Editorial

THE articles in this issue show health education in its operational, promotional, and research roles. Taken as a collection, nothing could more clearly demonstrate the versatility of modern health education and its acceptance as an instrument of preventive medicine, as a valuable ancillary to medical care, and as a contribution to general education. Mr. Dodd, Prof. Scott Simonds, and Dr. Holmes, apply the technique and philosophy of health education to each of these areas.

The research angle is provided by Mr. Frame and Miss Stock. Mr. Frame's article also includes the operational area. Studies of motivation will always occupy a prominent place in research and Mr. Frame shows how these can be carried out on a small scale—e.g. in the area of one health authority. Miss Stock shows that even in an area of popular interest, like V.D., there is a gap between what is expected and what is observed—the indispensable measurement in any research.

Dr. Wiener's article will appeal to all who are trying to form a balanced judgement on a much-publicized problem, which is still too little understood. He has carried out important fundamental research into the problem of drug abuse and, in making the distinction between what is a symptom and what is a basic problem, he makes a case for the re-focussing of our thinking and action—not only in relation to drug abuse but in relation to the well-being of young people as a whole.

Dr. Brian Holmes is an expert in comparative education. His paper, which is based on a lecture, deals with the fundamental problem of integration of health education into the school curriculum. The subject is still bedevilled by the conflict between its development as a curriculum subject and its inclusion, in an incidental manner, in the curriculum as a whole. Whatever developments occur in communication science, or motivational research, the value to individual development of that eclectic package of disciplines we call 'health education' must not be forgotten.

As to motivation, neurologists now claim that this is subserved by circuits linking forebrain and hind-brain. There must be a significance in this conclusion which is based on the latest neurophysiological techniques. The significance has not escaped us, as it will not escape our readers.

Psycho-social correlates of medication serum levels in patients with seizures: implications for education of patients

By

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Introduction and Purpose

IT HAS become clear, from many studies of 'patient-compliance' with prescribed medical regimens, that only a small proportion of recommendations made by physicians to their patients are actually followed. Summarizing considerable data on this subject, Davis[1] found that:

> 'regardless of the variety of regimens prescribed and illnesses considered at least a third of the patients in most studies fail to comply with doctors' orders. In almost half of the studies reviewed, the rate of non-compliance falls within the range of 30 to 35 per cent. Eighty-six per cent of the studies report non-compliance in more than 30 per cent of the cases, and one-third of the studies report a non-compliance rate of 50 per cent or more.'

The fact that regimens may be effective from a medical and scientific view is only part of the reason why patients may follow them. One has only to examine the reasons for sales of 'household remedies', and the reasons why many people turn to quackery, to understand that the patient's belief about a medication, treatment, or 'remedy', is a

significant variable in whether he will continue to adhere to a regimen or take a prescribed medication. If, on the one hand, the patient sees improvement in his condition associated with the taking of medications, he is likely to have the belief reinforced that the medication is indeed helping him. If, however, he does not take his medication and continues to feel the same or better, it is likely he will not have the belief reinforced any further, and the behaviour associated with taking medications will be extinguished. If he sees no improvement from the outset, it is likely he will have difficulty in establishing the behaviour of taking medications at all. Many medical practitioners find that patients stop taking medications when they get well. The problem is underscored in the chronic disease field since patients here rarely 'get well' and, rather, must continue to follow a regimen with often no improvement and sometimes with only minimal stabilization.

In order to examine some of the psycho-social variables related to management of patients and their compliance with prescribed medication regimens, an exploratory study of patients with epileptic seizures was undertaken. This particular condition was selected because it often poses a difficult management problem from the medical viewpoint, and, secondarily, because it provides a situation where the medications prescribed at any one point might not really help a particular patient. An assumption often made is that anti-convulsants have solved the problem of epileptic seizures, yet it is relevant to note that there has been no substantial improvement in long-term remission rates of epileptic patients over the last sixty years.[2]

This study was undertaken in order to examine some of the relationships among the following variables:

patient's report on prescribed medications; statements in the patient's medical record regarding prescribed medication; measures of internal/external control and 'social competence'; serum *diphenylhydantoin* (hereafter referred to as *Dilantin*) in the patient's blood; and selected socio-demographic and medical factors.

The study addressed itself to the following specific questions:

(1) To what extent do patients provide an accurate statement of their prescription for medication in comparison with the statement in the medical record?

(2) To what extent do patients have serum Dilantin levels in accordance with their prescription for this medication?

(3) Do those patients who have a greater belief in internal, rather than external, control in their lives report their medications more accurately (and have better serum Dilantin levels) than those who have less belief in internal control?

(4) Do those patients who have greater 'social competence' report their medications more accurately (and have better serum Dilantin levels) than those who have less 'social competence'?

(5) What socio-demographic or medical variables are associated with accuracy in reporting medications and serum Dilantin levels?

The study was carried out at a neurological clinic, in the Great Lakes region, which operates as a short-term treatment facility with additional responsibilities in teaching and research.

Between January and April 1969, patients were interviewed and had blood samples drawn for later assessment of concentrations of Dilantin in the serum. Patients were seen during their regular visit to the clinic, and were referred to the interviewers upon completion of their conferences with the attending physician.

The interview consisted of asking the patient for socio-demographic information, for knowledge of his condition both personally and generally, as it affects others, and for information about his use of medications. The patient was then asked to complete a questionnaire, an instrument designed to assess beliefs in internal/external control and 'social competence', the latter being a portion of the California Psychological Inventory.

DESCRIPTION OF THE SAMPLE

The criteria established for selection of patients were as follows: (1) Patient must have had a prescription for Dilantin for six months or more. (2) Patient must be taking no more than three medications including Dilantin. (3) Patient must not be so mentally retarded nor disturbed as to be unable to participate in the interview. (4) Patient must be 18 years of age or older.

Charts of 140 patients scheduled to be seen during the four months of the study were reviewed. Of this number only 49 met the above criteria. The main causes for rejection of patients from the study were that they were less than 18 years of age, or did not have Dilantin prescribed. Of the 49 eligible patients, 32 completed all study procedures, and, on two additional patients, a portion of the data was available. Cancelled appointments accounted for the loss of other eligible study patients.

Of the 34 patients in the sample, 62 per cent were males and 38 per cent were females; 67 per cent were white and 33 per cent were black. At the time of the study, only 25 per cent of the patients were married. The remaining 75 per cent had either never been married, or were widowed, divorced, or separated. Patients ranged in age from 18 to 55 years, with a median age for the total sample of 28 years. There was little difference between the median ages for males or females, blacks or whites.

Half of the sample had graduated from high school, and of those that had completed high school, a small number had gone on for further education or specialized training. Four patients had less than seven years of formal schooling. While the study includes nine patients whose

records indicated that they had measurable intelligence of less than 100 on standardized intelligence tests, their scores on other instruments and procedures used in the study showed no greater variability than the remainder of the sample.

Each patient was classified by the clinic physicians as to his seizure pattern. The distribution of seizure patterns can be seen in Table 1 below.

Table 1. Seizure Patterns of 34 Patients with Epilepsy

Classification	*Number*	*Percentage*
Grand Mal, Non-focal onset	2	5·8
Grand Mal, Focal onset	5	14·7
Grand Mal, Difficult to classify	4	11·7
Psychomotor	7	20·5
Petit Mal	1	2·9
Grand Mal, Focal onset, and Psychomotor	9	26·4
Grand Mal, Non-focal onset, and Psychomotor	2	5·8
Grand Mal, Non-focal onset, and Petit Mal	3	8·8
Grand Mal, Focal onset Combined with other	1	2·9
TOTAL	34	100·0%

The patient's record was reviewed to determine the date at which the first seizures were diagnosed. The patients were interviewed further when there was doubt about the record, in an effort to obtain a date as close to the estimated date of onset of seizures as possible. Some general picture of the number of years patients had seizures can be found in Table 2 below. The median years with seizures was 17 years:

Table 2. Length of Time Patients Had Seizures

Years	*Number*	*Percentage*
5 years and under	7	20·5
6–10 years	4	11·7
11–15 years	6	17·6
16–20 years	7	20·5
21–25 years	4	11·7
26–30 years	4	11·7
31–35 years	0	0·0
36 years and over	2	5·8
TOTAL	34	100·0%

In managing patients with seizures, the degree of seizure-control is an important consideration. For the study population, attending physicians rated the patients on seizure-control according to the following criteria, and the ratings are tabulated in Table 3.

Excellent: No seizures in year preceding interview.

Good: No seizures in month preceding visit and averaging less than one seizure per month.

Fair: Averaging one seizure per month, but fewer than two per month.

Poor: Two or more seizures per month.

Table 3. Physician Ratings of Seizure Control in 34 Patients with Epilepsy

Ratings	*Number*	*Percentage*
Excellent	4	11·8
Good	15	44·1
Fair	4	11·8
Poor	11	32·4
TOTAL	34	100·0%

In this study, when one eliminates the six women who were housewives, it was found that more than half of the patients were employed either full or part-time. For those who were unemployed, and not coded as housewives, the major reason given for unemployment was their epileptic condition. Further analysis indicated that in all likelihood the employment status was also related to a lack of formal education. Those who were employed either full or part-time were better educated on the whole than the unemployed group, with nearly all completing high school and some having education and training beyond high school. Those not employed, for reasons associated with epilepsy, were far more likely to have completed only grade school or to have had some high school. The four patients who did not finish grade school were all unemployed. For the unemployed, less-educated group, their condition probably prevented them from getting a more adequate education earlier in life.

FINDINGS

Accuracy of Patient Reports

Patients were interviewed to determine if they could report their medication dosages accurately. The criterion for accuracy was the extent of agreement between their clinic record and their verbal response. The patient was acknowledged to be reporting accurately if he could provide the names of his medications or describe the colour of the pills or capsules, and indicate the frequency of daily dosage. Discrepancies between patient's responses and the patient's record were coded as inaccurate reports.

In determining accuracy, at least two factors needed to be considered for reliability. First of all, when discrepancies occurred, it is possible that an error could have been made in the clinic record.

No data were obtained to assess this factor, but it is conceivable, for example, that a physician may have changed a patient's dosage or medication on a phone consultation and the change was not noted in the clinic record. Secondly, when no discrepancies occurred, it is possible that the patient had had his memory refreshed during the visit with the physician just prior to the study interview. In the design of the study, it was planned that all patients would have been interviewed prior to the conference with the physician, but operational problems in the clinic prevented this.

It can be seen from Table 4 below that female patients reported more accurately than males what medications they were to take. This held true for Dilantin as well as other medications:

Table 4. Patient Knowledge of Dilantin and Other Medications Including Dilantin

	Dilantin		*All Medications*	
	No.	*Percentage*	*No.*	*Percentage*
Males ($N=21$)				
Correct	16	76·2	9	42·9
Incorrect	5	23·8	12	57·0
Females ($N=13$)				
Correct	12	92·3	9	69·2
Incorrect	1	7·7	4	30·7
Total ($N=34$)				
Correct	28	82·4	18	52·9
Incorrect	6	17·6	16	47·1

It is of interest to note, however, that in both males and females, there was an almost 30 per cent drop in accuracy from reporting of one medication, Dilantin, to reporting accurately other prescribed medications. Of perhaps even greater interest is the fact that the most frequent discrepancy occurring between clinic record and patient response was the under-reporting of frequency of daily dosage. These findings support findings from other studies of accuracy in reporting medications, namely that accuracy in reporting the taking of medications for both sexes declines as the number of medications prescribed increases.

Other factors are likely to be involved in accurate reporting of medications, and it appears from the data that the ability to provide a correct response is partially a function of the number of years the individual has had seizures. It will be recalled that the median number of years that patients had had epileptic seizures was 17 years. Table 5 suggests that those who had had the condition for a fewer number of years provided more accurate responses than those who had had the condition longer. These data suggest that an inverse relationship probably exists between the length of time the patient has had seizures and the accuracy of his reporting prescribed medications. An association between age, alone, and accuracy of reporting did not appear.

Table 5. Knowledge of Medications among 34 Patients with Epilepsy

	Have had seizures 16 years or less	*Have had seizures 17 years or more*
Correct knowledge of medications	12	4
Incorrect knowledge of medications	7	11

$x^2 = 4{\cdot}48, \quad p > 0{\cdot}05$

In interpreting these data it must be remembered that the longer the patient has had seizures, and has attempted to take medications to control them, the more likely he has had a variety of medications prescribed over a period of time. The possibility of confusion is greater if he has had to change prescriptions frequently. It is also probable that the longer he has had the condition, the more often he takes his regimen into his own hands and follows his own inclination, in contrast to someone who is still adhering closely to the physician's advice in hopes of achieving a satisfactory treatment result.

Another possible interpretation is that patients who have had their seizures for a long time, regardless of degree of control, begin to grow more careless about their prescribed regimens than those who have had seizures for fewer years. Perhaps they begin to feel that medication is not so important in seizure-control as they once believed. If indeed they have not had their seizures controlled very well, regardless of dosage consumed, it is conceivable that they may begin to pay less attention to accuracy. Table 6, however, indicates that this is not quite the case, for those who have their seizures under excellent and good control are, indeed, those who report their medications more accurately.

Table 6. Knowledge of Medication and Seizure-Control in 34 Patients with Epilepsy

	Knowledge of Medications	
Seizure-Control	*Accurate*	*Inaccurate*
Excellent and good ($N=19$)	13	6
Fair and Poor ($N=15$)	5	10

$x^2 = 4{\cdot}14, \quad p > 0{\cdot}05$

An accurate knowledge of medications was not associated with having more formal education (high school graduation and above) in contrast to less formal education.

Serum Dilantin Levels

Any effort to measure patient behaviour always faces the criterion problem: What will be accepted as an indicator that a specific behaviour has occurred? Since it is nearly impossible to ascertain actual consumption of medications by patients, seen on an out-patient basis, an indicator other than actual observation of this behaviour must be employed.

Since techniques for measuring levels of medication in the blood have been developed for certain drugs, including Dilantin, it was possible to employ these techniques to determine whether or not a patient was taking his medications reasonably as prescribed. For the sake of simplicity in research design, it was decided to focus efforts on determining whether the patient was taking his Dilantin as prescribed, but, in doing so, it was fully recognized that this medication is not the only medication that is important in seizure-control.

While it has been demonstrated that Dilantin is one of the most useful drugs in the treatment of major convulsive disorders, it has also been shown that many patients (particularly those being treated on an out-patient basis) probably are not taking sufficient amounts of the drug to control their seizures.[3,4,5,6,7] Some studies support the fact there is a general tendency for the serum-Dilantin concentrations of the drug to increase with dosage up to 13 days of continuous administration.[3,5,6] On the other hand, some studies report that individual differences in rates of metabolism, and timing of dosage, affect the serum Dilanin levels to the extent that little or no linear relationship is found.[4,8,9]

Several methods for determining concentrations of serum Dilantin have been utilized.[10,12,13,14,15,16] The use of the gas-liquid chromatography method after *Sandberg, Resnick,* and *Bacallao*[17] with a modification following *Vogel* for generation of ethereal *Diazomethane,*[11] was chosen primarily for its sensitivity and its accuracy when used for determination of Dilantin when other drugs are also present. In addition, it was chosen because it required a smaller blood sample from the patient than other methods.

An analysis of the technique to measure Dilantin by this method, as used in this study, revealed that the test was very sensitive when low levels of Dilantin were present and when large amounts were present. It appeared somewhat less sensitive in the middle ranges. In reviewing the figures, it was apparent that the test did not measure quantities of Dilantin below 0·5 mcg/ml. Thus, some of the study patients whose serum analysis indicate *no Dilantin present* actually may have had less than 0·5 mcg/ml. but more than 0.

The initial results of the analysis are indicated in Table 7:

Table 7. Concentrations of Dilantin in Serum of 34 Patients with Epilepsy

Concentrations (mcg/ml.)	*No. of Patients*	*Percentage*
0·0	10	29·4
0·5–10·0	12	35·3
10·1–19·9	1	2·9
20·0 and over	11	32·4

From the work of *Lund,* it has been discovered that when serum Dilantin is found to be less than 10 mcg/ml., for patients who have been taking the drug for a period of approximately two weeks or more, seizures are not well controlled.[18] *Haerer* reports that a level of 11·4 mcg/ml. was found in patients with good seizure-control.[19] It has been found that those patients in whom there is no measurable serum Dilantin, are, in all probability, not taking their medications.[20]

In this study it was found that as the weight of the patient increases, there is a general tendency for concentrations of serum Dilantin to decrease as delineated in Table 8:

Table 8. Concentrations of Serum Dilantin According to Weight of Patients

Number	*Weight Range (in Pounds)*	*Mean Dilantin levels (in mcg/ml.)*
7	125 and under	11·6
11	126–150	13·3
9	151–175	10·8
6	176 and over	3·8

It is of interest to note here that, if one divides the patients into two groups, those who weigh under 150 pounds and those who weigh over 150 pounds, and compares the serum Dilantin levels of each with those of *Haerer and Grace,*[21] the figures are almost identical. (In this study, patients under 150 pounds had 12·6 mcg/ml.; in the Haerer and Grace study, they had 12·4 mcg/ml. In this study, patients over 150 pounds had 8·0 mcg/ml.; in the Haerer and Grace study they had 8·1 mcg/ml.)

A preliminary screening of the data in Table 7 indicates that there are ten patients in whose serum no measurable quantities of Dilantin are found. There are another twelve patients whose average serum levels appear below that generally regarded as optimum for control of seizures. Two-thirds of the patients have concentrations of Dilantin in serum, below what is needed for reasonably successful therapy, a finding parallel to that of Lund[22].

In examining the serum concentrations in Table 9, it is of interest that there is a much greater tendency for males than females to have no measurable serum Dilantin, and a somewhat greater tendency among females than males to have what appear to be toxic levels (over 20 mcg/ml.).

Table 9. Distribution of Serum Dilantin Levels in 34 Patients with Epilepsy

	Low Range (0·0 mcg/ml.)		*Middle Range (0·5–19·9 mcg/ml.)*		*High Range (20 mcg/ml. and over)*	
Males (*N*=21)	9	42·0%	6	28·5%	6	28·5%
Females (*N*=13)	1	7·7%	7	53·9%	5	38·5%

It is important to keep in mind that concentrations of Dilantin might be expected to vary according to the prescribed dosage. Table 10 illustrates some of the important differences.

Table 10. Mean Serum Dilantin. Concentrations and Prescribed Dosages of Dilantin for 34 Patients with Epilepsy

	Prescribed Daily Dosage of Dilantin		
	400 mg.	*300 mg.*	*100–200 mg.*
Males (*N*=21)	5·2 mcg/ml. (*N*=10)	10·2 mcg/ml. (*N*=10)	26·5 mcg/ml. (*N*=1)
Females (*N*=13)	19·1 mcg/ml. (*N*=5)	10·6 mcg/ml. (*N*=7)	2·0 mcg/ml. (*N*=1)

Using mean serum concentrations of Dilantin as a relative indicator of adherence to therapeutic dosages, it would appear that serum concentrations follow a trend for women in keeping with the amount prescribed; that is—the more prescribed, the more appears in the serum. The reverse appears true for men. There is only one male and one female included in the range of 100-200 mg. prescribed daily, which make these particular data difficult to interpret.

The data were examined from the standpoint of whether the patient was rated as having his seizures under excellent control, good control, fair control and poor control. No clear patterns emerged, and it is worth noting, as shown in Table 11 below, that there was little relationship between seizure ratings and concentrations of serum Dilantin:

Table 11. Mean Serum Dilantin Levels and Seizure Ratings of 34 Patients with Epilepsy

	Excellent Control	*Good Control*	*Fair Control*	*Poor Control*
Mean Dilantin Level	13·8 mcg/ml. (*N*=4)	5·23 mcg/ml. (*N*=15)	19·9 mcg/ml. (*N*=4)	9·3 mcg/ml. (*N*=11)

If anything, the data tend to suggest that in this sample, there is an inverse association between concentrations of Dilantin and the reported degree of control. While no firm conclusion could be reached from numbers as small as these, the data do illustrate one aspect of patient behaviour that could be a problem in the treatment of epilepsy. It would appear that in patients with this condition there may not necessarily be a positive relationship between having high concentrations of Dilantin and having seizures rated as controlled. As a result, little reinforcement may exist to support taking medications as prescribed because the patient may experience little, if any, improvement as a result of taking increased dosages.

No effort was made to determine to what extent patients were taking prescribed medications other than Dilantin which could have had substantial effects on the actual control of their seizures. However, in view of the fact that 82 per cent of the patients could give the correct information about their Dilantin medications, in contrast to only 52 per cent who could give correct information about all their prescribed medications, it is likely that the taking of other medications might show even greater discrepancies between prescribed dosage and serum concentrations than did Dilantin.

With consideration given to a wide possible variation in metabolism of Dilantin, it is important to note that among the 28 patients who reported their prescribed Dilantin dosage correctly, in 16 the concentrations of Dilantin were so high as to be considered toxic, or so low as to suggest no consumption of Dilantin at all. In fact, for 8 persons who reported correctly, no measurable Dilantin was recovered, and for another 8 persons who reported correctly, the amount recovered suggested chronic toxicity.

Patient Beliefs in Internal-External Control

Account of Reporting and Serum Dilantin Levels

In this study it was found that almost 90 per cent of the patients believed that their medications had reduced the frequency of their seizures; 10 per cent were not sure. Some indicated that the medications had also reduced the severity of their seizures.

When an individual believes that an event is contingent upon his own behaviour or his own relatively permanent characteristics, he is operating under believed *internal* control. On the other hand when he perceives an event as following some action he takes, but is not entirely under his control, it is labelled *external* control. In many cultures this is seen as the result of luck, fate, chance, control by others, or as predictable. Thus, whether the individual feels that certain events in his life are caused by his actions is largely dependent upon whether he perceives that the rewards follow the behaviour.

Rotter et al.[23,24] hypothesized that belief in an internal or external control is of considerable importance in understanding the learning process. The theoretical assumptions behind this position

evolve from social learning theory, in which a reinforcement tends to strengthen the expectation that a particular event or behaviour will be followed by additional reinforcement in the future. When the reinforcement is not seen as dependent upon the individual's own behaviour, however, the behaviour will be less likely to continue or increase as when the reinforcement is seen as dependent upon his own behaviour. Therefore, in a given situation, the more an individual is likely to think that the results he gets are a matter of luck and not related to his initiative or behaviour, the less likely is he to continue the action or behaviour.

A scale to measure how an individual generally perceives the extent to which he has control over his environment, and can predict that his actions will obtain certain results, has been developed by *Rotter* and is used in this study. The scale called the I–E Scale is a 'forced choice' 29-item scale with 6 filler-items. Satisfactory test/retest reliability and satisfactory correlations with other methods assessing similar variables have been demonstrated.[23] There is strong support for the hypotheses that an individual who has a strong belief that he can control his own destiny is likely to be more alert to those aspects of the environment which provide useful information for his future behaviour; that he will take steps to improve his environmental condition; that he will place greater value on skill or achievement reinforcements; that he will be generally more concerned with his ability, particularly his failures; and that he will be resistive to subtle influences. The I–E Scale is not highly correlated with intelligence or social desirability.

In the case of a patient with epilepsy, the application of these concepts has particular interest, for in epileptic patients there is considerable individual variation in the degree to which seizures may be actually controlled by prescribed medication regimens. Therefore, patients may adopt quite different beliefs regarding their ability to control seizures. For example, if their seizures have not been controlled well by medications taken regularly, they may come to feel that the medications have no value and discontinue them.

On the other hand, if the seizures have been controlled (which may or may not be due to the medications), the patient may continue to take his medications as prescribed because he feels they are helping him. This latter point would conflict with the position sometimes taken that individuals grow careless about, or stop, their medications when they feel well and only take them when they feel sick. It has been suggested that some patients with epilepsy stop taking their prescribed medications when they stop having seizures, over a period of time, or until they have another attack. In a sense, they remove themselves from the situation psychologically during the seizure-free interval by saying, in effect: 'I am cured' or 'My case is controlled'.

In order to determine to what extent patients with epilepsy believe that events in their lives are within their control (internal) in contrast to a belief that they are not entirely within their control (external), a scale to measure internal/external control (I–E Scale) was administered.

There were 31 patients in the study for whom completed I–E Scales were available, and the distribution of their scores can be seen in Table 12:

Table 12. Distribution of Scores on I–E Scale Among 31 Patients with Epilepsy

	Males ($N=20$)	*Females* ($N=11$)
Range of Scores	1–18	2–13
Mean	10·05	8·63
Median	11·00	8·00
Standard deviation	4·37	3·33

Since it could be questioned to what extent a sample of patients with epilepsy would score in ways comparable to other populations with whom the test has been used, the scores were compared with other scores reported.[23] Use of the test among patients with epilepsy has not been reported before, but it is seen in Table 13 below that the scores from the sample in this study fall within the range reported in other investigations:

Table 13. Distribution of Mean Scores on I–E Scale Among Selected Populations

	Males	*Females*
Lowest Reported Mean and SD	6·06 SD=3·51	5·48 SD=2·78
Highest Reported Mean and SD	10·0 SD=4·20	9·0 SD=3·90
Patients in this study	10·05 SD=4·37	8·63 SD=3·33

The data were examined from the standpoint of the possible effect of age on the scores, and it was found the scores varied randomly by age, with no significant differences among those above or below the median age of 28 for the total sample.

A positive association was expected between the patient's belief in internal control and the accuracy of his knowledge about his medication regimen—e.g. thus the more he believed in internal control, the more likely he would be to report his prescription. Although the data did not reach levels of significance, inspection of the mean I–E scores for the accurate group (I–E=8·9) in contrast to the inaccurate group (I–E=10·3) suggests that the trend might have been in the anticipated direction had a larger number of patients been available.

The patients' scores on the I–E Scale were examined in relationship to the concentrations of serum Dilantin, and it was noted that there was a slight tendency for those patients who had no measurable serum Dilantin and those who had quantities that were probably toxic to have higher I–E scores than those whose levels were in between these extremes. The data suggest, however, that those who were probably taking their medications as prescribed had a greater degree of belief in internal control, while those who probably deviated from the prescribed regimen had a somewhat lesser degree of this belief.

The relationship between scores on the I–E Scale and the number of years the patient had had epilepsy was examined, and the data are reported in Table 14 below:

Table 14. Scores of Patients on the I–E Scale and Length of Time They have had Epilepsy

	I–E Score 10 and below	*I–E Score 11 and above*
16 years and under	6	10
17 years and over	11	4

$x^2 = 3{\cdot}85, \quad p > 0{\cdot}05$

It can be seen that, in the total sample, an association exists between the length of time the patient has had epilepsy and his score on the I–E Scale. It appears, therefore, that the longer the patient has had his condition, regardless of his age, the more likely he is to have a greater belief in internal control. The fewer years he has had it, the more likely he is to have a belief in external control.

This fact is of particular interest because when data on seizure-control *per se* is reviewed against data on number of years the patient has had seizures, it is found that there is a tendency for the patients who have had their seizures for less time to have them under better control, and those patients who have had them for a longer time, to have them under poorer control. Although the data do not reach levels of significance, the trend is rather clear.

A possible interpretation of these data is that as one lives with epilepsy over a length of time, regardless of seizure-control, one may come to see oneself as having internal control, even though that control may actually consist only of a slightly greater ability to predict and cope with seizures regardless of frequency and severity.

Social Competence, Accuracy of Reporting and Serum Dilantin Levels

One of the major factors being examined in this study is 'social competence' and its relationship to utilization of medications by patients with epilepsy. For the purposes of this study, 'social competence' was defined as the degree to which scores of individual patients on selected scales of the California Psychological Inventory[25] identify the patient more as:

> (1) a person who is outgoing, sociable, and with a participative temperament; (2) a person who has a sense of personal worth, self-acceptance, and a capacity for independent thinking and action; and (3) a person with poise, and self-confidence in personal and social interaction. These three personality factors are identified by three scales on the California Psychological Inventory, namely *Sociability* (SY), *Self-Acceptance* (SA) and *Social Presence* (SP).

Two of these scales, *Self-Acceptance* and *Social Presence*, have been identified among a cluster of personality factors that were found to be correlated with successful employment of persons with epilepsy.[26,27] As such, it was believed these would probably be related to the functioning of 'successful' patients as well. Sociability contributed to the overall 'social competence' factor in the employment study, but was found to be of somewhat lower individual predictive value. It was included in the present study, however, because of its close relevance to the two other factors, and because additional data from a recent rehabilitation study indicate its usefulness in differentiating patients who would be more likely to be successfully rehabilitated.[28,29]

The California Psychological Inventory (CPI), from which the sub-scales were derived, is a standard instrument in the personality assessment field and has made possible rather comprehensive multi-factor evaluations of normal individuals. The total inventory utilizes 480 statements and is a self-administering questionnaire for literate persons. It requires the subjects to respond to each item on an answer sheet by marking 'true' or 'false' according to whether they agree or disagree with the statement as it applies to them. The three sub-scales used in this study employ a total of 126 questions grouped as follows: *Sociability*, 36 questions; *Self-Acceptance*, 34 questions; *Social Presence*, 56 questions.

Although there are actually eighteen sub-scales on the **CPI**, factor-analysis studies have indicated that in reality there may be fewer personality dimensions actually measured by the test.[30] The three sub-scales employed in this study are moderately correlated among themselves (in the range 0·48 to 0·57 for males, and in the range of 0·57 to 0·63 for females) however, and it is possible to consider them as representing a group of traits dealing with favourable interaction with others and sociability.

There were 32 patients who completed the **CPI** and the distribution of responses to the three scales may be observed in Table 15:

Table 15. Distribution of Scores on CPI Among Selected Populations (Means)

		Males	*Females*
Standard Norms	SP	34·0	34·0
	SA	19·0	19·5
	SY	24·5	20·0
College Groups	SP	35·1	37·0
	SA	21·3	19·5
	SY	25·3	26·0
High School Groups	SP	32·7	31·1
	SA	18·7	18·9
	SY	21·5	21·4
Patients with Epilepsy in this Study (Standard Mean Scores in brackets)	SP	31·3[44·5]	30·7[43·9]
	SA	17·7[43·4]	18·8[46·6]
	SY	21·4[42·6]	21·6[43·8]

From Table 15 it can be observed that the sample of patients in this study fell below the Standard Norms for the general population, fell well below the mean score for college groups, and slightly below the mean score for the high school groups that have been tested (with the exception of female patients on the **SY** scale).

From these generalized data one could infer that the sample of patients in this study was somewhat less 'socially competent' than 'average' individuals. These are not particularly surprising findings when one considers the multiple social, psychological, and medical problems that confront them. What is perhaps interesting is that they score as high as they do.

For the purposes of this study it was felt that conversion of the original score to standard score would permit greater ease of analysis. Scores for this purpose had already been developed for each scale with a mean standard score for each scale at 50 with a standard deviation of 10. The standard means are shown in Table 15 in brackets.

An analysis was carried out to determine the relationship between 'social competence' and knowledge of the medications regimen, on the assumption that the socially competent individuals would probably have a greater degree of understanding of the importance of the regimen and a greater accuracy in compliance. Each of the three sub-scales was analysed separately, and in combination with each other, to determine if such a relationship existed. Although there was a modest trend in those individuals who had a higher score on the Social Presence (SP) sub-scale to have a more accurate knowledge of regimen, no such trends were found in relationship to the two other sub-scales (Sociability SY and Self-Acceptance SA). The three scales when combined were not associated with *more* versus *less* accuracy in reporting medications or with serum Dilantin concentrations.

It may be noted in passing that in contrast to the findings of *Dennerll, Schwartz,* and *Rodin,* who found that the CPI scales dealing with Self-Acceptance and Social Presence were highly predictive of employment,[31] this study did not find significant differences between the mean standard scores on these sub-scales for the employed group in contrast to the unemployed group, as indicated in Table 16:

Table 16. Employment Status and Mean Standard Scores on Social Presence (SP) and Self Acceptance (SA) Sub-scales on the California Psychological Inventory

Employment Status	*Mean Standard SP Score*	*Mean Standard SA Score*
Employment Full or Part Time ($N=12$)	44·9	46
Not Employed for reasons associated with epilepsy ($N=15$)	42·0	46

It was anticipated that patients who were employed full-time were more likely to be able to provide correct responses regarding their medications than patients not employed full-time. The assumption here was that requirements for employment such as literacy, general education, and 'social competence', would lead to greater accuracy in reporting medications. Table 17 below indicates that this is indeed the case, although the association is not statistically significant at the 5 per cent level:

Table 17. Employment Status and Accuracy in Reporting Medications

	Employed Full-time	*Not Employed Full-time**
Reported accurately	10	3
Not reported accurately	6	8

$x^2 - 3{\cdot}24$, $0{\cdot}10 < p < 0{\cdot}05$ *Other than housewives.

SUMMARY

An intensive exploratory study of patients diagnosed with epileptic seizures was carried out in an out-patient clinic utilizing verbal and written reports of prescribed medications; measures of internal/external control and 'social competence', serum Dilantin levels; and selected socio-demographic and medical factors related to management of seizures and patient compliance with prescribed regimens.

Do patients report their medications accurately? The answer depends on the number of medications the patient is taking, for while 82 per cent could accurately describe their prescription for Dilantin, only 53 per cent could describe all prescribed medications accurately. It depends somewhat on the patient's sex, for females did almost 30 per cent better than males on reporting medication regimens accurately. The answer depends on the length of time that the patient has had seizures, for the longer patients have had seizures the less likely they are to report accurately. Of interest is the fact that those who reported accurately were also rated as having better seizure control and were somewhat more likely to be employed full-time.

Do patients have serum Dilantin levels related to their prescribed dosage? The answer appears to be that they probably do not. The concentrations of serum Dilantin indicate that two-thirds of the patients have either so little of the medication as to be relatively non-therapeutic, or so much that the dosage could be toxic. There appear to be a number of important variables that must be taken into account in assessing the serum Dilantin levels. For example, the concentrations decrease as weight of the patient increases, and vary inversely by dosage for males, but follow directly the prescribed dosage for females. There is a tendency for more Dilantin to be prescribed according to weight of the patient, and the men are generally heavier than the women. The clarification of this point requires a much larger sample and the use of a regression analysis to separate the major elements involved.

Do those patients who have a greater belief in internal rather than external control report their medications more accurately, and have serum Dilantin levels in accord with their prescription for this medication? The findings were in the expected direction but did not reach levels of significance. Those patients who believed more in internal control did in fact report more accurately and the mean scores on the I-E scale for the accurate patients and the inaccurate one were 8·9 and 10·3 respectively. It was noted, however, that the length of time that the patient had seizures had a direct effect on his beliefs about internal control. The longer he had his condition, the more likely he was to have a higher belief in internal control. There was a slight trend for those patients who had serum concentrations that were 0·0 mcg/ml. or above 20·0 mcg/ml. to have a greater belief in external control than those patients whose serum levels were between these extremes.

Do those patients who have greater 'social competence' report their medications more accurately and have serum Dilantin levels in accord with their prescriptions for this medication?

No relationship was found between 'social competence' and reporting medications accurately, and an inverse relationship was found between 'social competence' and concentrations of serum Dilantin. The data indicate that those patients with the highest scores on the CPI test were actually the patients with 0·0 mcg/ml. serum concentrations, and those with the next highest scores were those with serum concentrations at 20·0 mcg/ml. or higher—the toxic range. The most 'socially competent' appear to be deviating the most from prescribed dosage.

DISCUSSION

While it was noted that those patients with more accurate knowledge of medications also had better seizure-control than those with less knowledge, the relationship between accurate knowledge and serum levels, and between serum levels and seizure-control, did not appear.

In observing the relationship of beliefs in internal versus external control to the number of years the patient had had seizures, it was found that the longer he had had seizures, regardless of age, the more likely he was to have a greater belief in internal control. This is true in spite of the fact that the longer the patients have had seizures in this study, the less likely they are to have them well controlled. Thus there appears to be a 'coping' progress going on in these patients, through which their beliefs about how much they may control their lives increase over the years with the condition. It will also be recalled that patients who were most 'socially competent' actually had no measurable serum Dilantin, or had what could be considered as toxic levels. It will be recalled that accuracy of knowledge of medications decreased the longer the patient had his condition, which may be the result of brain damage. Thus we may be seeing a group of patients who probably feel their condition will not improve further, who may not recall accurately what their medications are, but who believe more in their personal (internal) control over their own lives.

The observation in the study, that 32 per cent of the patients had what could be considered toxic serum Dilantin levels, raises serious questions about the effect of the medications on the patients.

The routine use of serum Dilantin levels in the care of patients with epileptic seizures appears more frequently in European literature than in the literature elsewhere. If reports in the literature reflect the actual practice in caring for patients, it appears necessary to give greater attention to this measurement in the actual care of patients on a routine basis, so that the physician may know more accurately what is actually occurring. The actual reporting of the levels to patients should be explored more extensively as a way of gaining patient interest and co-operation in his own care.

The use of psycho-social measures, similar to those employed in this study, need to be more extensively utilized in routine care of patients, not only in research settings. The care of patients must include an educational component. Since it is likely that the nature of that education will be largely dependent upon the further understanding

of perceptual and motivational factors the patient brings with him to the setting in which care is provided, the need for a further understanding of these factors is apparent.

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