however that it is based on the therapist's description and is not something of which the patient or referring physician complains (Apfel & Sifneos, 1979). I would suggest, however, that if a patient complains of the traits characteristic of alexithymia he would not be alexithymic.

Finally, it should be stressed that not all psychosomatic patients are alexithymic nor do all alexithymics have psychosomatic disorders (Lesser, 1981; Neill & Sandifer, 1982; Shipko, 1982; Thayler-Singer, 1977). It is true, however, that the observations that gave rise to the formualtion of alexithymia as a clinical entity were based on psychosomatic patient samples.

Theoretical Foundation

Many mechanistic theories have been offered to account for the development and maintenance of alexithymia. In his very comprehensive theoretical article, Nemiah (1977) suggested that alexithymia is the result of a faulty perceptual, biological, or psychological system with which to respond to an affect-provoking situation. Affect is understood to incorporate a biological component (emotion) and a psychological one (feelings) expressive of thought and fantasy (Sifneos et al., 1977). According to Nemiah (1977) the difficulty therefore lies within this stepwise affective process: perceiving the external event, becoming biologically aroused, consciously labelling feelings, linking words appropriate to feelings, producing fantasies expressive of the feelings, and producing memories and associations that are tied to feelings.

Several authors have distinguished two types of alexithymia, and most authors have agreed that alexithymia is not an all or nothing phenomenon (Demers-Desrosiers, 1982; Freyberger, 1977; Krystal, 1982; Lesser, 1981; Sifneos, 1982). Primary alexithymia has been alleged to have a dispositional or pre-oedipal origin. Such an early-developed disorder may be considered an arrest in cognitive and affective development involving an absence of the capacity to fantasize. The secondary form, however, is believed to be a reaction to an external stress or trauma occurring later in life. It represents a regression in cognitive and affective development and it is qualitatively less severe. Secondary alexithymics theoretically possess fantasizing ability but have learned to ignore the results of this fantasizing or at least not to verbalize these fantasies.

Nemiah (1977) has proposed three theoretical models borrowed from psychosomatic theory which could account for the etiology of alexithymia and its frequent co-occurrence with psychosomatic disorders or somatic presentation. The deficit model originally formulated by Marty and De M'Uzan (1963) as pensee operatoire or concrete-operational thinking, maintains that psychosomatic symptoms are a result of specific ego deficits, specifically lack of capacity to form fantasies and to experience feelings. This model is best suited to account for primary alexithymia. According to this model, the causes of alexithymia are found in early mother-child interactions. Several authors hold to this view (McDougall, 1974, Vogt et al., 1977; Zepf, Liedtke, Berns, Arnold, Hartmann, & Wagner, 1981). They propose that the deficient fantasizing ability results from an early failure of the infant to develop an internally represented or introjected mother figure. This results from trauma in the early mother-child relationship, when either all or none of the child's instinctual demands are met. This failure to develop a mental image of mother sets a precedent for future representational deficits; as a result, the adult is entirely dependent upon the concrete presence of the love object.

The second theory proposed to account for alexithymia is a theory of denial (Nemiah, 1977). Its assumptions are that all affect and fantasy are globally defended against. It is therefore a model of secondary alexithymia, because it allows for the presence of fantasizing ability and hence for the reversal of the defensive process.

Finally, the structural models of alexithymia presuppose an absence of or defect in the neuronal pathways providing information about affect or an absence or defect in the neuronal centers registering this information. Nemiah (1977) and Flannery (1977) have suggested that there may be a disturbance in the brains of alexithymics in the connection between the limbic system and cortical centers.

Empirical Evidence

As pointed out by Lesser (1981), Neill and Sandifer (1982), and Von Rad and Lolas (1982), alexithymia is a construct in search of validation. They have justly criticized researchers in this area for the fact that copious theories have been offered but few have been operationalized and given an empirical test.

Sifneos (1973) proposed the Beth Israel Psychosomatic

Questionnaire (BIQ) as a measure of alexithymia. The BIQ is composed of 17 items, eight of which are used to detect the presence of the alexithymia trait cluster. This questionnaire is completed by the clinician following a clinical interview with the patient. To be considered alexithymic, a patient must get a positive score on six of the eight items. In his initial 1973 investigation, Sifneos observed that the average score of 25 psychosomatic patients on the BIQ was twice as high as that of a mixed group of psychoneurotics. Pierloot and Vinck (1977), administered the BIQ to a group of 50 referrals to an outpatient psychiatry unit and observed that BIQ scores were negatively correlated with intelligence for both actual IQ scores and clinician's estimates of intelligence. BIQ scores also had a negative correlation with socioeconomic status and with education. Although Pierloot and Vinck did not observe a relationship between BIQ scores and MMPI scale scores, they did report positive correlations between the BIQ and the somatic complaints scores on the Psychological Status Schedule and between BIQ scores and the patients' somatic worries. Pierloot and Vinck also observed that alexithymics were more apt to drop out of psychodynamic psychotherapy than out of systematic desensitization therapy. Alexithymics persisted as well as nonalexithymics in systematic desensitization. The psychodynamic therapy dropouts were more alexithymic than the patients who persisted.

In studying the neuroanatomical models of alexithymia, Hoppe and Bogen (1977) examined the BIQ scores of 12 patients who had received commissurotomies for severe epilepsy. (In view of the prodigious work of Sperry and his colleagues, it is surprising that commissurotomies are still performed.) The authors reported that this patient group got very high scores on the BIQ. Clinically they observed that commissurotomied patients demonstrated a paucity of dreams, fantasies, and symbols. Their dreams had few symbols, and the symbols they did use were concretistic. Similarly the fantasies they did have lacked imagination and were very pragmatic. Hoppe and Bogen suggested that alexithymics suffer from "functional commissurotomies".

Also investigating the structural mechanisms of alexithymia, Kaplan and Wogan (1976/77) created an experimental analogue of the alexithymic mechanism. The authors, working from the assumptions that linguistic functioning resides in the left hemisphere of the brain, whereas visual-spatial abilities such as fantasy reside in the right hemisphere, predicted that the mobilization of fantasy process in the right hemisphere should be associated with a decrease in pain reported in the laboratory when painful stimulation was applied to the finger. This is indeed what they found. When subjects were given instructions to think of their fingers as a piece of rubber, this instruction mobilized right hemisphere function as measured by EEG. Such fantasy was associated with a decrease in the subjective report of pain. Kaplan and Wogan concluded that when subjects are given such a visualization instruction they reassemble its meaning into visual imagery; according to the authors, this linguistic fantasy process is prerequisite to managing painful stimulation. When subjects do not have a "successful linguistic fantasy program" (Kaplan & Wogan, 1976/77, p. 152) to cope with painful stimulation, the subjects maintain verbal, left-hemisphere functioning, and therefore cannot control their experienced pain.

Sifneos and Apfel-Savitz (1977) also reported on the use of the Schalling Sifneos Questionnaire (SSQ), a 25-item, self-report inventory to measure alexithymia. Apfel and Sifneos (1979), however, concluded that the results they obtained with SSQ were erratic. Furthermore, this test did not correlate with the BIQ.

In 1981, Blanchard, Arena, and Pallimeyer factor analyzed the SSQ, reporting that the items loaded on three factors: difficulty in expressing feelings and events, importance of feelings (especially those towards others), and daydreaming-introspection. To test the hypothesis that the SSQ and the construct of alexithymia are novel, rather than simply providing new names for extant psychopathology, Blanchard et al. included patients' scores on the Beck Depression Inventory, on the State-Trait Anxiety Inventory, on the Rathus Assertiveness Scale, and on the Psychosomatic Symptom Checklist in the factor analysis. None of these scores loaded significantly on any of the three SSQ factors. Blanchard et al. found that SSQ scores were orthogonal to depression, assertiveness and state anxiety but were correlated with scores on the Psychosomatic Symptom Checklist and concluded that alexithymia was a unique construct. Blanchard et al.'s sample was drawn from a college student population. These authors reported that two percent of female and eight percent of male students were alexithymic, as measured by the SSQ. Pierloot and Vinck also observed that BIQ scores were orthogonal to MMPI scale scores; however, the orthogonality between the BIQ and the SSQ makes any corroboration of pathology independence impossible.

Shipko (1982) used the SSQ to assess 12 somatizers, 15 people with psychosomatic disorders and 27 individuals with no somatic complaints or psychosomatic illness. They observed that the somatic group scored significantly higher than normals and significantly higher than the psychosomatic group. Whereas the psychosomatic group had one of the seven classical psychosomatic illnesses, the somatic group all reported chronic pain. The authors did not control for age, sex, intelligence, race, or socioeconomic status. It is worth noting that other investigators had found correlations between alexithymia and age and that the subjects in Shipko's control group were quite a bit younger than those in the other two groups. If age is indeed a covariate which must be taken into account, the author's results may be invalidated by their failure to control for it.

Fava, Baldaro, and Osti (1980) used an Italian translation of the SSQ on a group of 20 hypertensive patients and on 20 cardiovascular patients with other than hypertensive disorders. The hypertensive group was significantly more alexithymic as assessed by the SSQ. In a group of 46 intestinal patients, these authors found a significant negative correlation between the SSQ and the extraversion scale of the Maudsley Personality Inventory.

Other investigators, using established test instruments, have adapted them to detect the alexithymic trait-cluster. Von Rad, Drucke, Knauss, and Lolas (1979) and Von Rad and Lolas (1982) utilized the Gottschalk-Gleser scale to content analyze the verbal behaviour of psychosomatic patients in a clinical interview. They reported that psychosomatic patients demonstrated less guilt, shame, and separation anxiety and less hostility inwards than psychoneurotic patients. This appears contradictory to Engel's (1959) formulation. Engel conceptualized the psychosomatic condition as an aggression which was self-directed. Von Rad and his colleagues (1979) did not control for education or occupation. They maintained that verbal behaviour depends upon these factors, but their psychosomatic group had lower socio-economic status and lower education than their psychoneurotic sample. They state, however, that lower socio-economic status correlates with higher Gottschalk-Gleser values. There is an inherent difficulty with the authors' methodology. They are not proposing the Gottschalk-Glaser scale as a measure of alexithymia but rather as a measure of the affective expression of psychosomatic patients. As was mentioned earlier, psychosomatic patients are all not necessarily alexithymic.

In 1977, Von Rad et al. addressed the deficit model of alexithymia by operationalizing the mother-child interaction that is supposedly the origin of the trait cluster. They used an open-ended story, asking their subjects - a group of psychoneurotics and a group of psychosomatics - to complete it. In this story the mother-child relationship was explicit. The story climaxed with the separation of mother and child. The authors reasoned that the story would encourage patients' to participate affectively as they identified with the main character in the story (the child). Von Rad et al. reported that the psychosomatic group used few words, fewer affect-laden words, and fewer adjectives and adverbs in completing the story than did the psychoneurotic group.

The Rorschach has also been used to detect the presence of alexithymia in patient groups. Vogt et al. (1977) operationalized their proposed theory that fantasy serves as an intermediary between drive and action by assessing fantasizing ability based on specific content, movement, and colour criteria in Rorschach responses. They reported that psychosomatic patients displayed a more restricted experience type in terms of modality, showed less emotional ability to experience themselves and the outer world, and gave fewer simultaneous human-movement and colour responses than a psychoneurotic group. They reported, however, that the Rorschach cannot distinguish alexithymic from depressive traits. These authors controlled for age, sex, IQ, and social class. They had observed that IQ in the average and subaverage range influences fantasizing ability.

Borens, Grosse-Schutte, Jaensch, and Kortemme (1977) also utilized the Rorschach, reporting that alexithymia occurs more or less exclusively in psychosomatic patients who are of a lower social class and have corresponding lower IQs as compared to upper class psychosomatic patients. This is inconsistent with Von Rad et al.'s 1979 results that social class is negatively correlated with affective expression in Gottschalk-Gleser content analysis of verbal behaviour. Borens et al., however, did not consider whether any covariate of social class such as psychological mindedness might have reduced the differences. Neither did they control for age or use a normal sample as a control. Perhaps upper-class psychosomatics are more alexithymic than normals.

Kleiger and Dirks (1980) developed an MMPI scale for measuring alexithymia. The items were derived by examining BIQ scores for 60 asthmatic true and false responders on each MMPI item. As determined by _t_ tests, if BIQ scores differed significantly for true and false responders, the item was included in the scale. The MMPI alexithymia scale correlated .66 with the BIQ. Of the 22 items in this scale, one reflected impoverished fantasy, two reflected denial of affect, and two reflected preoccupation with somatic cues. The alexithymia scale has poor internal consistency, as is true for many other MMPI scales as well.

Mendelson (1982) reported on the use of the MMPI alexithymia scale in a sample of 60 chronic pain patients, 28 of whom scored as alexithymic. Several factors appeared to influence the alexithymia score. Among these were increasing age, increased pain duration, and less pain intensity at initial consultation. He did not observe any significant difference between alexithymics and non-alexithymics in social class or in their Zung depression scores, trait anxiety, state anxiety, or hostility. Once again it is impossible to corroborate the independence of alexithymia from other psychopathological conditions because of the different measures used to assess the construct. In fact, in a recent investigation by Demers-Desrosiers, Cohen, Catchlove, and Ramsay (1983) chronic pain patients' BIQ scores showed no correlation with their MMPI alexithymia scores. Mendelson may be criticized for his statistical treatment of his results. He used a series of $\underline{t}$ tests for each dependent measure, which results in an inflated type I error rate. He would have done well to use a Hotellings $\underline{T}^2$ procedure instead.

The MMPI was also used by Feiguine, Hulihan, and Kinsman (1982) to assess a group of asthmatic patients. The authors also reported a significant correlation between MMPI alexithymia scores and age. They concluded that either their group were secondary alexithymics, or deficits in neuronal pathways were aged related, or sociocultural variables related to age contribute to the expression of alexithymic characteristics.

Several comments are in order regarding the diverse instruments currently being used to measure alexithymia. Lesser (1981) and Von Rad and Lolas (1982) have remarked that the BIQ is highly dependent upon the structured clinical interview upon which it was created. Its efficient use is also dependent on interviewing experience and skill on the part of clinicians. These authors have remarked as well that patients' BIQ scores may be more a function of interviewers' skill in eliciting affective material than of the actual affective ability of the patient. The BIQ therefore provides no external validity for the construct itself.

The Schalling-Sifneos scale to date has not been tested for its external validity. As mentioned by Apfel and Sifneos (1979) results using the SSQ are erratic and it does not correlate with the BIQ. The MMPI lacks internal validity as well as external validity in that Kleiger and Dirks created it based on their study of an asthmatic patient sample and did not test it on any other patient group. In addition, its derivation was based on BIQ scores; because the BIQ itself has not been adequately validated, the MMPI scale leans on a week reed.

Von Rad and his colleagues' use of the Gottschalk-Gleser scale is subject to query. First, they implicitly assume that psychosomatic patients are alexithymic; and, second, they have not adequately operationalized the theory they wish to test. By examining verbal behaviour they are addressing the observation that alexithymics cannot verbally express their feelings. However, content analyzing their self reports does not answer the important question as to whether alexithymics cannot recognize their feelings or just cannot verbally express them. Vogt et al.'s use of the Rorschach to detect the fantasy syndrome provokes skepticism, especially as concerns their somewhat cryptic remark that the Rorschach cannot distinguish alexithymic from depressive traits. This may suggest that either the differences between these traits are subtle or that the material elicited due to the nature of the test cannot reflect any existing differences. Theirs, however, was a more adequate means of operationalizing theories on the role of fantasy in the affective process. The same may be said of the open-ended story used by Von Rad et al. This method, however, has not been tested for internal or external validity.

Lesser (1981) maintained that alexithymia is being perceived as an established construct prematurely, because it lacks empirical validation. Certainly this is part and parcel of the relatively recent introduction of the term and its theoretical base. It is clear however that a reliable and valid instrument must be created or adapted in order to validate the construct itself and to answer the many questions that have been proposed. Whatever it is that researchers have been measuring, however, appears to be independent of other psychopathological traits and appears to be correlated with age, intelligence, and social class. Clinicians are generally in agreement that these patients are often not suited to dynamic psychotherapy, at least not without modifications (Flannery, 1978; Krystal, 1979; Krystal, 1982; McDougall, 1982; Nemiah, 1975; Nemiah & Sifneos, 1970; Pierloot & Vinck, 1977; Sifneos, 1973; Sifneos, Apfel-Savitz & Frankel, 1977). I can conclude, therefore, that an adequate empirical test of the construct would indeed be useful. As Wolff (1977) said, we must ask clearly defined and specific questions.

Aims

It is my intent to address the need for an empirically testable instrument which measures the alexithymic trait cluster. I have examined whether the Archetypal$_9$ Test (AT$_9$) can fulfill this need. This test purports to measure specific and clearly defined functions. It operationalizes the theory of alexithymia in a realistic way. Although its objectives may not be as ambitious as those of many other instruments proposed to measure alexithymia, the specificity of this test enhances its chances of achieving good reliability and validity.

The AT_9: Theory and Function

The AT_9 test operationalizes G. Durand's theory of imagination (G. Durand, 1971). In his work entitled Les Structures Anthropologiques de L'Imaginaire (G. Durand, 1969), Durand maintains that access to the mechanisms of imaginative function is by way of individuals' manipulation and integration of symbols. He maintains that the function of imagination is to master time and death through internal representation of these concepts. The objective of the imagination therefore is to decrease the anxiety elicited by negative experiences encountered throughout time. This is consistent with theories of alexithymia which propose that fantasy enables effective defense against anxiety (Krystal, 1982; Marty, de M'Uzan, & David, 1974; Vogt et al., 1977). G. Durand further proposes two subfunctions of the imagination. First to create images of death and time represented symbolically through the integration of meaning and image and second to create images of life triumphing over death. The structure of the imagination can symbolize these images in three orientations: the heroic, the mystical, and the synthetical.

The AT_9 test created by Y. Durand (1967) presents the subjects with nine symbols which they are asked to integrate into a drawing. They are then asked to provide a written explanation for the drawing, and answer an accompanying questionnaire, all in a self-administered format. The symbols with which the subject creates a mythical micro-universe are a fall, water, devouring monster, fire, refuge, sword, animal, character, and something cyclical (that turns or progresses).

The imagination therefore will seek to decrease the anxiety common to the negative experiences with the devouring monster, water, and fall. The subject therefore must resolve the anxiety elicited by some of the items, using other items for that purpose. The agent of resolution is therefore the character and the tools for resolution are the sword, refuge, or cyclical element. The sword represents the heroic orientation, the refuge represents the mystical, and the cyclical element characterizes the synthetical theme. The heroic myth revolves around the character's physical aggression against anxiety, the mystical myth revolves around the home as a defense against anxiety, and the synthetical myth seeks transitory resolution with the recognition that anxiety is omnipresent and therefore defending against danger characterizes life across time. The remaining items are accessory, serving to reinforce the constructed myth.

Deficient imaginative processes as measured by the subject's symbolic function and referred to as inhibited symbolic function will manifest itself in the subject's inability to create a myth. They will be unable to defend against anxiety and unable to integrate the meaning (story) and image (drawing) of the symbol.

Demers-Desrosiers (1982) has documented the use of the AT_9 test as a measure of symbolic function in a group of patients with psychosomatic complaints. The obstruction to the generalizability of the AT_9, however, was that projective interpretation of the protocols was heavily reliant on the examiner's knowledge of G. Durand's theory on the structure of imagination. Cohen, Demers-Desrosiers, and Catchlove (1983) addressed this issue and developed a quantifiable method for scoring the AT_9

protocols (SAT_9) based upon correlations with their ranked projective counterparts (PAT_9).

In a sample of 30 chronic pain patients, these authors found that the SAT_9 correlated .91 with PAT_9 rankings. The interrater reliability of the SAT_9 was .93 between two raters for the rated protocols from the same chronic pain patient sample ($p < .001$). The scoring procedure is reported extensively elsewhere (Cohen et al., 1983). Nevertheless, some reference to it is in order. Positive scores on the SAT_9 were assigned whenever any of the nine items were included in the drawing and the story, and whenever they were ascribed a meaning or symbol. In addition, the interaction of the items in the drawing and story received a positive score. In accordance with G. Durand's theory certain interactions received less weight than others in that they suggest an acknowledgement but provide an inadequate resolution of the elicited anxiety. The scoring weights which were chosen were those in which the total SAT_9 score produced the highest correlations between the SAT_9 and PAT_9 rankings. In a subsequent report on the SAT_9, Catchlove et al. (1982) observed in the same group of pain patients, significant positive correlations between the SAT_9 and age, but found that the SAT_9 was uncorrelated with the Depression, Hysteria, Hypochondriasis, Schizophrenia, or Social Introversion scales of the MMPI. SAT_9 scores were also unrelated to pain location, sex, educational level, and pain duration. Demers-Desrosiers et al. (1983) observed that the SAT_9 significantly correlated −.47 with the BIQ but was uncorrelated with the MMPI alexithymia scale scores for a subset of 12 pain patients for whom both scores were available. The SAT_9 BIQ correlation was statistically significant.

Building on this work, I attempted to establish the ability of the SAT_9 to detect the inhibition of symbolic function in additional patients suffering from chronic pain and in non-chronic, medical patients. In order to ascertain the contribution of SAT_9 scale subscores, the author coded each content area dichotomously. I used these scores along with other covariates (age, sex, and socioeconomic status) to derive a multiple regression equation, making use of the data from a previous sample of alexithymics and normals in order to derive scoring weights. The criterion variable was Demers-Desrosier's classification of the patients into alexithymic and normal groups, based on her projective interpretation of the protocols (Cohen et al., 1983). The scoring weights derived from the original sample were then tested upon new chronic pain and new non-chronic-medical patient groups. The author also computed a discriminant analysis of the new sample to determine whether different scoring weights would better discriminate among the patient groups.

Hypotheses

I hypothesized that the SAT_9 would detect the inhibition of symbolic function and that this inhibition would be greater for chronic pain patients than for non-chronic medical patients. I expected that SAT_9 scores would be influenced not only by diagnostic group but also by age, IQ, and occupational level, as has been observed by other researchers with other instruments.

CHAPTER II

METHOD

Subjects

The Montreal pain-patient group included 30 patients from the Pain Management Unit of the Royal Victoria Hospital in Montreal. There were 21 females and nine male patients in the sample. This group had an average age of 48.7 years.

The patients included in the study had to be able to speak, read, and write English. The author defined chronic pain operationally as pain of longer than six months duration which is disproportionate to the organic sources of pain that can be medically documented. Because previous investigation had indicated that SAT_9 scores are unrelated to the location of pain, patients with varied complaints of chronic pain were included (Appendix A). However, I excluded patients with a malignancy or a metastatic process. The first 30 patients referred to the Pain Management Unit, who met these selection criteria, constituted the sample.

To test the generality of our findings, I obtained a usable sample of 31 pain patients from the Pain Clinic at the Henry Ford Hospital in Detroit. There were 20 females and 11 males. This group had an average age of 41.6 years.

The author recruited the patients of the Detroit pain-patient group through a series of unselected referrals to the Henry Ford

Pain Clinic. Patients with malignant disease processes were excluded from this group as they were from the Montreal sample. Similarly, patients were included irrespective of pain location as long as their pain was of longer than six months duration (Appendix A). All patients spoke, read and wrote English. Although 43 patients met these criteria, only 31 patients agreed to participate and completed the testing.

Thirty-nine patients were drawn from a medical-patient population in Montreal. These people were in-patients admitted to hospital for minor surgical procedures, such as surgery for varicose veins, cyst removal, and tonsillectomy (Appendix A). Hospitalization for all of the various procedures was of 3-4 days duration. In addition, patients in whom it was medically determined that other chronic or malignant disease processes were evident, were not included in the medical-patient group. All subjects spoke, read, and wrote English. Although 39 patients met these criteria, nine refused to participate with the study. Of the remaining 30 patients, 16 were female and 14 were male. The group was, on average, 31.8 years of age. The medical-patient group provided an appropriate comparison because they had a medical problem that was not chronic.

Materials

The materials included both the AT_9 test (Durand, 1967) and the Clarke Vocabulary Scale (Paitich, 1977). The At_9 test was administered in accordance with Durand's instructions (1967). Patients were told that they had 30 minutes to complete the drawing section but were allowed more time if it was necessary. Questions concerning task directions were answered. Subjects drew the pictures and wrote their explanations in pencil. They were not allowed to erase anything.

The Clarke Vocabulary Scale is a multiple-choice test which consists of 40 words for each of which the subjects were instructed to choose one out of four possible definitions. All subjects were given as much time as they needed to complete the test.

Procedure

The Montreal pain-patients completed the AT_9 test and the vocabulary scale as part of routine assessment procedures prior to the first clinical interview. These instruments were therefore included in the battery routinely used by the Pain Management Unit for assessment. While all of the Montreal pain-patients completed the AT_9 test prior to beginning treatment, some patients, of necessity, received the vocabulary scale after treatment began. Because IQ is stable during adulthood, I did not anticipate any confounding to result from this procedure.

The Detroit pain-patients voluntarily completed both the AT_9 test and Clarke Vocabulary Scale prior to beginning treatment. In both Detroit and Montreal, those staff members responsible for testing at these clinics administered all the tests.

The author administered the AT_9 and vocabulary scale to the medical-patient group. Both tests were given on the day the patients came into hospital, before the day of their surgery. Patients were informed about the research purpose of the testing, and they were able to freely decide to participate in the research or not. In addition, the medical patients were required to sign a hospital-approved consent form which attested to their understanding of the research being done and their willingness to participate with it. Testing was done in the patients' hospital rooms.

The author used data from a previously tested group to derive scoring weights for the AT_9. These weights were derived from a multiple-regression that included age, sex, and occupation as covariates. The social status of the previously examined group of patients was estimated from their occupational level, using the 7-point occupational scale of Warner, Meeker, and Eells (1957). In the event that a patient's occupation was not classifiable according to Warner et al., the author used Blishen's scale of occupation by income (1958) to place the occupation at the appropriate level.

Because it is difficult enough to get sizable samples in a medical setting without matching, and matching would decrease the size of the usable sample, the Montreal and Detroit pain-patient groups and the medical group were not matched on age, sex, or occupational level. Rather, in the event that these variables showed a significant relationship with the criterion in the previously examined group of patients, they were included as covariates of SAT_9 scores in the statistical analyses of the present patient-groups. Since IQ scores were not available for the previously examined group, IQ was used as a covariate in the present analyses. In addition, distinguishing features between the pain-patient groups were examined in relation to SAT_9 scores.

Analysis

Analysis of preliminary study. AT_9 protocols of a previously examined group of 44 patients were used to derive SAT_9 score weights. Based on projective interpretation of these protocols, some had been designated as alexithymic and some as normal with respect to alexithymia. These protocols were rescored using the SAT_9 system since the previously assigned weighted scores could not be used. Instead, each item was scored dichtomously as to its presence or absence in the protocol. Thus dichotomous scores indicated whether an item was included in the drawing, story, role, and symbol sections of the questionnaire, indicated whether item interactions were present in the drawing and story, and indicated whether these interactions reflected a resolution of the elicited anxiety for each of the nine items.

The fact that there were 144 items but only 44 subjects in this preliminary study created a problem for the data analysis. If one were to include all 144 items in a multiple regression, in the attempt to choose items that would predict the categorizations of the subjects that had been made by free-hand analysis of the test, the prediction would be perfect -- but only because there are more items than subjects. To make use of multiple regression, therefore, one must reduce the number of predictor variables to a set that is smaller than the sample size. The author did this by grouping items into clusters. I proposed an a priori grouping of the items into 38 clusters and then sought empirical support for the reasonableness of the groupings.

Two of the 38 clusters consisted of those items which were included in the drawing and explanation (Cluster 1) and were included in the role and symbol sections of the questionnaire (Cluster 2). There were 18 items in each of these clusters. The remaining 36 clusters each consisted of three items -- an interaction in the drawing, that same interaction in the explanation, and the resolution of that interaction -- for a total of 108 items.

To check on the appropriateness of the 38 a priori clusters, the author randomly divided the 144 items into six sets of 24 items. I used the Alberta clustering program (Burnett, 1969) on each of these sets. The results supported the reasonableness of the grouping I had made a priori. A full report of these clustering results is included in the results chapter.

Having reduced the variables to 38, the author then worked to achieve a further reduction in the number of variables. (The reader should be reminded that the 38 clusters preserve information provided by all the 144 original items, because the clusters - which have high internal consistency - are simply sums of the original items.) I did this by applying the SAS Varclus program (SAS, 1982) to the 36 clusters. The remaining two clusters were not clustered because they contained relatively few items, all of which differed qualitatively from those items contained in the 36 clusters. The analysis of the 36 clusters yielded nine clusters for a total of 11 when the two remaining clusters were added. Each of the nine clusters embraced more of the original items than the clusters of the 36-cluster set did. The results section gives details of this SAS cluster analysis and of its results.

The author then did a multiple regression analysis, using the 11 cluster variables along with age, sex, and occupational level (as covariates), to predict the free-hand categorizations of the patients. This analysis provided preliminary weights to be used in combining the variables into an overall SAT_9 score, and also allowed the author to drop variables that did not contribute to prediction. The covariates were included in this analysis in order to make it possible to have a test that would be effective despite the influence of demographic variables.

Analysis of the main study. The Clarke Vocabulary Scale was scored in accordance with the instructions of Paitich (1977). Raw scores on the Clarke scale were converted into age-scaled centiles, using Paitich's table.

Using the scoring weights for the SAT_9 provided by the analysis of the preliminary study, the author then proceeded to compare pain subjects with control subjects on the composite score computed from these weights. The SAT_9 scores of the pain subjects were compared with the scores of the medical subjects of the comparison group, using an analysis of covariance with IQ as a covariate, and also using an analysis of variance. The author compared the Montreal pain-group with the medical group, and a combined pain-group (Montreal and Detroit subjects together) with the medical group.

The analysis just described combined the cluster-scores according to weights that had been determined on the preliminary sample. In order to find out whether different cluster weights would discriminate among the groups better, the author also computed a discriminant analysis. In order to avoid an estimate of the effectiveness of the discrimination that capitalizes on chance, an anlaysis was done using split groups and cross-validation. For future application of the test, however, weights derived from the total sample of 91 are most appropriate; therefore a discriminant analysis of the total sample was also computed.

CHAPTER III

RESULTS

Analysis of Preliminary Study

Cluster analysis. Tables 1 and 2 present a grid of the 144 dichtomously scored items in the SAT_9. The 38 clusters which the author defined a priori are shown in Table 3. The Alberta cluster program (Burnett, 1969), which was used to cluster six sets of 24 randomly chosen variables, yielded results which support the reasonableness of the author's a priori groupings of 38 clusters. The six sets of 24 randomly chosen variables resulted in a total of 32 clusters, 26 of which (81.25%) were identical to the author's a priori groupings. All of the 32 clusters had high internal consistency. The median K-R 20 for the 32 clusters was .825. The actual clusters produced by the six sets of randomly chosen variables are presented in tabular form in Appendix B. (It should be noted that, for example, in the first set of items, the fourth, ninth, and eighteenth items were chosen from the eight consecutive sets of 18 items producing 24 items which were then cluster analyzed. The same procedure was followed for the remaining five sets of items, however, different random items were used.)

The Alberta cluster analysis of the third and fifth sets of random variables produced fewer clusters than any of the other sets of random variables. This result occurred because the cluster program terminates when values become so small that they are unmanageable

TABLE 1

Grid of Dichotomously Scored Items: Included Items

Symbols	Drawing	Explanation	Role	Symbol
	Item Numbers 1 - 36			
Fall	1	10	19	28
Sword	2	11	20	29
Refuge	3	12	21	30
Devouring Monster	4	13	22	31
Cyclical	5	14	23	32
Character	6	15	24	33
Water	7	16	25	34
Animal	8	17	26	35
Fire	9	18	27	36

TABLE 2

Grid of Dichotomously Scored Items: Interaction in Drawing (D), Interaction in Explanation (E), Resolution of Interaction (R)

	ITEM NUMBERS 37 - 144							
	Sword	Refuge	D. Monster	Cyclical	Character	Water	Animal	Fire
	D E R	D E R	D E R	D E R	D E R	D E R	D E R	D E R
Fall	37 73 109	38 74 110	40 76 112	43 79 115	47 83 119	52 88 124	58 94 130	65 101 137
Sword		39 75 111	41 77 113	44 80 116	48 84 120	53 89 125	59 95 131	66 102 138
Refuge			42 78 114	45 81 117	49 85 121	54 90 126	60 96 132	67 103 139
D. Monster				46 82 118	50 86 122	55 91 127	61 97 133	68 104 140
Cyclical					51 87 123	56 92 128	62 98 134	69 105 141
Character						57 93 129	63 99 135	70 106 142
Water							64 100 136	71 107 143
Animal								72 108 144

TABLE 3

Thirty Eight A Priori Clusters

Cluster	Items	Cluster	Items
C1	1 - 18	C20	54, 90, 126
C2	19 - 36	C21	55, 91, 127
C3	37, 73, 109	C22	56, 92, 128
C4	38, 74, 110	C23	57, 93, 129
C5	39, 75, 111	C24	58, 94, 130
C6	40, 76, 112	C25	59, 95, 131
C7	41, 77, 113	C26	60, 96, 132
C8	42, 78, 114	C27	61, 97, 133
C9	43, 79, 115	C28	62, 98, 134
C10	44, 80, 116	C29	63, 99, 135
C11	45, 81, 117	C30	64, 100, 136
C12	46, 82, 118	C31	65, 101, 137
C13	47, 83, 119	C32	66, 102, 138
C14	48, 84, 120	C33	67, 103, 139
C15	49, 85, 121	C34	68, 104, 140
C16	50, 86, 122	C35	69, 105, 141
C17	51, 87, 123	C36	70, 106, 142
C18	52, 88, 124	C37	71, 107, 143
C19	53, 89, 125	C38	72, 108, 144

computationally. It is probable that too many subjects received a score of 0 on the particular items included in the third and fifth random sets of variables.

Although a priori Clusters 3 through 38 each contain only three items, Clusters 1 and 2 each contain 18 items. Therefore, in any of the six random sets of items, only three items would be included which were included in a priori Cluster 1 and three from a priori Cluster 2. It is interesting to note, however, that the Alberta cluster analysis did not bring together the items of a priori Clusters 1 and 2 but did group a priori Cluster 1 items with each other and Cluster 2 items with each other. This result therefore provides some empirical support for maintaining the first two a priori clusters as separate clusters. The results also indicate that the interaction and resolution items (see Table 2) are more similar to themselves than they are to the included items (see Table 1). One may conclude from this that Tables 1 and 2 present two discrete measurements of the SAT_9.

In summary, the obtained clusters indicate that it is reasonable to cluster items which are included in the drawing and explanation with each other and to cluster items which are included in the role and symbol sections of the questionnaire with each other. It is also reasonable to cluster items that describe an interaction of symbols in the drawing with items designating an interaction of these same symbols in the explanation and with the items designating the resolution of that same interaction. Because there are nine symbols in the test, this allows for 36 possible interactions in the drawing, 36 possible interactions in the explanation, and 36 possible interactions for the resolution. If these three categories are clustered, there are therefore 36 possible clusters in this part of the test (see Table 2).

Because the first part of the SAT_9 (Table 1) contains fewer items which, as shown by the Alberta cluster analysis, are qualitatively different from the many more items included in the second part of the SAT_9 (Table 2), the author therefore sought further reduction in the number of cluster variables through using Clusters 3 through 38, which embraced 108 of the 144 dichotomously scored items.

The SAS Varclus procedure (SAS, 1982) created 27 clusters from the original 36 clusters. However, it was my intent to have the fewest clusters possible which would retain the most information given by all 108 items separately. To this end, the author plotted the eigenvalues (which are the values obtained from the equation which describes the relationship between variables and subjects) and determined the point at which these values leveled out or stopped increasing. This procedure indicates that beyond the point at which the eigenvalues stop increasing, the addition of more clusters no longer substantially increases the amount of information contained in the model. The eigenvalues leveled out around the thirteenth cluster of the 27-cluster model obtained from the SAS Varclus procedure. This suggested that the 13-cluster model could describe the relationship between subjects and variables with little loss of information. It is important to note that this Varclus procedure was effected to reduce the number of cluster variables. The reduced number of clusters still included all 108 items.

In order to further test the reliability of the reduced cluster model, the author then examined the internal consistency of the several cluster models around and including the 13-cluster model. This was done using the SPSSX Reliability program (SPSS, 1983). At this point, the author added Clusters 1 and 2 (which incorporate Items 1 through 36) to the cluster models derived from the SAS Varclus procedure based on Clusters 3 through 38 (which incorporate Items 37 through 144). From now on each augmented cluster model will be named by the number of clusters in the SAS program, together with "(+2)" showing its augmentation by Clusters 1 and 2. The author then obtained reliability coefficients for each cluster in the 9 (+2), 11 (+2), 13 (+2), 17 (+2), and 23 (+2) cluster models. I then determined the median reliability coefficient (K-R 20) for each cluster model and chose the model which had the highest median K-R 20. The median K-R 20s for each of the cluster models ranged from .841 to .856. The 9 (+2) cluster model had the highest median K-R 20 (.856), and it was therefore this model that was used in subsequent multiple regression analysis.

The clusters in the 9 (+2) model showed low inter-cluster correlations (Table 4). This latter finding, in conjunction with the high internal consistency of the clusters, suggests that the items within a cluster are similar but items in different clusters are dissimilar, a desirable state of affairs. The items included in each of the clusters in the 9 (+2) model and the reliability coefficients for each of the 11 clusters are shown in Table 5.

<u>Multiple Regression analysis</u>. The 9 (+2) cluster model was entered

TABLE 4

Inter-Cluster Correlations for the 9(+2)-Cluster Variable Model

	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
C1	.34	.42	.26	.07	.32	.31	.16	.50	.19	.30
C2		.29	.17	.13	-.01	.24	.07	.27	.19	.07
C3			.04	.11	.22	.52	.15	.62	.41	.24
C4				.14	.15	.10	.12	.10	.10	.31
C5					.08	.22	.36	.06	.14	.18
C6						.19	.18	.06	.07	.00
C7							.25	.25	-.15	-.15
C8								.19	.21	.15
C9									.42	.35
C10										.46

TABLE 5

Incorporated Items and Reliability Coefficients for Each of the Clusters in the 9 (+2) Cluster Model

	CLUSTERS										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
Items	1-18	19-36	48,84,120 49,85,121 50,86,122	43,79,115 56,92,128 62,98,134 65,101,137 69,105,141	38,74,110 40,76,112 42,78,114 54,90,126	37,73,109 39,75,111 45,81,117 60,96,132 63,99,135 67,103,139 72,108,144	47,83,119 55,91,127 57,93,129	53,89,125 58,94,130 59,95,131 61,97,133 66,102,138 71,107,143	51,87,123 52,88,124 70,106,142	41,77,113 68,104,140	44,80,116 46,82,118 64,100,136
K-R 20	.886	.959	.908	.904	.852	.856	.812	.845	.805	.798	.891

into a multiple regression equation along with age, sex, and occupational level to predict the free-hand categorizations of the patients into alexithymic and non-alexithymic groups. This was done using the SPSSX program for Multiple Regression (SPSS, 1983). Occupational level was not available for eight of the 44 subjects. In order to control for the possible bias introduced by lack of the missing data, Cohen and Cohen's (1975) procedure for handling missing data was used. In this procedure, cases with missing data were not deleted but rather a dummy variable was created which dichotomously coded patients as to the presence or absence of occupational level. This dummy variable was included as another covariate in the regression equation. In this manner, I was able to determine whether the presence or absence of occupational level was predictive of the free-hand categorizations of the patients into alexithymic and non-alexithymic groups. As pointed out by Cohen and Cohen (1975), one cannot assume that cases with missing data are a random subset of cases.

In utilizing this procedure for handling missing data, Cohen and Cohen (1975) recommend using hierarchical multiple regression in which predictors are entered into the equation in an a priori theoretically derived order. Previous intestigation into the relationship between demographic variables and the SAT_9 (Catchlove et al., 1982) revealed that only age was significantly correlated with SAT_9 scores. Education and gender did not show a significant correlation with the SAT_9. However, the correlation between education and the SAT_9 was higher than the correlation between gender and the SAT_9. Based on this preliminary research, age was entered into the equation first, followed by occupational level, then the presence or absence of occupation, and finally gender. This hierarchical procedure controls for the chance prediction of a variable which bears no obvious relationship to the criterion.

When these four demographic variables are entered into the multiple regression equation without the 11 clusters, they account for 32% of the variance in the free-hand categorizations of protocols, F (4,39) = 4.60, $p < .004$. However, only age and occupational level account for a significant amount of criterion variance. Free-hand categorization of the protocols is negatively correlated with both age (r = -.37, t (42) = -2.58, $p < .044$) and occupational level (r = -.46, t (42) = -3.36, $p < .045$). Therefore, the inhibition of symbolic function increases with age and also increases as occupational level decreases.

When the 11 clusters are entered into the multiple regression equation without the demographic variables, they account for 62% of the variance in the free-hand categorization of protocols, F (11,32) = 4.79, $p < .0002$. The statistics for this multiple regression model are presented in Table 6. It is clear from this table that the model accounts for a highly significant percent of criterion variance. It is also apparent that the demographic variables account for a negligible increase in criterion variance (2%) after the clusters have been entered. Therefore, although the demographic variables account for a significant amount of criterion variance (32%), the 11 clusters can

TABLE 6

Multiple Regression Model with Eleven Clusters and Demographic Variables

Predictors Entering Model	Statistics for Regression Model			
	R^2	*F*	*p*	df
C1 - C11	.622	4.79	.0002	11, 32
C1 - C11, Age	.630	4.40	.0004	12, 31
C1 - C11, Age, Occupation	.633	3.98	.0009	13, 30
C1 - C11, Age, Occupation, Presence/ Absence of Occupation	.633	3.58	.0018	14, 29
C1 - C11, Age, Occupation, Presence/ Absence of Occupation, Sex	.642	3.34	.0028	15, 28

account for almost twice as much (62%). The increase in criterion variance accounted for by the model from 32% (when the demographic variables are entered alone) to 64% (when the clusters are added to the demographic variables) is significant; $\underline{F}$ (11,28) = 2.26, $\underline{p} < .05$. The demographic variables do not add any significant predictive information to the model once the 11 clusters are already included.

Although I had ordered the entry of the demographic variables into the regression equation, I had no basis upon which to order the 11 clusters or of estimating each cluster's unique contribution to the equation. I therefore made use of the SAS Max R Stepwise program (SAS, 1982) to determine which combination of clusters provided the best model with which to predict criterion variance. A seven-cluster variable model (Clusters 3, 4, 5, 6, 7, 9, 11) was able to account for 62% of criterion variance, $\underline{F}$ (7,36) = 8.43, $\underline{p} < .001$; the same percentage accounted for by the 11 clusters in the 9 (+2) - cluster variable model.

The results of entering only the seven clusters with the demographic variables in the regression equation are presented in Table 7. It is apparent from inspection of Tables 6 and 7, that the seven-cluster variable model is as predictive of the criterion as are the 11 clusters in 9 (+2) - cluster variable model. It is also clear that the demographic variables do not add any predictive power to the model.

It should be pointed out that by utilizing the seven-cluster variable model, I have eliminated four clusters, two of which are Clusters 1 and 2. These first two clusters include the items presented in Table 1 and represent the first part of the SAT_9. It becomes clear, therefore, that these items do not contribute to the

TABLE 7

Multiple Regression Model with Seven Clusters and Demographic Variables

Predictors Entering Model	Statistics for Regression Model R^2	F	p	df
C3 - C7, C9, C11	.621	8.43	.0000	7, 36
C3 - C7, C9, C11, Age	.629	7.41	.0000	8, 35
C3 - C7, C9, C11, Age, Occupation	.631	6.45	.0000	9, 34
C3 - C7, C9, C11, Age, Occupation, Presence/ Absence of Occupation	.631	5.65	.0001	10, 33
C3 - C7, C9, C11, Age, Occupation, Presence/ Absence of Occupation, Sex	.637	5.10	.0001	11, 32

predictive power of the test and hence it is only this seven-cluster subset of items, measuring symbol interaction in the drawing, symbol interaction in the explanation, and the resolution of symbol interaction, which are necessary to predict a significant 62% of criterion variance. The items included in the seven-cluster variable model (C3 - C7, C9, C11) can be found in Table 5, where the items included in the total 11 clusters are presented. From inspection of the items included in the seven clusters, it can be seen that the model now contains only 84 of the original 144 items scored on the SAT_9.

The cluster weights which are derived when only the seven clusters are entered into the model, are essentially identical to those cluster weights which are derived when the demographic variables are entered into the model in addition to the seven clusters. In order to justify using cluster weights based on the cluster-model rather than on the cluster and demographic variable - model, subjects' SAT_9 scores were calculated using the weights derived from each model. The SAT_9 scores, derived from the cluster and demographic variable-model, consisted of the weighted clusters and the weighted demographic variables. The SAT_9 scores, derived from the cluster variable model consisted of only the weighted clusters.

The SAT_9 scores derived from the cluster-model correlated .986, t $(42) = 38.54$, $p < .001$ with the SAT_9 scores derived from the cluster and demographic variable-model. Therefore, the regression weights chosen for the clusters were those derived from the model which only included the clusters as predictors. The demographic variables were ignored because, although age and occupational level are significantly correlated with the criterion, they do not add significantly to the model once the clusters are entered.

The regression coefficients and their significance for each of the clusters in the seven-cluster model are presented in Table 8. Although Clusters 5 and 9 are the only clusters which account for a significant amount of variance in the model (see Table 8), the model of seven clusters accounts for 62% of criterion variance (see Table 7). In fact, when the Max R Stepwise program (SAS, 1982) was used to reduce the number of cluster variables, it was found that Clusters 3 and 9 were the best two-variable model found which could predict the criterion, however, this two-variable model only accounted for 52% of criterion variance. Therefore, the larger seven-variable model does have more predictive power. In addition, although it is my intent to obtain the model with the least variables and the most predictive power, there are disadvantages in using a model which contains too few variables. Most salient among these, is that a model with too few variables may be greatly influenced by sampling variability. In other words, the smaller model may not be able to predict group membership in another sample because of the variability between samples. The larger model, which retains more information about the original 144 items, will be less influenced by the inherent variability between samples.

Analysis of Main Study

Analysis of Variance and Covariance. The scoring weights derived from the previous sample of 44 subjects were then used to score the

TABLE 8

Regression Coefficients for Each Cluster in the Seven-Cluster Variable Model

Cluster	Regression Coefficient (unstandardized)	t	p
C3	.03	1.46	.153
C4	.04	1.69	.100
C5	-.05	-2.15	.038
C6	-.02	-1.31	.199
C7	.02	.83	.412
C9	.10	3.78	.0006
Constant	-.03	-.30	.767

protocols of a new group of 91 patients (Montreal pain-group, Detroit pain-group, Montreal medical group). For each subject, the item scores in each cluster in the seven-cluster variable model were added together and then multiplied by the regression coefficient for that cluster. All seven cluster scores were added together and then added to the constant (see Table 8) to form a composite SAT_9 score for each of the 91 subjects.

A frequency distribution of composite SAT_9 scores for each of the three groups is presented in Figure 1. As can be seen from the graph, both pain-groups' scores are positively skewed, whereas the medical group's scores tend to show a more normal distribution. (The lower the score, the greater the inhibition of symbolic function.) Whereas both the Montreal pain-group's scores and the Montreal medical group's scores appear to have a bimodal distribution, the Detroit pain-group's scores do not. However, all three distributions show considerable overlap.

Table 9 shows the composite SAT_9 score means, standard deviations, and ranges for the three groups. The average SAT_9 score of the medical group is nearly twice the average SAT_9 scores of both the Montreal pain and Detroit pain-group. The score variance in the Detroit pain-group is somewhat larger than the score variance in the other two groups. In addition, the SAT_9 score range for the Detroit pain group falls in between the SAT_9 score ranges of the Montreal pain and Montreal medical groups.

When the pain groups are collapsed and their composite SAT_9 scores

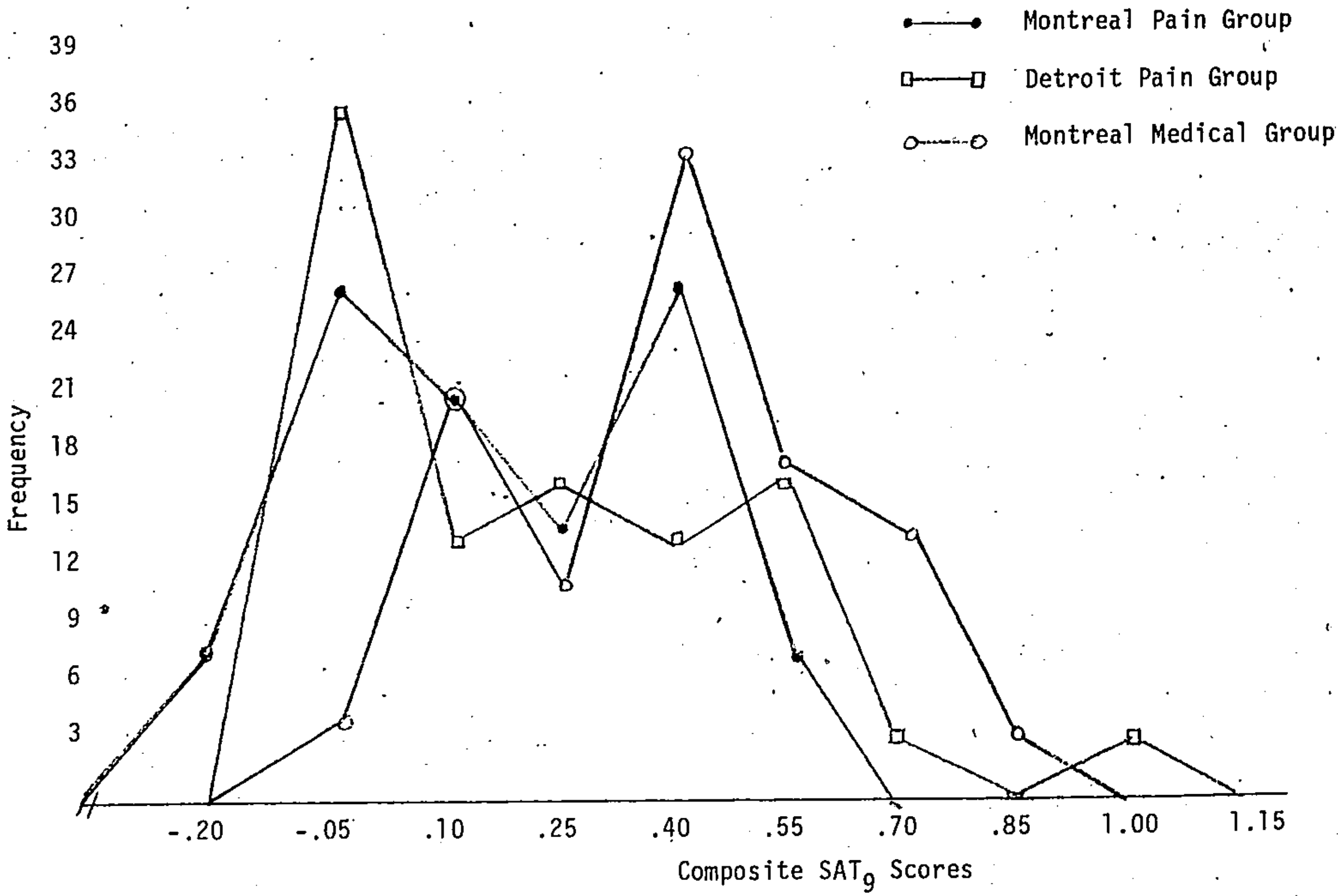

Figure 1. Absolute Frequency (Percentage) of SAT_9 Scores for Three Patient Groups.

TABLE 9

Descriptive Statistics for SAT_9 Scores for the Three Patient Groups

	Statistics for SAT_9 Scores		
Patient Group	M	S.D.	Range
Montreal Pain-Group	.206	.229	-.23 — .60
Detroit Pain-Group	.267	.288	-.02 — 1.07
Montreal Medical Group	.420	.225	.06 — .97

Note. The lower the score, the greater the inhibition of symbolic function.

are compared with the composite SAT_9 scores of the Montreal medical group, a significant difference in scores between the pain and medical groups is observed, t (89) = 3.29, p = .001.

Figure 2 shows the frequency distribution of composite SAT_9 scores for the collapsed pain group (Montreal and Detroit) and the Montreal medical group. Although there is still considerable overlap in scores, the pain groups' distribution is positively skewed. Peak scores of both groups differ by three class-intervals.

The SAT_9 scores of the collapsed pain group (Montreal and Detroit) were also compared to the SAT_9 scores of the Montreal medical group using IQ as a covariate. In this analysis, there is a significant difference in SAT_9 scores between the two groups, F (1,88) = 10.17, p = .002. However, IQ does not significantly predict SAT_9 scores, t (88) = .05, p = .824. The relationship between IQ and SAT_9 scores was further examined in order to assess whether the slope of the line representing the correlation between IQ and SAT_9 scores differed between the three groups. The correlations between IQ and SAT_9 scores for the three patient groups are presented in Table 10. Using z_r transformations of the correlation coefficients, it was determined that none of the coefficients significantly differed from each other when examined in pairs. As can be observed in the Table, all z values are less than the critical value of 1.96 which is required for significance at the 5% level.

Although both ANOVA and ANCOVA results reveal a significant difference in SAT_9 scores between the collapsed pain-groups and the

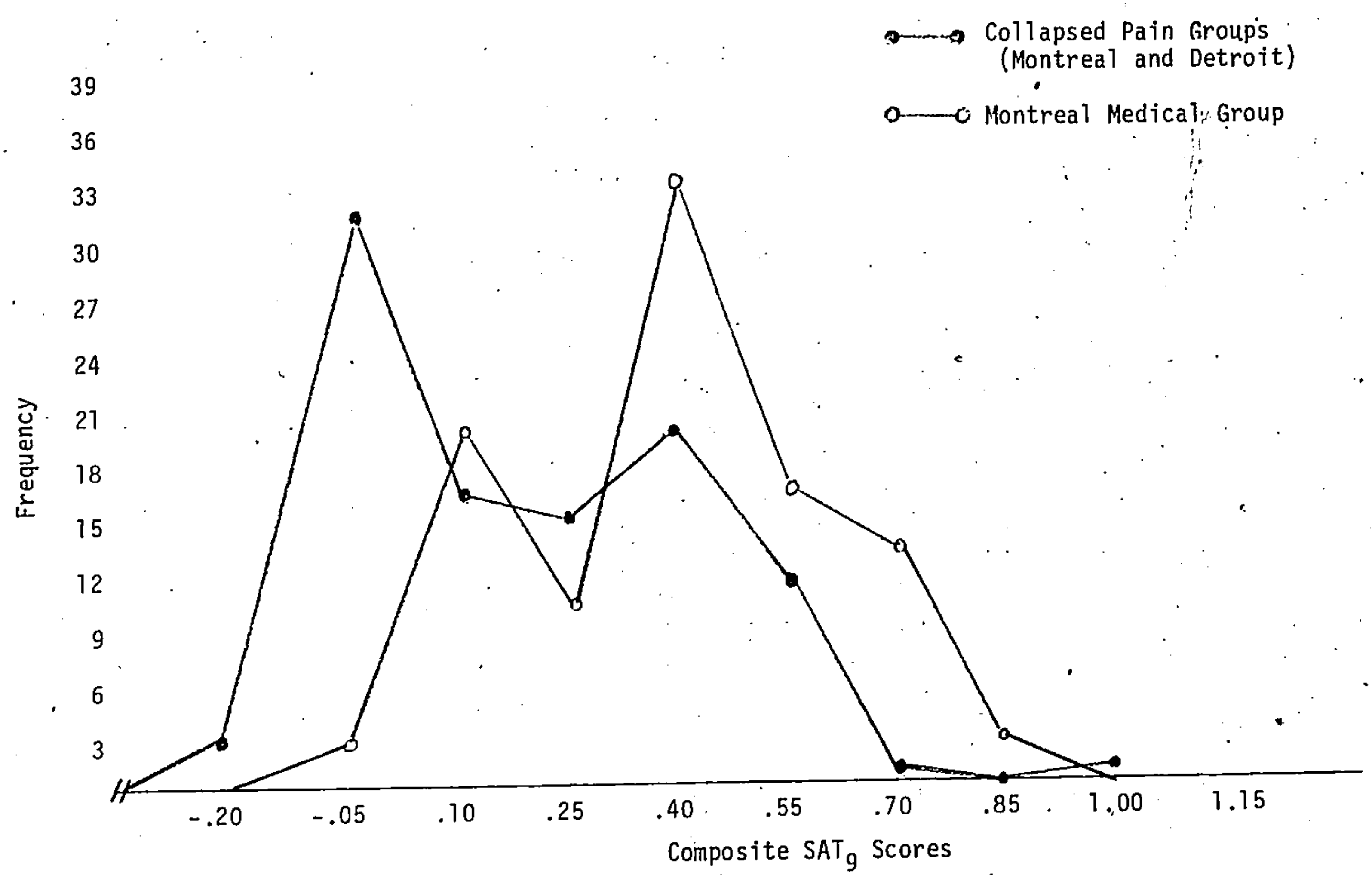

Figure 2. Absolute Frequency (Percentage) of SAT_9 Scores for Two Patient Groups (Collapsed Pain and Medical).

TABLE 10

Correlations Between SAT_9 Scores and IQ for the Three Patient Groups

Patient Group	Correlations Between SAT_9 Scores and IQ r	z_r	
Montreal Pain-Group	-.223	-.229	A
Detroit Pain-Group	.077	.080	B
Montreal Medical Group	.074	.075	C

AB z = -1.15, NS
AC z = -1.12, NS
BC z = .02, NS

Montreal medical group, there is a considerable overlap in SAT_9 score variance between the two groups. It is possible to obtain highly significant results when the predictor actually accounts for only a small proportion of criterion variance. In this case, SAT_9 scores (predictor) only account for 11.23% of the variance in patient group (criterion).

When only the Montreal pain-group and the Montreal medical group are compared, a significant difference in composite SAT_9 scores is observed, $F(1,58) = 12.89$, $p < .001$). In this case, SAT_9 scores account for 20.61% of the variance in patient group.

Discriminant analysis. A split method discriminant analysis was computed on the sample of 91 patients using SPSSX (SPSS, 1983). A discriminant function was calculated on a randomly selected 50% of the total sample of 91 subjects in order to derive different weights for the seven-cluster variable model. Therefore the same cluster-variable model that was derived using the previous group of 44 subjects was used in the discriminant analysis, however the seven clusters were given different weights. The discriminant function was then used to classify the group which was not selected for analysis. The significance of this function is χ^2 (7, N = 51) = 28.39, p = .0002. The results of this classification are presented in Table 11. Table 11 shows that 72.5% of unselected subjects were correctly classified into their patient groups. Using Fisher's exact test of significance for Chi Square, it was determined that the probability of obtaining a 72.5% correct classification by chance, is less than 3%. It is apparent from

Table 11 however, that the discriminant function tends to over-predict the inhibition of symbolic function in the medical group.

The discriminant function was derived using only half of the subjects in the sample of 91 patients. In order to statistically increase the sample size, a second discriminant function was derived using those subjects who were not selected for analysis of the first discriminant function. This second discriminant function was also significant, χ^2 (7, $\underline{N}$ = 40) = 19.14, $\underline{p}$ = .008. The results of this second classification are presented in Table 12. Table 12 shows that 70.6% of unselected cases were correctly classified into their patient groups. Once again, using Fisher's exact test of significance for the Chi Square, the probability of correctly classifying 70.6% of patients by chance is less than 3%. Combining tests of independent samples is a statistical method of increasing sample size. In this manner, the classification results for the unselected samples in the first discriminant analysis (Table 11) and in the second discriminant analysis (Table 12) were combined. When these two unselected samples are combined, the probability of obtaining this correct classification due to chance decreases, χ^2 (4, $\underline{N}$ = 91) = -14.33, $\underline{p} < .01$.

A discriminant analysis was also derived using only the Montreal pain and Montreal medical groups. Half of the 60 cases were randomly selected to compute the discriminant function with which the unselected cases were classified. The discriminant function was significant, χ^2 (7, $\underline{N}$ = 34) = 18.54, $\underline{p} < .01$. The classification results are presented in Table 13. This model correctly classified 84.62% of

TABLE 11

Predictive Efficacy of the SAT_9 as Shown by

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Collapsed Pain Group	Predicted Group Membership: Montreal Medical Group
Collapsed Pain Group	26	23 (88.5%)	3 (11.5%)
Montreal Medical Group	14	8 (57.1%)	6 (42.9%)

Note. Classification results are for cases not selected for use in the first discriminant analysis.

TABLE 12

Predictive Efficacy of the SAT_9 as Shown by

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Collapsed Pain Group	Predicted Group Membership: Montreal Medical Group
Collapsed Pain Group	35	28 (80.0%)	7 (20.0%)
Montreal Medical Group	16	8 (50.0%)	8 (50.0%)

Note. Classification results are for cases not selected for use in the second discriminant analysis.

TABLE 13

Predictive Efficacy of the SAT_9 as Shown by

Classification Results

Actual Group	No. of Cases	Predicted Group Membership: Montreal Pain Group	Predicted Group Membership: Montreal Medical Group
Montreal Pain Group	11	10 (90.9%)	1 (9.1%)
Montreal Medical Group	15	3 (20.0%)	12 (80.0%)

Note. Classification results are for cases not selected for use in the analysis of the discriminant function based on only the Montreal Pain and Medical Groups.

unselected cases, χ^2 (1, N = 26) = 10.09, $p < .01$. As can be observed from Table 13, when only the Montreal pain and medical groups are used to derive the discriminant function there is no tendency to overpredict the inhibition of symbolic function in the medical group.

Finally, scoring weights were derived using the total sample of 91 patients in a discriminant analysis. The discriminant function was calculated using the collapsed pain groups (N = 61) and the medical group (N = 30). These weights are to be used to score the protocols of future patient samples. This function, which was derived using all 91 cases, was also significant, χ^2 (7, N = 91) = 28.97, $p < .001$. This analysis revealed that the covariance matrices of the two groups were significantly different, F (28, 12306.8) = 1.58, $p < .03$. However, classification results only differed by the misclassification of one case when pooled covariance matrices were used to compute the discriminant function instead of separate covariance matrices.

Table 14 presents the means and standard deviations for each group (collapsed pain group and Montreal medical group) on each of the unweighted clusters. It is clear from the table that the medical group has higher average scores than the collapsed pain group on all of the clusters except Cluster 7. The two groups have identical average scores on Cluster 7.

According to Tabachnick and Fidell (1983), when using discriminant function analysis with only two groups (in which case there can only be one discriminant function), the single discriminant function is more conveniently used for classification of new cases than are the

TABLE 14

Descriptive Statistics for the Unweighted Cluster Scores for the Collapsed Pain-Group and the Montreal Medical Group

	Unweighted Clusters													
	C3		C4		C5		C6		C7		C9		C11	
Patient Group	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.
Collapsed Pain-Group (Montreal and Detroit)	3.39	2.96	.69	1.29	1.54	2.28	1.46	1.73	2.0	2.27	1.93	2.06	1.08	1.51
Montreal Medical Group	5.33	2.79	1.30	2.09	2.00	2.41	3.33	2.47	2.0	1.68	3.50	1.98	1.50	1.55

classification functions. (Although there is only one discriminant function, there are two classification functions - one for each group.)

The unstandardized discriminant function coefficients for each of the clusters are presented in Table 15. In order to classify a new case, the dichotomous scores for the items within a cluster are added together and then multiplied by the discriminant function coefficient for that cluster. Once this is done for each of the seven clusters, the seven weighted cluster scores are added together. Finally, the constant (see Table 15) is added to this resulting composite score in order to derive the discriminant score. (In the present analysis the constant is negative and is therefore subtracted from the composite score.) Using this classification scheme, if a subject receives a discriminant score above zero, then he/she is classified into the non-alexithymic group. Conversely, if a subject receives a discriminant score below zero, then he/she is classified into the alexithymic group.

TABLE 15

Unstandardized Discriminant Function Coefficients

For the Seven Clusters

Clusters	Discriminant Function Coefficients
C3	.04
C4	.20
C5	-.10
C6	.40
C7	-.20
C9	.30
C11	-.10
Constant	-1.20

CHAPTER IV

DISCUSSION

The results indicate that the seven-cluster-variable model of the SAT_9 accounts for a highly significant 62 percent of variance in the free-hand categorizations of the original 44 patients. It would appear therefore, that one can score the SAT_9 objectively to measure the inhibition of symbolic function (alexithymia) in much the same way that a skilled clinician makes free-hand categorizations.

It will be recalled that the author tried two approaches to developing a scoring scheme for discriminating pain patients from a control group of medical patients (who did not have more pain than would be expected, given their physical ailments). These two approaches were: (1) deriving the scoring weights from the preliminary sample (who had taken the AT_9 test as part of another research project and who had been designated as alexithymic or non-alexithymic through free-hand analysis) then applying this formula to the newly gathered data and (2) deriving the scoring weights from the new sample (but only from a randomly-selected half of the subjects), then applying the formula with these weights to this same sample (of course, to the other half that was not used to derive the formula). The second strategy worked far better than the first. Apparently there are differences in the qualities that discriminate alexithymics from normals in the preliminary study and those that do so in the main study, which thwarted my attempt to derive a formula on one sample and apply it to the other.

It turned out, too, that the Detroit pain-group and the Montreal pain-group responded to the SAT_9 in quite different ways. Because the Detroit group got scores on the SAT_9 that are more like those of control subjects, including the Detroit pain-subjects in the analysis blunted the difference between pain and control subjects. Selective factors that entered into the recruitment of the Detroit pain-subjects -- who were all volunteers -- may account for their resembling the control patients more than the Montreal pain-subjects (who were not volunteers) did. In other words, the more emotionally responsive, better functioning patients were more likely to agree to participate in the study.

Despite these problems, it is clear that patients in both of the pain-patient groups get higher scores on my measure of the inhibition of symbolic function than the patients in the medical group. It is also clear that the inhibition of symbolic function is in some way a function of both age and occupational level.

Although the author had considerable difficulty finding suitable statistical procedures to reduce the original 144 SAT_9 test items to a smaller number, because having only 44 subjects in the original sample made a straight forward multiple regression unsuitable, the strategy of first combining items into clusters offered a way to arrive at fewer variables than subjects. The clusters were internally consistent and had low intercorrelations, as desired. I found that the SAT_9 seven-cluster model accounts for a highly significant percent of variance in free-hand categorization of the protocols. Although this finding shows that the SAT_9 can be used reliably in place of free-hand categorization of the AT_9 test, it does not tell us what the AT_9 test actually measures. Previous research with the AT_9 (Catchlove et al., 1982) does suggest, however, that whatever it is that the AT_9 detects, it is unrelated to other measures of psychopathology. Therefore, it remains uncertain whether the results obtained from cross-validation reflect the vicissitudes of either the scoring system for the AT_9 or the content of what the AT_9 test actually measures.

The author's attempts at cross-validation may have been hindered by several factors. First, the multiple regression equation was derived from a sample of 44 patients, only 14 of whom were normal with respect to symbolic function as determined by free-hand categorization. These 14 patients were a subset of patients who showed no evidence of alexithymia, part of a larger group of medical patients. However, some members of the sample from which they were drawn did show signs of alexithymia, according to the AT_9. There is no theoretical reason to suppose that members of the population at random will not show any signs of alexithymia, but there is reason to expect that certain patient groups will have a higher proportion of people who have alexithymia than will the general population. In fact, the present study shows that the inhibition of symbolic function tends to be normally distributed in general medical patients and has a positively skewed distribution in the population of pain patients. This finding illustrates the point made by Lesser (1981), Neill & Sandifer (1982), Shipko (1982), and Thayler-Singer (1977), who argued that not all psychosomatic patients are alexithymic and that not all alexithymics have psychosomatic disorders.

Second, it becomes necessary to examine whether the medical group is an adequate comparison group. The author judged them to be appropriate, reasoning that the patients in this group had a physical problem that was not chronic; there was no reason, therefore, to expect them to have the constellation of psychosomatic personality features of which alexithymia is a part. However, it is reasonable to anticipate that while in hospital, even for minor surgical reasons, a medical patient would be more pre-occupied with bodily functioning than he or she would be when outside the hospital. The question remains, then, whether a transient increase in somatic pre-occupation could be associated with a transient increase in the inhibition of symbolic function.

Third, and perhaps most important, is the fact that whereas the Detroit pain and Montreal medical groups took the AT_9 test voluntarily, the Montreal pain-group did the testing as part of routine assessment. The author believed that she could not have ethically designed the study requiring all subjects to take the AT_9 test. The impact of selecting patients for the study through having them volunteer may be far-reaching. I would anticipate that those individuals who have a deficient capacity to fantasize, would also be those patients who after viewing the projective nature of the test would refuse to take it or to finish it. This could account for the difference in score distributions between the

Montreal and Detroit pain-groups and the fact that the SAT_9 score range for the Detroit group falls in between the score ranges for the Montreal pain and Montreal medical groups. It is important to recognize, however, that despite the voluntary nature of subjects' participation, the Detroit pain-group did show a greater incidence of the inhibition of symbolic function than did the Montreal medical group.

One may assume, furthermore, that voluntary consent would screen out proportionally more alexithymics from the Detroit pain-group than from the Montreal medical group; this would follow if the proportion of people having an inhibition of symbolic function is higher in psychosomatic patient groups than it is in acute medical patient groups. In this event, it is not surprising that the results of cross-validation are more significant when only the Montreal pain and Montreal medical groups are used than when the combined pain groups are compared with the medical group. It is, of course, likely that the Montreal groups are more similar to each other demographically than they are to the Detroit group; because these variables confound any comparison, it may be more appropriate to compare the Montreal groups with each other than to compare them with the Detroit group.

Despite the difficulties these three factors made for all attempts at cross-validation, I was able to show that the SAT_9 can discriminate between the pain-patient and medical-patient groups. Given the small size of the original sample (particularly the rarity of patients who were normal with respect to the inhibition of symbolic function, $\underline{N} = 14$), it would seem methodologically more appropriate to use the SAT_9 weights which were derived from the discriminant analysis of 91 patients than to use those weights derived from the multiple regression analysis of 44 patients. In this discriminant analysis, the within-group dispersion matrix of the combined pain-group had significantly greater variability than that of the medical group. This finding, in conjunction with the finding that the combined pain group showed a higher frequency of low scores (inhibition of symbolic function), suggests that although pain-groups include individuals who score along a wide range of scores on the test of symbolic function, the medical group includes individuals who more often receive scores at the middle to upper end of the continuum. From this one would conclude that whereas pain-groups include people suffering severe degrees of alexithymia (primary), the medical group has only individuals suffering from a moderate degree of alexithymia (secondary) or showing no evidence of alexithymia. These findings are therefore consistent with the theoretical formulations of Demers-Desrosiers (1982), Freyberger (1977), Krystal (1982), Lesser (1981), and Sifneos (1982), in which these authors maintain that alexithymia is not an all-or-nothing phenomenon but has both a primary and a secondary form.

The fact that the inhibition of symbolic function increases as age increases and as occupational level decreases is consistent with the findings of other researchers who have used other instruments to measure alexithymia. Although the SAT_9 can detect the presence or absence of alexithymia with much more accuracy than can age or occupational level, one could still significantly predict group membership with the knowledge of these demographic variables alone.

Several speculations upon the nature of the relationship between the AT_9 test and age and occupational level are in order. It is important to determine whether this relationship is a function of taking a test or of taking this particular test. In other words, younger patients and those patients at higher occupational levels may be more acquainted with test-taking procedures and with the nature of research than older patients and than patients with lower-level occupations. If the relationship is a function of the nature of the AT_9 test, it would be reasonable to speculate that somatic concerns increase with age and that it is this increased somatic emphasis that is associated with the inhibition of symbolic function. Older people who are experiencing chronic pain or who are undergoing minor surgery may show more somatic concerns than otherwise healthy older people. This latter hypothesis may provide another reason to question the appropriateness of the medical patients as the only comparison group.

One might speculate that occupation is in some measure related to intelligence; however, there is no relationship between IQ and SAT_9 scores in our sample. If the AT_9 test is indeed measuring fanasizing ability, this capacity does not appear to be a function of intelligence.

Implications of the Present Investigation for the Construct "Alexithymia"

The hypothesis that alexithymia can be advanced as an explanatory mechanism of chronic pain is confirmed - but this hypothesis can only explain part of the process leading to such chronic somatic disorders. The author predicted that those individuals suffering from chronic pain would also evidence a higher frequency of more severe inhibition of symbolic function (primary alexithymia) than would those people with acute medical problems. However, it is not inconsistent with my results to propose that a good number of the pain patients were not dispositionally predisposed to develop alexithymia but rather developed it secondarily in reaction to their ongoing chronic pain conditions (secondary alexithymia).

In addition to the physical discomfort experienced by chronic pain patients, they also have to contend with the impact this pain has on their lives. Many chronic pain patients find themselves forced to leave their jobs, relinquish domestic activities, and curtail social and interpersonal relations. Krystal (1979) has similarly documented the onset of alexithymia as a reaction to stressful life events. Therefore, although it appears possible that the predisposition towards alexithymia may explain why some people are at a loss to symbolically handle their pain, the development of alexithymia may also be a defensive reaction to the pervasive life stresses caused by the impact of their pain rather than a reaction to the perceived physical pain itself.

These alternate explanations are not inconsistent with each other if one examines when and under what conditions pain becomes chronic. The repercussions in the pain patient's work and personal life may also serve to perpetuate the physical pain if the patient has learned to express psychic pain somatically. It may simply become a question of at what etiological point the inhibition of symbolic function becomes mobilized as a defensive reaction to stress which is somatically represented.

It is also possible to speculate that some of the acute medical patients may develop an alexithymic style secondarily to their physical illness. It would indeed be interesting to examine the recovery styles of those medical patients who showed some degree of the inhibition of symbolic function. None of this latter group of patients showed evidence of severe inhibition of symbolic function (primary alexithymia), and it is this finding that most distinguishes them from the chronic pain patient group and provides empirical evidence for the theoretical conceptualizations of alexithymia.

Conclusions

The present author concludes that the SAT_9 has adequate internal and external validity and that it offers a starting-point for the development of tests to be used in research on alexithymia. In future investigation with the SAT_9, researchers may find it advisable to choose different kinds of comparison groups and to take account of the impact of voluntary participation upon SAT_9 scores and of the relationship between SAT_9 scores and age and occupation. The implementation of these suggestions for future research will, it may be hoped, increase the ability of SAT_9 scores to predict whether patients will have chronic pain.

For the purpose of scoring and classifying the responses to the SAT_9 for future patient samples, it may be more convenient to convert the fractional weights derived from discriminant analysis into integers. In this manner, Cluster 3 would be dropped (because of its negligible contribution to the model) and the remaining clusters would be weighted as follows: 2*(C4), -1*(C5), 4*(C6), -2*(C7), 3*(C9), -1*(C11); and the constant would become -12. Patients with scores below zero would still be classified as alexithymic and patients with scores above zero would still be classified as non-alexithymic. Using integer weights would make computations considerably easier.

The accurate identification of alexithymia in patient groups has far-reaching implications in the understanding and treatment of psychosomatic disorders. This identification may not only contribute to our theoretical understanding of psychopathology but also to a more appropriate choice of a treatment which would help psychosomatic patients. The author believes that the SAT_9 will provide a means to study these theoretical and clinical problems.

APPENDIX A

PAIN LOCATION FOR MONTREAL PAIN-GROUP AND DETROIT PAIN-GROUP AND SURGICAL PROCEDURES FOR MONTREAL MEDICAL GROUP

MONTREAL PAIN-GROUP

Pain Location	Number of Patients
Neck	2
Neck, Head	2
Head	1
Eye	1
Gum	1
Neck, Shoulders	1
Forearm, Hand	2
Finger, Hand	1
Chest, Abdomen	1
Chest, Arm	1
Chest	1
Abdomen	2
Abdomen, Perineum, Thigh	1
Abdomen, Perineum, Low Back	1
Thoracic Back	1
Thoracic Back, Neck	1
Low Back	7
Leg	1
Buttocks, Thighs	1
Rectum	1
	30

DETROIT PAIN-GROUP

Pain Location	Number of Patients
Neck, Head	1
Neck, Shoulders, Arms, Legs	1
Neck, Jaw, Stomach	1
Neck, Back, Arm, Wrist	1
Neck, Shoulder, Arm, Back	1
Neck, Arm, Back, Buttocks, Thigh	1
Neck, Shoulder, Back, Leg	1
Head	2
Head, Chest	1
Head, Arms, Legs, Joints	1
Head, Chest, Stomach	1
Head, Back, Hip, Knee	1
Shoulder, Arm, Chest	1
Shoulder, Arm	1
Hand	1
Wrist	1
Fingers	1
Abdomen	1
Side, Hip, Low Back	1
Side, Back	1
Back, Legs	3
Low Back, Thigh	1
Back, Hip, Leg, Toe	1
Low Back, Hip, Leg	1
Hip, Leg, Foot	1
Thighs	1
Foot	1
Diffuse	1
	31

MONTREAL MEDICAL GROUP

Surgical Procedure	Number of Patients
Tonsillectomy	3
Lesion Epiglottis	1
Deviated Nasal Septum	4
Traumatic Nasal Deformity	4
Otosclerosis	1
Polyp Removal Nasal	1
Perforated Left Eardrum	1
Disc Location Left Shoulder	1
Trauma Left Hand	1
Repair Extensor Right Thumb	1
Tibial Turbical	1
Bilateral Caldwell	1
Locked Knee	1
Varicose Veins	2
Excision Cyst Right Breast	1
Hernia	3
Gall Stones	1
Psoriasis	1
Anal Stenosis	1
	30

APPENDIX B

ALBERTA CLUSTERS OF SIX SETS OF 24 RANDOMLY CHOSEN VARIABLES

SIX SETS OF RANDOMLY CHOSEN ITEMS

Clusters	1	2	3		5	6
Items chosen from eight consecutive sets of 18 items	4th, 9th, 18th	1st, 5th, 13th	2nd, 15th, 17th	3rd, 11th, 16th	6th, 12th, 14th	7th, 8th, 10th
Cluster 1						
Items	45, 81, 117	67, 103, 139	53, 89, 125	39, 75, 111	102, 104, 114	43, 79, 115
K-R 20	.921	.950	1.0	.921	.793	.965
Corresponding A-Priori Cluster (Table 3)	C11	C33	C19	C5	-	C9
Cluster 2						
Items	54, 90, 126	37, 73, 109	56, 92, 128	47, 83, 119	14, 32, 50	61, 97, 133
K-R 20	.827	.897	.917	.865	.787	.917
Corresponding A-Priori Cluster (Table 3)	C20	C3	C22	C13	-	C27
Cluster 3						
Items	94, 108, 130	59, 95, 131	69, 105, 141	65, 101, 137	-	46, 82, 118
K-R 20	.824	.876	.848	.853	-	.900
Corresponding A-Priori Cluster (Table 3)	-	C25	C35	C31	-	C12

Continued .....

Clusters	1	2	3	4	5	6
Cluster 4						
Items	40, 76, 112	49, 85, 121	-	57, 93, 129	-	44, 80, 116
K-R 20	.820	.810	-	.827	-	.895
Corresponding A-Priori Cluster (Table 3)	C6	C15	-	C23	-	C10
Cluster 5						
Items	4,63,72,99,135	41, 77, 113	-	52, 124, 142	-	64, 100, 136
K-R 20	.675	.795	-	.807	-	.818
Corresponding A-Priori Cluster (Table 3)	-	C7	-	-	-	C30
Cluster 6						
Items	22, 27, 36	55, 91, 127	-	21, 29, 34	-	7, 8, 10
K-R 20	.785	.773	-	.785	-	.629
Corresponding A-Priori Cluster (Table 3)	C2	C21	-	C2	-	C1
Cluster 7						
Items	-	19, 23, 31	-	3, 11, 16, 88, 106	-	25, 26, 28
K-R 20	-	.759	-	.525	-	.666
Corresponding A-Priori Cluster (Table 3)	-	C2	-	-	-	C2

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