There has not been general agreement regarding the nature of abnormality of concept formation in schizophrenic thought disorder.

Kurt Goldstein and his followers (14, 41, 42) have argued that schizophrenics are abnormally "concrete" in their thinking i.e. they are unable to perform inductive reasoning, since they are unable to make an abstract generalisation, i.e. schizophrenics react to the most readily observable characteristics of the stimulus. This does not mean that normals do not think in terms of concrete events, but rather it means that they are superior to schizophrenics in the case of abstract thinking whenever a stimulus property is required to be abstracted from a group of events and if that property is not so obvious, it becomes difficult for the schizophrenic to detect it. Norman Cameron (18, 19, 20, 21, 22, 23, 24, 25) on the other hand argues that in one sense at least, schizophrenic concepts are over-generalized. He believes that the concepts formed by schizophrenics are "over-inclusive" in nature. They are unable to maintain the normal conceptual boundaries, and incorporate into their concept elements (some of them personal) which are merely associated with the concept, but are not an essential part of it. This makes their thinking...
both over-general, and less precise than the thinking by the normal. A large number of studies have been carried out to test both these hypotheses. It will prove very useful to review the results of some important studies made in this connection.

Studies of "Concreteness" of Thinking

Bolles and Goldstein (14) first attempted to demonstrate abnormal "concreteness" of schizophrenic thinking by using the Goldstein-Scheerer (44) battery of tests for concept formation with a group of 16 schizophrenics. While they were reported as "concrete" according to the scoring criteria used, no control group was tested.

Rapaport et al (88), using an object sorting test similar to Goldstein's, found that a group of schizophrenics were no more "concrete" than normals. However, the concepts they evolved were unusual, and the term "Syncretistic" was used to describe them.

McGaughran (81,82) and McGaghran & Moran (83) reported an interesting series of studies with Goldstein object sorting test. They scored the sorting behaviour along two dimensions. The first was called "conceptual freedom" or "open-closed", which they identify with "concreteness". It is assessed by the number of objects the concept covers (the degree of generality). The second
was called the "public-private" dimension and was a rating of the extent to which the concept formed was usual or unusual. They found that far from being "concrete", schizophrenics formed slightly more extensive concepts than normals. Their concepts, however, tended to be "private" or unusual.

Another group of studies has made use of the Vigotsky (95) test for concept formation, which unlike the Goldstein tests requires the subject to form only one concept, the score being a function of the speed with which this is done. Kasanin and Hanfmann (65,66), Hanfmann & Kasanin (50) & Kasanin (63) report several studies using this test with schizophrenics. They demonstrated that the score was probably related to educational level, but that even when this is controlled, schizophrenics do worse than normals. However, these results are not unambiguous, since poor scores on this test could be purely a function of mental slowness, or a tendency to produce unusual generalisations. They do not necessarily indicate an inability to generalise. Indeed Fisher (39) using the Vigotsky test material as a sorting test to determine how many different sortings could be achieved, found that 20 schizophrenics and 20 hysterics were not differentiated (although 20 normals were younger and brighter than either group, did better).
Studies by Rashkis, Kushman and Landis (90) and Rashkis (89), rather a different type of word-sorting and number sorting test, produced very similar results in as much as schizophrenics were inferior in their performance, not because they could not generalize, but because they produced very unusual generalisations.

Feldman & Drasgow (34) developed a test of concept formation using pictures on cards. On each cards were 4 pictures, and on each 2 different groupings of 3 objects each were possible. While schizophrenics were inferior to normals on this test, it is possible that this is because they think of unusual generalisations, and not because they are "concrete". It is also possible that they seem to be thinking in concrete terms because they have the tendency to over-inclusion to include much irrelevant and unusual material while taking the test.

Thus the studies using "sorting" tests of concept formation have produced more or less consistent results. Schizophrenics cannot be regarded as "concrete" in the sense of being unable to generalize at all. Rather, they tend to produce unusual generalisations.

Another different technique for studying the ability to form concepts, consists in asking the subjects to sort a long series of cards into 2 groups, correcting
the subject when an error is made. The principle of sorting is not explained beforehand, but must be learned during the course of the experiment. This technique was used by Heidbreder (52,53,54,55,56,57,58,59) for the study of concept formation in normal people. The Wisconsin sorting test (9, 46,47,48) makes use of a similar technique. During the course of the test, concepts must be learned and several times the principle of sorting is changed, to force the subject to learn a new concept. Fey (35) used the test with a schizophrenic and a normal group and found that the schizophrenics were inferior, possibly not because they were unable to learn the concept, but having learned it, they had "..........difficulty in holding the correct set........"

The remaining group of studies of "concreteness" attempt to assess it by rating the quality of definitions given to words or the explanations of proverbs. The results have been consistent and all these studies report schizophrenics as being more "concrete". For example, Flavell (40) gave a multiple choice vocabulary test to 24 schizophrenics and reported that they chose more "concrete" definitions than did normals. Proverbs have been used in studies by Wegrocki (96), Benjamin (8), Becker (6) and Gorham (45). Gorham reports two very large studies, one using a matched group of 100 normals and 100 schizophrenics. He used both the ordinary form of the proverbs test, and a
multiple choice version. Schizophrenics consistently gave more "concrete" interpretations.

In the light of the earlier studies discussed, these consistent findings with the proverbs test cannot be regarded as unambiguous. There is no doubt that schizophrenics tend to define words and interpret proverbs peculiarly. However, this is not necessarily due to an inability to generalize. It is possible that unusual generalizations given in response to proverbs are often labelled "concrete". It is also conceivable that, just as they tend to use and define words peculiarly, some schizophrenics may interpret words as they hear unusually. Some, for example, may interpret the instructions of the proverbs test, as following either a general statement of the principle illustrated or the use of an apt concrete illustration of the meaning it has for them. These studies have apparently not established what generalisations these schizophrenics might have produced, had they been encouraged to continue talking long enough.

It is perhaps not unfair to conclude that the studies of "concreteness" so far carried out have not succeeded in demonstrating that schizophrenics are unable to make abstract generalizations, although there is ample evidence that the generalizations they do make tend to be unusual and hence look like concrete.
Studies of "Over-inclusive" Concept Formation

Norman Cameron was one of the first to explain much of the thought disorder in schizophrenia in terms of over-inclusive concept formation, although Schilder (91) and Bychowski (17) among others have described a similar type of thinking disturbance. More recently Angyal (1) and Lovibond (77) have reformulated this theory.

Cameron first used the theory to account for the performance of small groups of deteriorated schizophrenic patients on the Vigotsky test, and on a sentence completion test. He reported that the schizophrenics were unable to preserve the "conceptual boundaries", of the task. In solving a problem the schizophrenics "...included such a variety of categories at one time that the specific problem became too extensive and too complex for a solution to be reached........". Not only are their concepts "over-inclusive" but their thinking is disturbed by the "interpretation of personal themes", although this might be regarded as one aspect of the general disorder of "over-inclusion".

A surprising number of studies have been conducted to investigate "over-inclusive thinking in schizophrenia. The results consistently support the theory. Shneidman
(93) developed a modification of the Thematic Apperception Test in which the subject selects from a large group of different human figures, those he believes suited to each background scene, makes up a picture, and then tells a story about it. As predicted from Cameron's theory, Schizophrenics' stories were "over-inclusive" in several aspects. For example, they chose significantly more figures as relevant to each background, than did normals.

Zaslow (99) developed a simple test of over-inclusion in concept formation, which consisted of a series of 14 cards, each containing a drawing which gradually progressed from an equilateral triangle to a perfect circle. Various methods were used to determine how many cards the subjects would incorporate into the concepts "triangle" and "circle". As predicted schizophrenics included significantly more cards than normals. However, Kugelmass and Fondeur (71) were unable to repeat these results at an acceptable level of significance.

White (97), testing a matched schizophrenic and normal group asked his subjects to group 15 cards with a word printed on each, in any way they liked. The schizophrenics tended to form very large, vague categories, forming concepts such as "suspicion" or "having to do with God" etc.

Daston, King and Armitage (29) read two short
stories aloud to 25 paranoid schizophrenics and 27 matched normals. Afterwards the subjects were given a check-list of 36 positive and 36 negative statements about the characters in the stories. The schizophrenic group checked off did significantly more adjectives than the normals.

Moran (85) tested several deductions from Cameron's theory with a group of 40 schizophrenics and 40 matched normals. The subjects were given 25 words to define. There were no differences in the "conceptual level" of the definitions given, thus not supporting the hypothesis that schizophrenics are "concrete". The subjects were then asked to give as many synonyms as possible for each word. As predicted, the schizophrenics' synonyms were less precise. When asked to free-associate to the words, the schizophrenics produced more "distant" associations. When asked to incorporate the words into a sentence, their sentences were unclear, contradictory and ungrammatical. The subjects were also given a test in which each word (printed on a page) was followed by 8 response words, including neologisms. They were asked to underline each word which they regarded as an essential part of the concept denoted by the stimulus word. As predicted the schizophrenics did not underline significantly fewer correct words, but did underline significantly more of the distantly related words. Epstein (32) developed a very similar test, and obtained
the same results with a schizophrenic and a normal group.

Lovibond (77) using the Goldstein object sorting test, with schizophrenics and normals, employed a rating system to assess the amount of "over-inclusion" in sorting behaviour. Schizophrenics were rated as more over-inclusive.

Chapman (26) and Chapman & Taylor (27) report a series of interesting experiments which have also confirmed the theory of over-inclusion. They made use of card sorting tests of different types, and found that when asked to sort according to a specific concept (e.g. "fruit"), schizophrenics tended to include in this category similar cards (e.g. cards with the names of vegetables), but not completely dissimilar cards. Normals did not do this. In another experiment, they presented the subjects with cards containing 4 pictures, some of which illustrated a concept. The subjects were asked to sort the cards according to a concept, but to disregard all the pictures on the cards except the picture on the lower right hand corner. As predicted the schizophrenics were influenced by the irrelevant "distractor" item, whereas the normals were not. There was no evidence of "concreteness", or inability to sort at all, since the number of errors made varied directly with the number of distractor items, there being no significant difference between normals and schizophrenics when these distractor items were not present.
It appears from these studies that Cameron's theory of over-inclusion has received comparatively stronger support from the experiments so far performed.

In light of the results of these past studies and gaining some experience from them, the present author has undertaken to study the same problem, making use of most of these tests, but redesigning the test material and scoring procedures where necessary to suit his environment and also revising the experimental design with a use of a control group. The additional use of a repertory grid technique to study schizophrenic thought process is also his unique contribution. In the next chapters are discussed the problem, the experimental work and the results.