An Hypothesis about Schizophrenic Behavior

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This paper, like a number of other recent theoretical papers on schizophrenia, was stimulated by the large amount of data—disorganized and often contradictory—concerning the behavior of schizophrenic patients. For many reasons data about schizophrenia are contradictory (I will comment on these reasons below) and contradiction is probably in large measure responsible for the constant addition of new data. The disorganized state of the results of these many experiments can be laid directly to the fact that no accepted theory sufficiently simple, sufficiently general, and yet testable in its implications now exists. In this paper, I will attempt to start with a relatively simple and testable hypothesis and trace its implications both in experiments and in clinical descriptions. A restriction which must be imposed on anyone evolving a theoretical description of schizophrenic behavior is that it must make reference to the known genetic component of the illness (its physiologic basis) at the same time as it pays tribute to the fact that the behavior of organisms is modified throughout their lifetime as described by the principles of behavior theory.

The basic hypothesis states that the behavior of schizophrenic patients is more often controlled by stimuli which are immediate in their spatial and temporal environment than is that of normals. It is the compelling control of the immediate stimuli over the behavior of schizophrenics which represents the physiologic basis of schizophrenia. The fact that stimuli which impinge on organisms leave them in a different state from the way they were before represents the environmental basis of schizophrenia. Individuals whose behavior is modified primarily by immediate aspects of the environment would be expected to behave differently from individuals (presumably normals) whose behavior is controlled and modified by both immediate and remote stimuli. Finally, the theoretical system suggested here requires one other assumption, which I think is well supported by experimental data (in the form

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of variability of data in many different areas) and by clinical observation. The assumption is that whatever the schizophrenic defect is, it fluctuates over time, thus giving rise to the apparently "normal" periods and also providing the periods during which new (different) behavior can be acquired by a patient, one of whose major problems is the fact that the effect of stimuli, and therefore their power of acquiring control over behavior, is not lasting during his abnormal periods.

It should be pointed out here that the appeal to stimulus control rather than to a motivational variable (in behavior theory as in schizophrenia) is quite consistent with present day experimental findings in behavior theory (1). Extremes in rates of behavior traditionally attributed to differences in motivation have been demonstrated merely by changing from a stimulus in which one rate or type of behavior is reinforced to a stimulus in the presence of which another type or rate of response is reinforced. The motivational variable of anxiety used in Mednick's (2) learning theory of schizophrenia, or Silverman's (3) attention theory, as it is in so many other theories, with all its contradictory descriptions (a great deal of anxiety is ascribed the schizophrenic and so is shallowness of affect), and its lack of actual or real measurement can be supplanted by the more tangible and measurable concept of the immediate stimulus. The question of whether a schizophrenic patient has a tendency to respond primarily to immediate stimuli can be settled by experimental investigation; some experiments not specifically designed to test this hypothesis provide some evidence for its validity already.

In the process of listing the evidence for the hypothesis advanced in this paper, I will specify more explicitly what the term "immediate" refers to. Basically, it refers to simple temporal contiguity; given two stimuli, one of which was administered a while before and one of which is currently present, the latter is prepotent. Thus in an experiment using a modified method of absolute judgment (4), results were obtained congruent with this prediction. Subjects (both normal and schizophrenic) were instructed to judge the heaviness of a series of weights with and without an anchor weight preceding the weight to be judged. They were also told, at the beginning of the anchored condition, to try to correct for the effect of the anchor weight. The results showed that the schizophrenic patients were more influenced by the physical effect of the anchor weight (closer in time than the instructions and therefore the immediate stimulus) than were the normal subjects, despite the explicit verbal instructions (the more remote stimulus) presented to correct for the anchor effect.

In an experiment based on behavior theory considerations (5), normals and schizophrenics were compared on rate of conditioning and extinction of a verbal response during what appeared to the subjects to be a usual clinical interview. Viewing the conditioning period as the period during which the
immediate stimulus is present, namely the interviewer's verbal reinforcement, and extinction as the time during which the immediate stimulus (reinforcement) becomes ever more remote, the results of no difference during conditioning but a larger number of responses for the normals than for the schizophrenics during extinction are again congruent with the immediacy hypothesis.

Perhaps the most interesting evidence for the prepotency of immediate stimuli comes from our research on communicability of schizophrenic speech (6–8). Using the type-token ratio (number of different words divided by the total number of words in a given speech sample) as an index of degree of repetitiousness, as well as more direct measures of repetitiousness, it was found, comparing schizophrenics and normals, equated for age, sex, education and speech community, that the former repeated more words (lower type-token ratio) than did the latter. The interpretation traditionally given to results like this (9) has been that schizophrenic patients tend to exert less effort to make themselves understood than do normals. It is assumed that repeated use of the same word implies the assignment of different meanings to that word. An interpretation in keeping with the hypothesis submitted in this paper, however, suggests that the constraining effect against repetition of the same word extends over a longer series of words in normals than in schizophrenics.

More direct methods of studying communicability, which was started primarily as a way of quantifying objectively the general defect in a schizophrenic's ability to make himself understood, consisted of the cloze procedure, the method of reconstruction, and the method of unitization.

The cloze procedure was introduced as a method for the study of readability by Taylor (10) and was successfully applied to the study of statistical approximations to English (11) as well as to the study of the effect of drugs on communicability (12). It was observed that the administration of small single doses of chlorpromazine actually reduced communicability. The measure itself is quite straightforward. A given speech sample is typed without punctuation; every fifth word is deleted and a group of normal subjects unfamiliar with the speaker is asked to guess what words are missing. It is assumed that the larger the number of words correctly guessed, the more understandable a person's communication (the greater the communicability). Application of this method to schizophrenic speech showed that it is in fact significantly less comprehensible than the speech of normal individuals.

The method of reconstruction, also directed at estimating communicability, consists of dividing a sample of speech into a number of equally long segments, which are placed in random order; the normal subjects are then required to place these segments back into the order in which they were emitted by the speaker. Again the results showed that schizophrenic speech
was less comprehensive than that of normals, that is, it took longer and resulted in more errors for normal subjects to reconstruct the passages of schizophrenics than those of normals.

The final method used to assess communicability is the unitization procedure. It consists of submitting the unpunctuated typescripts of the speech samples to a group of normal subjects with the instructions to divide the material into sentences, crossing out any words that could not be fitted into the sentences without rearranging them. This method also showed greater communicability in normals than in schizophrenics, namely, a significantly larger number of words in the schizophrenic speech samples had to be crossed out than in the normal speech samples.

One other interesting result concerning the methods of cloze procedure and reconstruction is that the degree of communicability of the schizophrenic speech related to the outcome of illness—the greater the communicability, at the time of hospitalization, the shorter the stay in the mental hospital. Not enough data had been collected on the method of unitization to relate it to outcome of illness.

The accepted and the traditional interpretation of these results would be that the schizophrenic patient displays his thought disorder through his speech; it has also been suggested that the schizophrenic patient tries not to communicate for fear of the consequences. My interpretation will again make reference to the prepotency of immediate stimuli through time. Even superficial consideration given to language makes clear that unless an individual is able to respond to relatively remote response-produced stimuli (his prior verbal behavior) his speech would only make sense for short segments. Thus the hypothesized prepotency of immediate stimuli (response-produced in this case) would be expected to interfere with the language of schizophrenic patients as has, of course, been reported in numerous clinical reports. The present data suggest that it is the prepotency of the short-range constraints over the necessary long-range ones which produce the lower communicability in schizophrenia. A more exact test of this consists of having normal subjects guess the deleted words with differing amount of verbal context for normal and schizophrenic speech samples; one would predict on the basis of the immediacy that a smaller amount of context would favor the correct guessing of schizophrenic speech, while longer context would favor normal speech. But this experiment is yet to be done.

The notion of immediacy is meant to apply not only to temporal contiguity but also to spatial aspects of stimulus situations. The question is, in what way is one stimulus more spatially immediate than another. The answer to this must refer to the temporal continuum of the subject's observing or scanning responses. The immediacy hypothesis suggests that the immediacy of a controlling stimulus in the spatial environment is determined by the
stimulus to which a schizophrenic’s attention is drawn. Thus the proverbial schizophrenic who sorts cards by seemingly idiosyncratic criteria, say amount of dirt on the cards rather than the color, shape or number of configurations, would be equally likely to have his attention drawn to the dirt spots first and would therefore be as likely to be controlled by them as by other stimuli. A more exact experimental test of this was undertaken by Chapman (13) who showed that the effectiveness of sorting behavior of the kind described above deteriorates in schizophrenics as “distracting” stimuli, that is, stimuli irrelevant to the way the sort should be done, are deliberately added to the “sorting” stimuli. Such a notion has been thoroughly explored by Silverman (3) who discussed extremes in scanning behavior in relation to defensive aspects of schizophrenia, namely, defense against anxiety-provoking stimuli. Silverman’s review of the literature concerning the differences in what we prefer to call observing responses between schizophrenics and normals provides some of the background for the hypothesized prepotency of immediate stimuli.

Immediacy will also be defined in terms of the importance of the subject’s conditioning history in controlling his response to the stimulus. It will be assumed that the unconditioned response, or the response requiring fewer intermediary responses, is the response to the most immediate aspect of the stimuli. Thus one would expect schizophrenics to show a tendency toward retinal image (more immediate) rather than object constancy (more remote and depending upon conditioning history [14–16]). One would also expect more stimulus generalization to homophones than synonyms in schizophrenics and the reverse in normals, as was shown empirically by Peastrel (17). Chapman, Chapman and Miller (18) have demonstrated that conceptual performance in schizophrenics is often interfered with by the most common or primary response to a stimulus word when that response is not called for. This experiment presents an example of the response requiring the smallest number of intermediary responses, or a response to a word with, as those authors say (p. 51) “a lesser responsiveness to contextual cues,” that is, the stimuli around it which may drastically modify the “meaning” of a given word.

Given the hypothesis that schizophrenics are primarily controlled by immediate stimuli, one would also expect that a stimulus of greater magnitude, with a greater probability of gaining the patient’s attention, would bring his performance closer to that of a normal. This was in fact shown by King (19) for reaction time, a measure which typically shows the schizophrenic to respond more slowly than the normal. The generally slower reaction time can be explained in terms of irrelevant, yet more immediate stimuli being present around the time of the relevant stimulus, thus delaying responses to the relevant stimulus.
Another important aspect of stimuli which must be discussed with respect to their immediacy is their public vs. their private nature. No account of schizophrenic behavior can be considered complete without taking into account the effect of immediate private stimuli. Response-produced stimuli have already been discussed with respect to the speech of schizophrenics; it was pointed out that schizophrenics are more likely than normals to respond to immediate than remote stimuli even when these are produced by their own responses. I shall assume that the patient's thoughts (subvocal behavior) do not differ, with respect to the immediacy hypothesis, from his verbal (vocal) behavior and thus I expect similar distortions in thought as in speech. The question is under what conditions would one expect the private immediate stimulus to be prominent and under what conditions the public one. Under what conditions would one expect the hallucinations to control the patient's behavior and under what conditions the questions of the interviewer? It must first be pointed out that a very large number of responses are at least partially controlled by preceding responses in lower organisms and particularly in normal human beings in their verbal behavior. There are patients and times, however, when no external stimulus appears able to impregnate the patient's own response-produced stimulus control. Chapman (20) recently referred to episodes of inattention in patients lasting in duration from seconds to hours. While he reports that recovery from these episodes occurs spontaneously, it is also coincident with a new and sudden stimulus that returns them to the control of external stimuli.

The only way to explain the question of private vs. public stimuli is to comment on the development of schizophrenia. At this stage these remarks are highly speculative but the speculation is such that at least parts of it can be tested on a population of high schizophrenia-risk subjects, as Mednick is now doing to test his theory. The immediacy hypothesis suggests that a person likely to become schizophrenic is also one who has a tendency to respond preponderantly to immediate stimuli. Such a response tendency is quite prevalent in young normal children and given the assumption that it occurs only part of the time in the preschizophrenic, it might take quite a while before it results in recognizably "strange" behavior. As people surrounding such an individual recognize the strange behavior they begin to ridicule the preschizophrenic, which may result in his avoiding people, or they begin to stay away from him because of his strange behavior. It is the resultant isolation which will promote the importance of the private stimuli (which also act through their immediate stimuli primarily) during the isolation and which make more important the immediate public stimuli after periods of isolation. The importance of immediate private stimuli would then be expected to be greater in those patients who went through periods of isolation than in those who did not.
The "strange" behavior which is postulated would come from the many misinterpretations of the environment, including what people say, since remarks will constantly be taken out of context by these people. The accident of which words serve as immediate stimuli would then govern whether the paranoia would result in delusions of grandeur or persecution; the confused state found in other schizophrenics could then be attributed to the contradictions evoked by the immediate stimuli which impinge on them.

Relationship of the Immediacy Hypothesis to Current Theories of Schizophrenia

As was stated in the beginning of this paper, a large number of theories have recently been promulgated. The large amount of work which has gone into the reviews basic to the theories helped this author in arriving at his formulation also. What then can be said about those theories vis-à-vis the immediacy hypothesis?

The importance of the symptoms of thought disorder and shallowness of affect was promulgated by Bleuler (21) and Kraepelin (22). The theme of thought disorder has been taken up again and again in Arieti's (23) concept of "paleological thought," by Von Domarus' (24) principle of para-logical thinking, and by Goldstein's (25) notion of concrete thinking. The details of these theories, and others discussing thought disorder, are in conflict and may in fact be wrong in all cases, but their general outlines can all be deduced from a basic deficit of overreacting to immediate stimuli.

The notion of shallowness of affect which has been equally enthusiastically received by workers in the field may well be an important example of an artifact of measurement. The studies in the Biometrics Research Laboratory (26, 5, 27–29) have shown that the rate of emission of verbal self-referred affect statements is controlled to a large degree by the behavior of the interviewer (his reinforcing behavior, that is) and in extreme cases of response emission (with chronic patients) may well be better interpreted as a general deficit in behavior rather than as a specific deficit in expression of affect. A general behavior deficit is again amenable to interpretation by the immediacy hypothesis, since the latter implies the need for constant availability of stimuli to direct and control the behavior of the schizophrenic patient. Particularly for the back ward chronic patient where little stimulation is provided, but also for many an acute schizophrenic patient, the immediate stimuli are private and therefore so are many of the responses.

Motivational theories of schizophrenia, and therefore increasing attention to motivation in performance as evidenced by Johannsen's (30) recent review, have always been of great interest in explaining the extreme behavior of schizophrenics. As was pointed out earlier in this paper, however, extremes in behavior can be engendered as well or better by specific reinforcement
contingencies signaled to be in effect by otherwise nondescript stimuli. Mednick's (2) theory has, because it is based on a learning theory approach to schizophrenia, always appealed to me. Inadequacies of empirical validation of it have been pointed out recently by Garmezy (31) (another psychologist prone to view a learning theory approach with favor), Johannsen (30), and Lang and Buss (32). To me the important inadequacy has been the lack of definition of the central theoretical concept, namely anxiety. It is therefore proper to ask whether the immediate stimulus can function to explain at least some of the differences between normals and schizophrenics which Mednick's theory seemed able to explain. Mednick attributes the faster conditioning of simple restricted responses in schizophrenics and the faster learning of complex responses in normals to a difference in anxiety drive.

It is also true of these two types of studies, however, that they generally differ in the number of irrelevant stimuli which might evoke responses incompatible with the "correct" response. The fact that some experiments with simple responses do not show the schizophrenics to condition faster might well be due to differences in stimuli in these simple response experiments. As to Mednick's prediction of higher stimulus generalization in schizophrenia, it is clear on the basis of such experiments as those of Peastrel (17) that one would expect to obtain entirely different results depending on what stimulus aspect one is examining—the immediate or remote aspects. The experiment by Turouh (33) cited by Johannsen (30) as a contradiction of Mednick's theory apparently dealt with semantic generalization and produces results precisely predicted by the immediacy hypothesis, since semantic properties of stimuli are, as already pointed out above, remote rather than immediate stimuli. The greater stimulus generalization in terms of the immediate aspects of stimuli is of course fully to be expected on the basis of the immediacy hypothesis.

Another recent theory concerning schizophrenia limited itself to consideration of verbal behavior only (18). Its content can easily be subsumed as a special case of the presently considered hypothesis. These investigators state that schizophrenics respond with the "strongest meaning responses"; the weaker meaning responses, they go on to explain, may well require responsiveness to contextual cues, in which schizophrenics show a deficit. In terms of the immediacy hypothesis this can be described as responding only to small segments of verbal behavior at a time—a description which was found useful in interpreting the results in the study of schizophrenic communicability.

Other theories promulgated to explain the behavior of schizophrenic patients have concentrated much more on the stimulus side than have the above mentioned theories. Silverman (3) has suggested a basic attention defect mediated as explained above through attention-responses. How this theory might relate to the immediacy hypothesis has already been suggested when discussing the problem of spatial immediacy. It might be reiterated here
that his theory too is drive based since the patient's screening out of stimulation is considered to be defensive.

Buss and Lang (34) and Lang and Buss (32) have arrived at an interference theory of schizophrenia, according to which the schizophrenic patient has difficulty in concentrating on relevant as well as in excluding irrelevant stimuli; they go on to emphasize a deficit in inhibition of sensory input. This theory is obviously similar to the immediacy hypothesis but differs in two important aspects: (1) The immediacy hypothesis requires only one process to explain the attention deficit, namely that attention is drawn to certain stimuli rather than others. Inhibition as a separate process is unnecessary since when one stimulus controls the behavior of an organism, another one obviously cannot do so also. In this sense therefore the immediacy hypothesis is considered to be simpler. (2) The immediacy hypothesis states not only that irrelevant stimuli will control the schizophrenic patient's behavior but which irrelevant stimuli. In this sense the immediacy hypothesis is more specific than interference theory.

Venables (35), in still another theory of schizophrenia, speaks of an input dysfunction which is manifested as a restriction in attention for the chronic patient and as an inability to restrict the attention for the acute patient. This kind of subdivision of patients may well be genuine but the different behavior found in chronic and acute patients may well reflect only the length of hospitalization rather than the illness itself.

The concept of overinclusiveness stemming from Cameron (36) and extended by Payne (37) also resembles the immediacy hypothesis except that it does not, like it, state what stimuli will be "overincluded."

Finally, Yates (38) most recently in reviewing both experiments and theories in schizophrenia comes up with one of his own also. Agreeing with McGhie, Chapman and Lawson's (39) formulation with one difference, he suggests that the basic defect in schizophrenia is a very slow rate of information processing with a consequent loss of information so that only part of the relevant information comes through. It is difficult to see how Yates would explain the results of Chapman's (13) experiment which shows deterioration of performance with increasing irrelevant stimuli. Nevertheless, Yates also believes that the deficit is to be sought on the stimulus end of the problem.

Before leaving this discussion of different theories of schizophrenia (this discussion by no means covered them all; see Lynn [40] for Russian work in this area), it should be pointed out that the immediacy hypothesis differs from most of the stimulus input malfunction theories in making an attempt to involve behavior theory to explain the development of schizophrenia.

The Relation of the Immediacy Hypothesis to Data

A problem of some moment in the study of schizophrenia concerns itself with the experiments used to test the theories. Shakow (41) has shown quite
early that many experiments which might have been interpreted as showing a basic deficit in a function in schizophrenia could be attributed to differences in cooperativeness, an attribute not suggested to be of basic importance in schizophrenia. Obviously the term cooperativeness requires further definition. Generally it has been measured by the use of rating scales applied to the patients while observing their test behavior. This kind of procedure has obvious shortcomings because of the subjective nature of the estimation of cooperativeness. Perhaps this factor should be considered in a more general context of what variables control the behavior under study. The investigator is interested in gauging the effect of a restricted number of variables at a time. If he assesses differences between normals and schizophrenics in reaction time to light stimuli, to take one common experiment, it is important that this response measure not be influenced differentially by the patient's ability to understand instructions, his memory for them, his hand steadiness, his ability to keep his eyes open, to look in the general direction of where the light will appear, his imperviousness to differences in examiner, sex, tone of voice and general demeanor, and perhaps what comes closest to the concept of cooperativeness, the content of his subvocal behavior (his thoughts) in response to the various aspects of the experimental situation. A number of small modifications in the experimental procedure enable the experimenter to control many of the interfering variables mentioned above and sophisticated experimenters do control for these artifacts.

Much more difficult to deal with is the patient's subvocal behavior about the significance of the experiment, the experimenter, and the experimental setting. Thus if the schizophrenic tells himself that reacting too fast will make the examiner think he is "nervous," while the normal tells himself the faster he reacts the less time he will have to spend at a pretty boring task, the obtained differences are unlikely to have significance in terms of uncovering a basic deficit in schizophrenia. Another problem related to experimenting with schizophrenic patients consists of the fact that the interest of many of these experiments is not in maximum ability but in sample or typical behavior. This suggests that experiments so designed that the subjects do now know what aspects of their behavior interests the examiner would have an advantage over those which reveal the exact purpose of the experiment.

Another source of artifacts consists of the relative unfamiliarity of many of the tasks which experimenters set before patients and normals alike. It is important to point out that unless the interest lies in the rate of learning, the experimenter should deal with stabilized behavior. If the patient is still learning, then obviously the stage of learning will determine the results of the comparisons unless they are well controlled. In addition, it is also to be noted that associated with early stages of learning is a larger amount of variability than will be found later when the behavior has been acquired. These
possible sources of artifact have led me, in addition to considerations of the
centrality of the behavior in schizophrenia, to study communicability in a
situation where the patient had no idea that his speech would eventually be
tested for communicability. It is difficult indeed to think of any behavior
which human adults indulge in more often than verbal behavior. Because
of this, speech has great stability and shows more clearly than unstabilized
behavior the effects of disease processes, like schizophrenia or of drugs (12).

Another important consideration in the design of an experiment is the
selective bias which it exerts. The issue of cooperativeness comes up most
blatantly in the case where a patient simply does not perform a task he is
asked to do. He may, for example, refuse to look in the direction of the
stimulus or he may respond in a manner otherwise obviously unrelated to the
stimulus. It is also a fact that the more one requires of a patient the smaller
the number of patients who are testable. In other words, although ingenious
designs can be elaborated for patients as for normals, the more complex the
experiment, the less representative is the sample of patients and the less
relevant to testing a theory.

It is for the above reasons that I have chosen to study verbal behavior in
a situation (an interview or monologue) where the patient does not know
that his communicability will be measured. Stable behavior is evoked and
(even in situations where attention is drawn to considerations of content, for
example) there is no interference from the artifact of the subject trying to do
or not to do the task given him. In fact, the procedure can be applied to
almost all patients tested.

If a criticism is to be made of the recent reviews of the experimental lit-
erature in schizophrenia, then it should be addressed to the fact that not
enough attention has been paid to the circumstances of data collection as
mentioned above. The same point can be made about the present paper
except that an attempt was made to concentrate on verbal behavior experi-
ments which are not susceptible to the listed artifacts.

Although for many years experimenters were sufficiently impressed by the
low level of psychiatric diagnosis as to refuse to divide schizophrenics into
groups along these lines, new lines of division have arisen along the axes of
process vs. reactive, acute vs. chronic, good vs. poor premorbid state, and
paranoid vs. nonparanoid (an old division, revived). The first three overlap
in meaning and are apparently empirically correlated as well (32). Results
on studies employing these lines of division have been conflicting in many
cases and since the classifications are often based upon case record data which
are notorious for their lack of reliability, the formation of these subgroups of
schizophrenia may indeed be premature. The formation of subgroups has
in fact always been tempting with respect to schizophrenia because the
patients always appear to give rise to a great deal of variability and because
seemingly incomprehensible results often look more orderly when one takes advantage of the subdivisions. But variability, as has been pointed out above, may be due to experimental artifacts and the order introduced by subdivisions due to statistical artifacts of chance factors. Furthermore, some of the divisions into subgroups may expose not different aspects of schizophrenia but rather subgroups separated from each other by what are essentially "hospital artifacts," that is, the effect of prolonged hospitalization.

The only other point to be made concerning the collection of data in the field of schizophrenia is that despite the widespread and almost automatic use of drugs, experiments purporting to uncover the nature of schizophrenia must deal with patients uninfluenced by these drugs, for otherwise they may well constitute still another confounding variable in this type of research.

SUMMARY

An hypothesis was offered to explain the basis for schizophrenic behavior. It states that the behavior of schizophrenic patients is more often controlled by stimuli immediate in the spatial and temporal environment than is that of normals. The different meanings of the term "immediate" was explored in the context of specific experiments, thus giving supporting evidence for the hypothesis. Then this hypothesis was related to a number of now extant theories to point up differences as well as to show what data this hypothesis can handle which those theories cannot. Finally, a list of complications in general experimentation with schizophrenic patients was drawn up and discussed in relation to the problem of validating a theory.

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