MENTAL STATUS, INTELLECTUAL, AND MOOD STATES ASSOCIATED WITH ENVIRONMENTAL ILLNESS PATIENTS

THESIS

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

Cynthia Ellen Riecken, B.A.
Denton, Texas
April, 1991

The purpose of the present study was to begin development of a psychological profile for environmentally ill patients. Existing psychiatric labels are unable to encompass these patients. Test scores were drawn from a pool of 89 patients whose environmental exposures were verified by the presence of toxins in the blood serum. A Mental Status Exam, a Wechsler Adult Intelligence Scale-Revised screen, and the Profile of Mood States were administered.

Results indicate a primary pattern which is significantly different from test norms consisting of fatigue, reduced mental functioning, and a lack of psychotic or personality disorder indicators. The reported symptoms of environmentally ill patients were objectively verified by current psychological test instruments. The need for a new diagnostic category for people who have been poisoned by environmental toxins is discussed.
To Forrest and Martha Riecken
Whose Extraordinary Efforts
Have Made My Research Possible
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>LIST OF TABLES</th>
<th>iv</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF ILLUSTRATIONS</td>
<td>v</td>
</tr>
<tr>
<td>MENTAL STATUS, INTELLECTUAL, AND MOOD STATES ASSOCIATED WITH ENVIRONMENTAL ILLNESS PATIENTS</td>
<td></td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Method</td>
<td>10</td>
</tr>
<tr>
<td>Subjects</td>
<td>12</td>
</tr>
<tr>
<td>Materials</td>
<td>21</td>
</tr>
<tr>
<td>Procedure</td>
<td>36</td>
</tr>
<tr>
<td>Results</td>
<td>50</td>
</tr>
<tr>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>Appendices</td>
<td></td>
</tr>
<tr>
<td>References</td>
<td></td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table                                                                 Page
1. Orientation of Environmental Illness Patients Based on the Mental Status Exam...... 13
2. Memory Deficits of Environmental Illness Patients Based on the Mental Status Exam...... 14
3. Attention of Environmental Illness Patients During the Mental Status Exam........... 14
4. Content and Progression of Thought of Environmental Illness Patients in the Mental Status Exam......................... 15
5. Perceptual and Sensory Distortions of Environmental Illness Patients Based on the Mental Status Exam......................... 17
6. Occupational History of Environmental Illness Patients Based on the Mental Status Exam......................... 18


LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>WAIS-R Profile for Environmental Illness Patients</td>
<td>19</td>
</tr>
<tr>
<td>2.</td>
<td>POMS Profile for Environmental Illness Patients</td>
<td>20</td>
</tr>
</tbody>
</table>
MENTAL STATUS, INTELLECTUAL, AND MOOD STATES
ASSOCIATED WITH ENVIRONMENTAL ILLNESS PATIENTS

An increasing number of health problems have been linked to toxic chemicals such as pesticides, solvents, volatile fuels, and heavy metals (Weiss, 1983), (Anderson, 1982). Many symptoms and diseases have been attributed to environmental pollutants. Some examples have been asthma, (Juhlin, Michaelsson & Zetterstrom, 1972), headache (McGovern & Haywood, 1970), vasculitis (Rea, Bell, & Smiley, 1980), cerebral allergies resulting in symptoms like sleep disturbance, inability to concentrate, feelings of unreality, general unhappiness, morbid depression, loss of pride, loss of sexual interest, and childish compulsions (Davison, 1949), allergic tension/fatigue syndrome (Speer, 1954, 1970), and hyperactivity in children (Feingold, 1975).

One of the syndromes which has been increasingly documented is Immune Disregulation and Chemical Susceptibility Syndrome, which is commonly known as Environmental Illness. (Bell, 1982) This syndrome may best be defined by the adverse reactivity of a given individual as manifested by a unique pattern of clinical symptoms after exposure to an environmental toxin (Randolph, 1962). The
treatment of chronic illness caused by environmental toxins has focused on "individual susceptibility to the everyday chemical environment" (Randolph, 1962, p. 11).

Research on the mechanisms of Environmental Illness has focused upon immune-system dysfunctions (Bell, 1982). Studies indicated that the T-cell count was low in many people who exhibited severe Environmental Illness (Bell, 1982, p. 32). Another process that was investigated was the complement system.

Complement is a set of serum proteins that interact to produce elements of the inflammatory response as well as destruction of foreign cells, bacteria, and viruses in the body. Complement function is one of the potential common pathways on which antigenic, chemical, physical, and psychosocial stressors all might act, leading to the same set of endogenous events which cause the symptoms of Environmental illness. (Bell, 1982, p. 32)

This syndrome has been difficult to diagnose because of the variety of symptoms manifested in an individual reaction pattern after exposure to an environmental contaminant to which the person was sensitized. There have been difficulties, then, in diagnosing individual variations in manifestations and potential scope (Randolph, 1962). O'Bannion (1981, p. 30) described a variety of psychological
and behavioral manifestations of reactions including: fatigue, apathy, depression, impaired attention, impaired concentration and comprehension, aphasia, learning disabilities, hyperactivity or hypoactivity, irritability, talkativeness, insomnia, obesity, anxiety, fearfulness and apprehensiveness, ravenous hunger, excessive thirst, and muscle tension.

Although individuals vary considerably in their symptomatology, Flannagan (1990) found a core symptom pattern of fatigue, low energy, weakness, poor concentration, poor memory, poor comprehension, headache, aches and pains, clumsiness, sinus discomfort, mucus, eye problems, restlessness, and present performance inferior to prior level of functioning.

The recognition that the same basic cause, an environmental toxin, has caused different symptoms in different people based upon the degree of exposure as well as their own personal physiology was not a part of the early research in toxicology (Fein, 1983). Tanquerei des Planches's study of lead poisoning in 1838 is a classic in the field of toxicology (Dana, 1848). He documented the symptoms of more than a thousand paint and cosmetic workers in Parisienne factories. Faced with the wide variety of symptoms caused by lead poisoning, Planches concluded that there were actually four different diseases caused by lead.
He divided the symptoms into "diseases" based upon whether the primary complaint was gastrointestinal, pain in the limbs and muscle contractions, loss of voluntary motion or sensation, or delirium and coma and convulsions. He called the "diseases" colic, arthralgy, paralysis, and encephalopathy. Using his model of disease, Planches was unable to answer two questions: "Why is there a greater disposition [in certain people] to be attacked by one form of lead disease than by another?" and "Why then is not the manifestation...in the system the same?" (Dana, 1848, p. 12).

Fein, Schwartz, Jacobson and Jacobson defined a multiple-effects model in 1983 which was able to account for the variations which the previous model of disease could not explain (Fein et al., 1983). These authors concluded that:

For any given dose of a particular chemical, different individuals might exhibit different effects depending on genetic predisposition or the presence of a prior sensitizing condition. Furthermore, some individuals might exhibit multiple ailments, others only one, and still others none. Under high levels of exposure, these multiple effects appear as a set of characteristic clinical signs...Under low levels of chronic exposure, the effects are unlikely to be characteristic of a particular compound.
Conditions such as fatigue, apathy, emotional lability, and tremors may appear in persons exposed to a variety of toxic agents. (p. 1192)

Unlike the biological disease model in which a disease was either present or not present, the multiple-effects model recognized that chemicals accumulated in the body and that prior to overt disease, there were mild symptoms or "precursors". In describing these precursors, Fein et al. wrote that:

Evidence of poisoning may appear in subtle behavioral alterations and in emotional or sensorimotor difficulties...the effects may be predominantly behavioral or may differ in different individuals. For these reasons, the overt disease model of toxicity is being replaced by a multiple-effects model that includes subtle behavioral alterations and covert physical changes in addition to overt clinical signs. (p. 1192)

Weiss (1983) also found that mental symptoms act as the first warning signs of poisoning. "Many poisonings, before they bloom into overt clinical signs, may be heralded by vague, subjective, nonspecific psychological complaints." (Weiss, 1983, p. 1174). Weiss further concluded that psychological measures might yield more information than
blood tests in detecting neurotoxic damage because they might be able to detect the subtle alterations in mental functioning earlier than the current measures were able to detect changes in the blood biochemistry. Chemical poisoning was usually accompanied by mental symptoms according to Anderson (1982) because most toxic chemicals were neurotoxins. Industrial solvents, pesticides, heavy metals anesthetic gases, carbon monoxide, and volatile fuels were all poisonous because of their neurotoxic effects (Anderson, 1982). "Because the changes that neurotoxins bring about are often subtle, [they] may be confused with psychologically caused symptoms." (Anderson, 1982, p. 30).

Weiss concluded that:

> the adverse health impact of environmental chemicals should be gauged by how people feel and function, not solely by death or overt damage...Psychology can help resolve many critical issues in environmental health science. (1983, p. 1174)

A variety of mental symptoms has been reported in patients with Environmental Illness (Flanagan, 1990), (Rea, Butler, Laseter, & DeLeon, 1984). Bell found that:

Environmentally-ill patients may exhibit signs and symptoms of acute organic brain syndromes that resemble intoxication. For example, a typical patient with central nervous system symptoms may
report difficulty in concentration and may exhibit confusion, poor short-term memory, slurred speech, motor incoordination, irritability, emotional lability, and flushing. (1982, p. 29)

Some professionals have viewed the vague and numerous symptoms caused by chemical poisoning as indicating a somatoform disorder (Simon, Katon, & Sparks, 1990), (Brodsky, 1983), or indicative of a psychiatric condition (Stewart & Raskin, 1985).

Psychological impairment, however, also has been found in animals which have been exposed to toxic substances (Hayes, 1982). Unlike human subjects, when animals display behavioral deficits following a known exposure to a neurotoxic chemical, the behavioral change is attributed to the toxic agent, rather than to the psychological history or state of the animal. In 1944 Domenjoz studied the effects of DDT upon animals. He found that the first perceptible symptom of poisoning in the animal was an abnormal susceptibility to fear and a violent reaction to stimuli which were previously subthreshold. Motor unrest and an increase in the number of spontaneous movements were then observed. As the poisoning increased, the animals began to get hyperirritabile. Tremors appeared at a later stage of poisoning, and it was not until the last stages that the animals experienced convulsions (Domenjoz, 1944).
Carlson and Rosellini (1987) found that rats exposed to the pesticide dieldrin in combination with inescapable shocks later demonstrated escape deficits. They concluded that "the stressor played a role in determining the behavioral effects of the compound" (p. 125). Mice exposed to low levels of PCB's pre-natally showed longer latencies in response to painful stimulation and difficulties in tasks requiring perceptual-motor integration, despite the fact that the PCB's were no longer detectable in their body tissues (Tilson & Mactutus, 1979). Low level exposures to PCB's perinatally have also been shown to result in a sluggish response to stress, an initially depressed response to a novel environment, and a failure to habituate in mice (Storm, Hart, & Smith, 1981).

Pesticides have also been shown to alter the feeding behavior of rats (Pfister, Hollingworth, & Yim, 1978). A low dosage of chlordimeform, a formamidine pesticide, acted as an appetite stimulant, whereas it induced anorexia at a higher dosage. This bipolar effect on appetite is consistent with the findings of researchers in the field of Environmental Illness (Bell, 1982), (Randolph, 1978), (O'Bannion, 1981). In human patients, an alternating pattern of stimulatory and withdrawal symptoms has been observed in which a patient may alternate between hyperactivity and fatigue or excitement and irritation followed by depression (Bell, 1982, p. 26-27).
The initial evidence of studies done on people who have Environmental Illness and who have experienced cerebral symptoms has indicated that the removal of the pesticides, or other toxins, can result in a clearing of the mental symptoms. Rea, Butler, Laseter, and DeLeon (1984) found that patients in an environmentally pure unit undergoing medical treatment for Environmental Illness improved significantly on objective psychological measures in correlation with a decrease in the pesticide levels in their blood. The patients studied had an average of 3.6 pesticides in their blood serum. The authors concluded that a decrease in the overall body burden of toxic chemicals was crucial to the change in psychological/brain function (Rea et al., 1984). In a follow-up study, Berschler, Butler, Lawlis, Rea, and Johnson (1985) found that patients undergoing treatment for Environmental Illness improved in measures of mental functioning in the areas of subjective depression, alienation, suspiciousness, and misspent emotional/physical energy. They also increased in effortful cognitive processing. The authors concluded that the increase in mental functioning and improved physical health added to the patient's ability to cope emotionally, which further improved their mental functioning.

As recently as 1982, Mountain, Monninger, and Walker found that almost no training existed in medical and nursing
schools that they surveyed in the assessment or care of low level and acute pesticide poisoning. They concluded that a definite interest was expressed by many schools in training doctors and nurses how to recognize and treat pesticide poisoning. They also outlined the need for centralized resources so that available information could be better disseminated among the medical community.

The purpose of the present study is to verify the subjective reports of symptoms and mental status observations of Environmental Illness patients by objective measures. It seeks to better qualify the complaints of fatigue and mental clouding frequently reported. It also seeks to establish a general pattern of Environmental Illness symptoms and to compare this pattern to the psychiatric categories of neurosis, psychosis, and somatiform disorders.

METHOD

Subjects

The subjects were patients who were in treatment at Environmental Units in Dallas, Texas or Charleston, South Carolina. The test scores were drawn from a pool of 89 patients who were known to have had toxic chemical exposure, determined both by self-report and blood serum analysis. There were 31 males and 58 females. Their age range was from 13 to 74, with a mean age of 46.3. From this pool of
subjects, 44 Mental Status Exams were obtained, 66 WAIS-R screens were obtained, and 41 POMS were obtained.

Materials

Three clinical instruments were used as part of a test battery. They were a Mental Status Exam (MSE), a Weschler Adult Intelligence Scale-Revised (WAIS-R) screen, and the Profile of Mood States (POMS).

The MSE is a general initial evaluation form (see Appendix B). It was used to evaluate a patient's appearance, orientation to reality, symptom complaints and general demeanor. It is not an empirically derived test, but rather a clinical instrument which the skilled practitioner can use to systematically gather important information about the patient.

The WAIS-R is an individually administered, standardized, objective measure of intelligence and cognitive function (Weschler, 1981). It is composed of twelve sub-tests which measure acquired knowledge like vocabulary and general information as well as short term-memory and immediate recall ability. Six of the sub-tests were used in the present research project: Information, Block Design, Digit Span, Vocabulary, Comprehension, and Digit Symbol. The test reliability of the WAIS-R is .97 (Weschler, 1981).

The POMS is a standardized measure of current mood
state. It identifies and assesses transient, fluctuating affective states. The reliability of the individual items within each of the mood scales to measure the same factor is .90 or greater (McNair, Lorr, & Droppleman, 1981).

Procedure

The clinical instruments (MSE, WAIS-R, and POMS) were administered to the ecological patients by professionals trained in psychometric procedures. They were administered and scored according to standardization procedures. Blood serum analyses were used to confirm the presence of toxic chemicals from environmental exposures. The blood serum analysis used was similar to the one described in a study by Rea et al. (1984). The chemicals were measured in "serum using high resolution glass capillary gas chromatographic methods following extraction with residue analysis grade hexane. Detection was by electron capture" (p. 146).

RESULTS

All data were subjected to descriptive statistics including frequencies, means, percentiles, and standard deviations. The POMS scores were subjected to post hoc t tests, with a correction for multiple tests. The WAIS-R profile as a whole was compared to the expected profile with average scores of 10 on each subtest by means of the Hotelling’s T-Squared. Following the significant multivariant analysis, t tests were performed to determine
which subtests contributed to the differences between the profile of mental functioning of persons suffering from chemical toxicity as compared to expected functioning.

Some of the descriptive data from the Mental Status Exam interview is displayed in Tables 1-6 in the text. Tables 1-3 show the orientation, memory deficits and attentional abilities of the 44 patients with Environmental Illness. Table 4 demonstrates the lack of psychotic thought processes which these patients exhibit. Because the Mental Status Exam was administered as part of a diagnostic

Table 1

<table>
<thead>
<tr>
<th>Orientation</th>
<th>number of people</th>
</tr>
</thead>
<tbody>
<tr>
<td>n = 44</td>
<td></td>
</tr>
<tr>
<td>Oriented to time</td>
<td>40</td>
</tr>
<tr>
<td>Not oriented to time</td>
<td>4</td>
</tr>
<tr>
<td>Oriented to place</td>
<td>43</td>
</tr>
<tr>
<td>Not oriented to place</td>
<td>1</td>
</tr>
<tr>
<td>Oriented to person</td>
<td>43</td>
</tr>
<tr>
<td>Not oriented to person</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 2

Memory Deficits of Environmental Patients Based on Mental Status Exam

<table>
<thead>
<tr>
<th>Type of Memory Deficits</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate memory deficits</td>
<td>39</td>
</tr>
<tr>
<td>Recent memory deficits</td>
<td>33</td>
</tr>
<tr>
<td>Remote memory deficits</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 3

Attention of Environmental Illness Patients During the Mental Status Exam

<table>
<thead>
<tr>
<th>Quality of Attention</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alert</td>
<td>8</td>
</tr>
<tr>
<td>Normal Attention</td>
<td>9</td>
</tr>
<tr>
<td>Able to Concentrate</td>
<td>18</td>
</tr>
<tr>
<td>Attention Deficits</td>
<td>29</td>
</tr>
<tr>
<td>Clouding</td>
<td>30</td>
</tr>
<tr>
<td>Distractibility</td>
<td>18</td>
</tr>
<tr>
<td>Confusion</td>
<td>11</td>
</tr>
</tbody>
</table>
Table 4

Content and Progression of Thought of Environmental Illness Patients on the Mental Status Exam

<table>
<thead>
<tr>
<th>Quality of Thinking</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 42</td>
</tr>
<tr>
<td>Logical Content &amp; Progression</td>
<td>41</td>
</tr>
<tr>
<td>Illogical Content and Progression</td>
<td>1</td>
</tr>
<tr>
<td>perseveration</td>
<td>1</td>
</tr>
<tr>
<td>neologism</td>
<td>0</td>
</tr>
<tr>
<td>incoherent</td>
<td>0</td>
</tr>
<tr>
<td>clanging</td>
<td>0</td>
</tr>
<tr>
<td>echolalia</td>
<td>0</td>
</tr>
<tr>
<td>pressured</td>
<td>0</td>
</tr>
<tr>
<td>poverty of content</td>
<td>0</td>
</tr>
<tr>
<td>Delusions</td>
<td>0</td>
</tr>
<tr>
<td>grandiosity</td>
<td>0</td>
</tr>
<tr>
<td>nihilist</td>
<td>0</td>
</tr>
<tr>
<td>reference</td>
<td>0</td>
</tr>
<tr>
<td>systemitized</td>
<td>0</td>
</tr>
<tr>
<td>being controlled</td>
<td>0</td>
</tr>
<tr>
<td>jealousy</td>
<td>0</td>
</tr>
<tr>
<td>persecutory</td>
<td>0</td>
</tr>
<tr>
<td>somatic</td>
<td>0</td>
</tr>
<tr>
<td>bizarre</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 4--Continued

<table>
<thead>
<tr>
<th>Confabulation</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magical Thinking</td>
<td>0</td>
</tr>
<tr>
<td>Illogical Thinking</td>
<td>0</td>
</tr>
<tr>
<td>Overvalued Ideas</td>
<td>0</td>
</tr>
<tr>
<td>Ideations</td>
<td>16</td>
</tr>
<tr>
<td>Obsessiveness</td>
<td>11</td>
</tr>
<tr>
<td>Ambivalence</td>
<td>5</td>
</tr>
</tbody>
</table>

and treatment program, not every evaluation was completely filled out.

Table 5 shows the incidence of hallucinations, illusions and perceptual distortions in Environmental Illness patients. Table 6 is a summary of the occupational history of the patients in terms of their prior work stability and satisfaction.

One item which is not shown in a table is the incidence of "indecisiveness". This symptom was reported by 30 of the patients.

The rest of the data from the Mental Status Exam is displayed in Appendix A.
Table 5

**Perceptual and Sensory Distortions of Environmental Illness Patients Based on the Mental Status Exam**

<table>
<thead>
<tr>
<th>Perceptual Alteration</th>
<th># with symptom</th>
<th># without</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hallucinations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>visual</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>auditory</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>tactile</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>olfactory</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>somatic</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>gustatory</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Illusions</strong></td>
<td>2</td>
<td>38</td>
</tr>
<tr>
<td><strong>Perceptual Distortions</strong></td>
<td>23</td>
<td>13</td>
</tr>
</tbody>
</table>
Table 6

Occupation History of Environmental Illness
Patients Based on the Mental Status Exam

<table>
<thead>
<tr>
<th>Occupational Measure</th>
<th>Number of People</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupational Stability:</td>
<td></td>
</tr>
<tr>
<td>very stable</td>
<td>14</td>
</tr>
<tr>
<td>stable</td>
<td>5</td>
</tr>
<tr>
<td>fairly stable</td>
<td>2</td>
</tr>
<tr>
<td>less than stable</td>
<td>1</td>
</tr>
<tr>
<td>unstable</td>
<td>0</td>
</tr>
<tr>
<td>Occupational Satisfaction</td>
<td></td>
</tr>
<tr>
<td>satisfied</td>
<td>17</td>
</tr>
<tr>
<td>average</td>
<td>4</td>
</tr>
<tr>
<td>unsatisfied</td>
<td>3</td>
</tr>
<tr>
<td>Current Work Status:</td>
<td></td>
</tr>
<tr>
<td>full-time</td>
<td>5</td>
</tr>
<tr>
<td>part-time</td>
<td>1</td>
</tr>
<tr>
<td>unable to work</td>
<td>21</td>
</tr>
<tr>
<td>due to illness</td>
<td></td>
</tr>
</tbody>
</table>
The Hotelling's T-Squared ($F = 13.725, p \ll .001$, df = 64) demonstrates that the WAIS-R profile as a whole is statistically unlike a normal profile. The $t$ tests performed on the sub-tests reveal that this population scored significantly above average on the Information, Vocabulary, and Comprehension sub-tests ($t = 2.273, p < .01$, $t = 4.481, p < .001$, and $t = 2.883, p < .01$) and below average on the Digit Symbol test ($t = -5.745, p \ll .001$). Figure 1 shows the profile pattern.

The profile pattern of POMS scores is displayed in Figure 2. The composite Fatigue-Inertia score is

Figure 1

WAIS-R Profile for Environmental Illness Patients

![Graph showing WAIS-R Profile for Environmental Illness Patients]
significantly higher than the cut-off level measuring for fatigue ($t = 4.235, p < .001$). The Tension-Anxiety and Depression-Depression scores are significantly lower than the pathological measures ($t = 3.173, p < .005$, and $t = 3.471, p < .002$). All three scores are highly significant when corrected for post hoc testing. On both the Confusion-Bewilderment and the Vigor-Friendliness measures, the patients have scores which are slightly above the cut-off level for significant amounts of a particular mood state. On the Anger-Hostility measure, the Environmental Illness patients were slightly below the cut-off level.

Figure 2
POMS Profile for Environmental Illness Patients
DISCUSSION

The results clearly substantiate that Environmental Illness has a distinctive pattern of symptomatology and etiology which distinguishes it from mental illnesses of psychogenic origins: including somatoform disorders (hypochondriasis, hysteria, psychogenic pain, dysmorphophobia, conversion disorder, somatization and neurotic depression) and functional psychoses (including schizophrenia, bipolar disorder and paranoia). It will not, however, be surprising that many health professionals will continue to make comparisons to the psychiatric conditions just listed even though it has never been substantiated that Environmental Illness patients can be accurately classified by these conditions using the criteria of the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders-III-R*. It seems curious that in light of the distinctive pattern of symptomatology of Environmental Illness it has not been generally accepted by the medical profession when that profession willingly accepts such diagnoses as hypochondriasis, hysteria, or functional psychosis, although there has never been a clearly established cause and effect relationship in any of these disorders.

The results of the present study also strongly support
the hypothesis that the subjective reports of Environmental patients can be objectively verified. Standardized tests of intellectual and mood functioning both substantiate the verbal reports of the patients. Establishing a test profile for Environmental Illness patients would be very useful to health professionals as they would more readily be able to diagnose their patients who are affected by this malady.

The Mental Status Exam can be used to describe general characteristics of patients with Environmental Illness. All of the patients interviewed were able to maintain appropriate eye contact and did not display overt psychotic behavior. Although patients may occasionally be sloppy with their appearance, either not caring how they look or being too ill to improve their appearance, the majority of patients are dressed and groomed appropriately, unlike the disheveled appearance of many schizophrenic patients. Most patients respond appropriately to stimuli.

Although people can become disoriented from the effect of toxic chemicals on the brain, rarely is this impairment obvious. For example, patients are usually oriented to time, place, and person. However, they may be disoriented in subtle ways because of their problems with attention and memory. Some report having difficulties remembering how to get to familiar places. Others lose their train of thought mid-sentence. Almost all patients report memory
disturbances. Immediate memory is the most impaired. Often the extent of the memory dysfunction is obscured by the patient successfully compensating for the losses in mental functioning, such as writing down information rather than relying on memory. Patients often report that they forget words, but can substitute other ones. Attention deficits are also very prevalent, but not readily apparent. As the clinician continues to talk with a patient, the gaps in memory and attention appear. Most of the patients have spontaneous and relevant things to say, but with more conversation, the number of comments that can be classified as circumstantial or blocked increases.

The speech and motor functioning of Environmental Illness patients are also altered by the illness. None of the patients in this study had problems with their tone of voice, but they did have problems with articulation, precision, and slurring. Many people in a chemical reaction are told that they sound as if they are drunk. Some patients have reported that it is as if their face and jaw muscles are "frozen" or "loose and flabby". Patients may have difficulty articulating their ideas because they have forgotten the point they are trying to make or have blanked out on a word. Sometimes the clinician may have difficulties distinguishing a precision or slurring of the speech, because it sounds like a lisp.
Motor activities are also altered by Environmental Illness. In our sample, there was a fairly equal distribution between people who were observed to be overly active, normally active, and underactive, but inevitably people complain of fatigue. Even patients who are able to carry on fairly normal lives complain of having less energy than they used to have. When patients do experience a "high" from a chemical reaction, it is followed by a "low" period of extreme fatigue. One patient described the fatigue as "feeling so weak that it feels like my arms may fall off because they are too heavy". The activity level is a bipolar symptom. Patients tend to alternate between being hyperactive and lethargic or they experience agitation, restlessness, and a slowed response simultaneously. Many people also experience problems in their gait, stance and balance. Balance problems are a typical symptom of toxicity because neurotoxic chemicals affect the Central Nervous System. Many patients also have posture problems, which are even more apparent when the patient is seated. Muscle weakness may be the cause of the poor postures. Some patients report that their posture is worse when they feel ill or when they are in a chemical reaction.

Although psychological symptoms are present, such as memory impairment and low mood, it appears that these symptoms have a physiological basis induced by adverse
reactivity to environmental chemicals. There is no evidence of delusional systems or severe thought disturbances. All but one of this sample were judged to have logical thought content and a logical progression of thought. The lack of somatic delusions, delusions of being controlled or persecution delusions is noteworthy considering the nature of the illness and the number of things to which most of these patients are allergic. The subjects are not incoherent, clanging, using neologisms or using echolalia. There is usually not a poverty of content, or pressured speech. Other psychotic symptoms such as confabulation, magical thinking, and illogical thinking are also not present.

The patient population in this study is in touch with reality, although their reality is difficult. At times patients seem to want to withdraw from what they perceive to be a hostile environmental reality. As with any chronic illness, there is a high level of stress associated with pain as well as lifestyle changes. The mood of most patients is depressed, dysphoric, sad, negative, and angry. Although almost all of them are judged to be cooperative and able to relate to the examiner, many are anxious, negative, and confused in their attitude. Most of these patients have a low level of comfort. The insight of most of the patients is good or fair. It is not that they lack a good
perspective on their situations, it is that the situation is, in fact, unpleasant. The primary defense mechanisms these patients use are denial, repression, and withdrawal. Many of the patients complain about having to be more dependent since they have become ill. This kind of dependency/ regression often occurs in the case of a severe illness.

One type of thought disorder which is often characteristic of these patients is indecisiveness. Patients report that they can line up the reasons in favor of each possible decision, but are then unable to make up their minds. This seems to be characteristic of a specific brain reaction, as these same people are able to make up their minds when they are not feeling ill. Many of the patients in this sample were formerly professionals who made their livings by making complex decisions. Patients also report that they worry a great deal about a decision after it has been made. Another thought disorder which can be present is depressive or suicidal ideations. Some patients report that their families would be better off if they were dead.

Some hallucinations are present among Environmental Illness patients, though this is not the typical pattern. The hallucinations observed can generally be attributed to a physical basis--known chemicals. Visual hallucinations will
result from any pressure or interference on the optic nerve. Trichloroethylene is one chemical which is known to cause a ringing in the ears. Tactile hallucinations could result from a variety of nerve disorders. The absence of delusional or illogical thought substantiates the likelihood that the hallucinations are the result of toxic brain activity, rather than indicative of a psychiatric disorder.

Unlike hallucinations, perceptual distortions are often present. Patients describe the sensation of walls and other fixed objects seeming to move, of seeing what look like floating spots, and of other visual disturbances.

The historical backgrounds of the patients do not indicate pathology. Most of the patients in this study have stable work histories, unlike schizophrenic or bipolar patients, and express satisfaction with their jobs. Few of them are able to continue their work following the illness. All of them report that the illness interferes with their ability to work. It cannot be determined from this study what type of family relationships are typical for patients with Environmental Illness. Patients with less stable support systems are not likely to be represented in the hospital setting.

Increased stress is consistently reported by Environmental Illness patients. They also report that they have less ability to cope with stress and have poorer
psychological functioning overall. Generally, these patients have not previously received psychiatric drugs or hospitalization. They also did not usually have a history of drug or alcohol abuse. In their family histories, there is a greater tendency for other family members to have a history of physical illnesses rather than psychiatric disorders. Whether the physical illnesses of family members is significant or not is difficult to say, as many of the patients have aging parents who may be experiencing the normal physical deterioration which accompanies aging.

Many of the patients have been healthy throughout their lives, prior to a toxic exposure, either a single large-dose exposure or multiple low-dose exposures. Although some have experienced poor health throughout their lives, they are the exception. This finding is inconsistent with the pattern for hypochondriasis or malingering. Also, the age of onset is inconsistent with that of schizophrenia.

The scores on the WAIS-R screen are generally well above average. The high scores on this test are likely to be the result of a selection bias. The difficulties involved in receiving a diagnosis of Environmental Illness probably result in few patients other than the exceptional ones receiving medical attention at this time. Financial resources, persistence, and an adequate educational level to research and find appropriate medical care are usually
necessary. Although these patients may have a tendency to obtain higher scores on intelligence measures than the overall patient population, the profile pattern which they create is applicable across Environmental Illness patient groups.

This group of patients scores well above average on Information, Vocabulary, and Comprehension. These subtests all test for verbal comprehension. Long-term memory, retention, a general fund of information and education, learning ability, concept formation, common sense, abstract thinking, and social judgement are all measured by these subtests. One of the mental skills measured by the Comprehension subtest is the ability to recognize antecedent-consequent relationships, which leads to good decision-making abilities. Although this would indicate the presence of good decision-making skills, patients consistently report difficulties with indecision. Their difficulties are not the result of a lack of understanding of the decision-making process or of a lack of ability to organize information. Rather, the memory lapses cause data gaps which impair data-based decisions.

On the Digit Span and the Block Design sub-tests, the means of the patients with Environmental Illness are within the normal range. Their performance on these tests is below their performance on the previous sub-tests. Digit Span
measures short-term memory, auditory sequencing, and immediate auditory memory. Block Design measures perceptual organization, visual-motor-spatial coordination, and abstract conceptualizing ability.

The mean on the Digit Symbol subtest is significantly below average. This test measures for visual-motor coordination or dexterity, speed of mental operation, psychomotor speed, short-term memory and visual recall. The perceptual-motor learning which this task requires involves more than one sensory modality. This test is the most sensitive to neurological disturbances. The type of short-term memory required by this task is more likely to be affected by Environmental Illness than is the immediate auditory memory which Digit Span measures. The lowered performance is an objective measure of the subjective reports of slowed or impaired mental functioning.

The WAIS-R profile of Environmental Illness patients shows a distinct pattern. The scores of the patients are highest on the tests which are the most resistant to change. They are not able to do as well when given a test which measures current mental functioning. Someone without efficient mental processing skills would not be able to do well in abstract thinking tasks or in acquiring vocabulary. The contrast between acquired knowledge and current short-term functioning is evidence of mental deterioration.
The results of the POMS test primarily show a pattern of fatigue. The patient population did not score within the pathological range on the three "neurotic scales": Tension-Anxiety, Anger-Hostility, and Depression-Dejection. In fact, their scores are significantly lower than pathological levels on the Tension-Anxiety measure and the Depression-Dejection measure. The Tension-Anxiety scale measures for heightened musculoskeletal tension.

The Depression-Dejection scale measures for a mood of depression accompanied by a sense of personal inadequacy, worthlessness, sadness, and guilt. Endorsing adjectives like: sad, blue, unworthy, sorry, and worthless would lead to a higher score of Depression-Dejection.

The low measure on the scale of Depression-Dejection is unexpected. Patients verbally report being depressed and unhappy. These patients are likely to be experiencing a different form of depression than the one being measured. The POMS score indicates that their sense of worthlessness, excessive guilt, and unhappiness combined does not reach pathological levels. Low energy is not measured by this scale, though it is a symptom of depression. The primary cause of the feelings of unhappiness and depression which patients report may be fatigue. Unlike psychiatric patients who suffer from clinical depression, most Environmental Illness patients perk up when engaged in conversation and
are able to function, though they report that it is difficult. When patients report that they are depressed, they are probably reporting that they are experiencing low-energy depression and secondarily are unhappy and distressed about being ill.

Additionally, the POMS measures for the current mood state of the patient. The treatment process itself may instill an element of hope, which would affect the POMS measurement.

The Anger-Hostility scale represents a mood of anger and antipathy towards other people. People who are bitter, resentful, and ready to fight are likely to score high on this scale. The average score on this scale, though elevated, does not exceed normal limits.

The Environmental Illness patients have statistically high scores on the scale of Fatigue-Inertia. Feelings of being worn-out, listless, exhausted, and weary are all measured by this scale. The high score on the Fatigue-Inertia scale verifies patient reports that they are experiencing unusual levels of fatigue.

The Environmental Illness patients in the present study have scores around the cut-off level on the scales of Vigor-Activity and Confusion-Bewilderment. The Vigor-Activity scale represents a mood that is lively, cheerful, alert, and energetic. Friendliness is highly correlated
with this factor, which may represent a generally positive affect. There is a negative correlation between this scale and the other test scales, with psychiatric outpatients generally scoring below the mean. This finding is inconsistent with the poor social skills attributed to the hypochondriacal, hysterical or schizophrenic patient.

The Confusion-Bewilderment scale is characterized by muddle-headedness and an inability to concentrate. It may represent how people report their own cognitive efficiency. The score at the cut-off level for abnormal functioning is indicative of impaired mental functioning, and lends support to patient reports of mental clouding.

It is apparent from the patient profile that existing psychiatric labels are inappropriate in explaining Environmental Illness patients. There is no evidence of a hysterical neurosis, or conversion type disorder. Many of these patients had stable backgrounds prior to the illness. Most of them find the illness distressing. Conversion disorder is suggested when the symptoms of a person are inconsistent with the course of an actual physical disorder. Fatigue, mental impairment, and pain are known consequences of toxic exposures in both animal and human studies dating back to 1838 or beyond.

Hypochondriasis can only be diagnosed in the absence of a physical disorder. A somatization disorder or somatoform
pain disorder are also viable diagnoses only in the absence of an organic pathology. A somatization disorder requires a belief that one is sickly beginning before the age of 30, and lasting for several years. Many of these patients were healthy until later in their lives.

The instability associated with personality disorders is not present. The occupational stability of these patients is in marked contrast to the history of instability associated with a schizoid or schizotypal personality disorder. Most of the patients in the present study were sad or had a restricted affect, unlike the profile of someone with a histrionic personality disorder. The absence of delusions, prominent hallucinations, catatonic behavior, flat or grossly inappropriate affect, incoherence or marked loosening of associations all indicate the absence of schizophrenia.

A pattern of symptomatology which is consistent with known research on the symptoms of toxic chemicals, unremarkable past histories, average to high intelligence, normal mood states, and a consistent pattern of physical complaints would all seem to bear evidence of a unique illness pattern which has not yet been adequately defined and accepted. The lack of symptoms which cluster around known psychiatric conditions suggests the need for a new category which can account for the physical evidence of
chemical poisoning and psychological impairment—including memory deficits, attention deficits, low energy, dysphoria, indecisiveness, restricted affect, and alterations in speech and motor activities.
APPENDIX A

FIGURES SHOWING RESULTS OF THE
MENTAL STATUS EXAM
Figure 3
APPEARANCE OBSERVATIONS

Figure 4
Figure 5
Figure 6
MENTAL ACTIVITY PRODUCTIONS

Figure 7
Figure 8
Figure 9
Figure 10
APPENDIX B

MENTAL STATUS EXAM
### Clinical Interview

**NAME**

**ADDRESS**

**TELEPHONE** ( )

**AGE** D.O.B.

**MARITAL STATUS**

**EDUCATION**

**OCCUPATION**

**REASON FOR REFERRAL**

**DATE(S) OF EXAMINATION**

**PLACE EXAMINED**

**EXAMINER(S)**

**TESTS ADMINISTERED**

- WAIS-R screen
- Bender-Gestalt
- CAQ, Symptoms Checklists
- H-T-P
- Harrell-Butler Comprehensive Neuropsychological Screen (H-B CNS)
- MMPI
- DSM III Rating Scale (partial)
- Profile of Mood States (POMS)
- Stress Management Inventory
- Wechsler Memory Scale
- Other

### Mental Status

#### Description and Behavioral Observations:

**A. Description**

1. **Race**
   - 🌟
   - 🌟
2. **Sex**
   - 🏇
3. **Height** feet, inches
4. **Weight** pounds
   - loss
   - gain
   - Time period
5. **Hair color**
6. **Eye color**
7. **Eyeglasses** yes no
   - Contact lens yes no

**Appearance**

3. **Appropriate** yes no
9. **Grooming**
10. **Posture** sitting standing
11. **Facial expression**

**B. Eye Contact**

1. Maintains  
2. Avoids
3. Excessive scanning

**C. Speech**

1. **Quantity**
   - **Normal**
   - **Excessive**
   - **Limited**

**C. Speech (continued)**

2. **Quality**
   - Tone
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟

3. **Content and Progression**
   - Logical
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟

**D. Motor Activity**

1. **Quantity**
   - Normal
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟
   - 🌟

**Note:**

---

(Add any additional notes or observations here.)
E. Motor Activity (continued)

1. Quality
   a. Normal
   b. Abnormal
      Gait
      Stance
      Balance

2. Specific Patterns
   a. Tics
   b. Mannerisms
   c. Other repetitive activities

E. Orientation
   Time  Place  Person

F. Attitude and General Behavior
   Positive  Negative
   Fearful  Anxious
   Suspicious  Alert
   Relates (rapport)
   Cooperative  Confused
   Bewildered  Evasive

G. Affective Sphere
   1. Fluctuations  yes  no
   2. Mood
      Normal  Dysphoric
      Elevated  Sad
      Angry/Hostile
      Positive  Negative
      Happy  Euphoric
      Depressed  Expansive

H. Mental Activity
   1. Productions
      __ Spontaneous  __ Blocked
      __ Relevant  __ Tangential
      __ Circumstantial

   2. Thought Disorder
      __ Perseveration
      __ Loose Associations
      __ Flight of ideas
      __ Delusions of
         Grandiosity  Jealousy
         Nihilistic  Persecutory
         Reference  Somatic
         Systematized  Bizarre
         Being controlled

      __ Ideations
      __ Obsessiveness
      __ Memory deficit:
         Immediate
         Recent
         Remote
      __ Attention:
         Alert
         Clouding
         Confusion
         Concentration
         Distractibility
         Confabulation
         Indecisiveness
         Ambivalence
         Tloological thinking
         Magical thinking
         Overvalued ideas

   3. Perception/Sensory-Motor
      __ Hallucinations:  __ auditory
         visual  somatic
         tactile  gustatory
         olfactory
      __ Illusions
      __ Perceptual distortions

   3. Perceptual/Sensory-Motor
      __ Hallucinations:  __ auditory
      __ visual  somatic
      __ tactile  gustatory
      __ olfactory
      __ Illusions
      __ Perceptual distortions
I. Defense Mechanisms
   - Denial
   - Repression
   - Rationalization
   - Regression
   - Projection
   - Withdrawal
   - Intellectualization
   - Other

J. Primary Conflicts

K. Insight:

L. Level of comfort and satisfaction:

PRESENTING COMPLAINTS:

Primary Symptoms

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Began</th>
<th>Present Duration</th>
<th>Present Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

HISTORY:

A. Describe previous treatment modes and effectiveness for present illness:

B. Describe any psychological or psychiatric treatment:

C. Family health history: Mother
   Father
   Siblings

D. Describe your general health:
   Childhood
   Adolescence
   Adulthood

E. Describe your childhood in terms of happy, loving, punishing, etc.

F. Personal Relationships:
   1. Marriage or close relationship: Very supportive, Supportive
      Less than supportive, Unfriendly, Antagonistic,
      Comments:
   2. Children:
   3. Mother:
   4. Father:
   5. Siblings:
   6. Friends:
   7. Problem relationships:
G. OCCUPATION:
1. Job history: Stable 5 4 3 2 1 Unstable
   Comments:
2. Presently working: ___Full-time ___Part-time ___Unable to work due to illness. How long
   Comments:
3. Occupational satisfaction:
   Performance: prior to illness present
   Comments:

H. PSYCHOLOGICAL HISTORY:
1. Functioning prior to present illness:
   Now:
2. Stress: prior to present illness now
3. How well did you cope with stress prior to present illness:
   Now:

I. CHEMICAL OR INHALANT EXPOSURES (INCLUDING MEDICATIONS):
1. Chemicals/inhalants:
2. Surgeries and dates
3. Prior medications
4. Current medications
5. Drug and/or alcohol abuse

J. GOALS OR PLANS FOR THE FUTURE:
1. Specific short-term
2. Specific long-term
3. Vague or none
   Comments:
REFERENCES


