BODY IMAGE AND SELF-CONCEPT IN SCHIZOPHRENIA

AN EXPERIMENTAL STUDY

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DISTURBANCES of ego, self-concept and body-image have always been regarded as central in the psychopathology of schizophrenia. The passivity phenomena, *automatisme superieur* of the French authors, are indeed very common in this disease. There is a disturbance of the self which is shown in depersonalization and in feelings of influence and passivity. The boundaries of the self become loose or blurred and the patient may feel, for example, that parts of his body do not belong to him or that he is part of the plants, animals, clouds, other people or of the whole world and that they are part of him. He may feel at one with the whole of mankind. Self-concept is closely related to what has been termed "body image" or "perceived body". Head (29, 30) has shown that what he called "body schema" is very important for motor co-ordination and performance of purposeful movements and also for orientation in space. Schilder (53) in his monograph has analysed the problem of body-image in great detail. He has found in the idea of the body image the basis for the body or physical ego. He follows Head in stating that the body image consists of the proprioceptions of the whole body and that it changes with the body's varying postures. Yet neither Head's body schema nor Schilder's body image are identical with the body ego. The body schema represents the constant mental knowledge of one's body; the body image is the changing presentation of the body in one's mind. Throughout the changes of the body image there is an awareness of continuity of one's body, a sense of basic identity and oneness. This constitutes the bodily or physical ego. The body ego in its turn is the basis of a wider "self" which can be called self-concept or selfhood. This self-concept or selfhood contains, in addition to the awareness of the continuity and the identity of one's own body in spite of its constant change, the awareness of the continuity of one's self as a person in spite of constantly changing relationship with the external world, and in spite of the playing and taking different "roles" in social interactions. According to Mead (38) and Coutu (16), selfhood is a social phenomenon and emerges only through interaction with other people, through "taking their roles" and viewing oneself from their point of view.

Self-concept is linked up with the problem of one's identity and continuity and also with the problem of one's individuality, by which is meant perception of oneself as an independent entity in the environment. It embraces, therefore, the concept of ego as the witness, the experiencer or the subject, with which philosophers since Descartes were concerned and which in psychological theory was stressed by Brentano's school of "act psychology"; it also embraces the

concept of ego as the nodal point in the integrative process of behaviour with which personality theorists, psychoanalysts, and gestalt psychologists were mainly concerned. The first aspect of the ego is equivalent with the philosopher's subject, the second with the philosopher's object. The ego as the subject may be equated with the English pronoun "I" and the ego as the object with the English pronoun "me". To put it in other words, "ego" in its objective aspect is concerned with relatedness to the environment with establishing a point of reference in physical or social space or in flow of time. In terms of field theory it is a point determined by the totality of the field forces. This point of view is most typically represented by Koffka (34) who describes "ego" as a certain point in the psycho-physical field, from which phenomena are referred as being in front, behind, above and below, and so on. On the other hand, "ego" in its subjective or "I" aspect is concerned with the ability to detach oneself from the environment, to break down the environment-bondedness, to attain an autonomy from the environment, to be an independent entity and to act as a free agent.

An analogy may be drawn from physics. The experience of self is like a physical event which can be described either from the point of view of wave mechanics or the point of view of quantum mechanics. In the first case an event is just a focal point in a physical field; in the second case it is an independent and enduring entity. In social psychology the distinction between "I" and "me" was particularly stressed by Mead (38). He identified "I" with subject and "me" with percept of oneself as seen by others in social group. To quote this author's own words: "The 'I' is the response of the organism to the attitudes of the others; the 'me' is the organized set of attitudes of others which one himself assumes. The attitudes of the others constitute the organized 'me' and then one reacts toward that as an 'I' ".

Both these aspects of self experience are important in ego psychology and its proper integration and functioning depend on the proper balance of these two aspects. The development of selfhood and ego has been studied by many child psychologists; for example, Piaget (44), Preyer (46), Moore (40), Cooley (13), Gesell (26), Shinn (55), Fisher (20) and Bain (5). All these studies point to the gradualness of ego development, to the importance of body image, to the importance of perceptual and conceptual constancies and of interaction with other people. Piaget (43) describes the phase of egocentrism in the development of selfhood. Cameron (11, 12) follows Mead in stressing the importance of role-taking in the development of self in relation to the outside world. The common factor in both egocentrism and deficiency of role-taking is the inability to look at oneself from an outside point of view, an inability to distinguish between "I" and "me".

Many of the above-mentioned authors studied the language of children, particularly the usage of pronouns as a means to attain insight into the development of selfhood in children. Thus Bain (5) has found that in the earliest stage of speech development the child does not use pronouns referring to self, describing himself in the third person. In a later stage he develops the concept of "me" and "mine" and in a still later stage he develops the concept of "I".

There is ample clinical evidence that self-concept is disturbed in schizophrenia. Abnormalities of body image, delusions of changing sex, delusions of body disintegration, and depersonalization are very frequent in this disease. However, even more important and pathognomonic for schizophrenia are disorders of selfhood, both in its subjective and objective aspects. Some authors have stressed disorders of the experiencing ego while others have stressed

disorders of the experienced self. Still others have emphasized the breaking-down of the boundaries between self and non-self in schizophrenia. Bender and Keeler (7) in an experimental study have found that schizophrenic children have particular difficulty in determining the periphery of their bodies. Fisher and Cleveland (21) have recently developed a method of scoring the Rorschach test by which they determined the definiteness of the body boundary. They have found that schizophrenic patients give very few "body boundary" responses on the Rorschach test in comparison with normal controls and other psychiatric patients.

The disorder of objective ego or "me" may manifest itself in the lack of a sense of continuity, in the loss of boundaries of self*, in misperception of one's identity and in abnormalities of role-playing and role-taking. Weinberg (62), a sociologist, believes that inefficient role-taking protects the schizophrenic from looking at himself, and thus permits him to retain his autistic ideas and delusions. On the other hand a disorder of subjective ego manifests itself in feelings of passivity, in impersonality ("itness" quality) of one's inner experience. Both Schilder and Federn (53, 19) use the concept of cathexis and libido to explain the integration of experience into the ego system. Federn postulates that schizophrenia begins with an impairment of ego cathexis; the ego boundary in particular can no longer be held cathected to its normal extent, leading to a weakness of ego system and its eventual disintegration. Schilder (54) cites Minkowski who believes that "the immediate experience of experiencing oneself" is impaired ("Le schizophrène, par contre, sait où il est, mais le moi-ici n'a plus sa tonalité habituelle"). Sherif and Cantril (52) developed a theory of ego psychology in which they substituted the term ego-involvement for that of ego-cathexis. This gives an adequate description of the phenomena concerned, avoiding at the same time any assumption as to the existence of "mental energy" or "libido". These authors explain ego as a system of organized attitudes and values, which is responsible for the style and consistency of one's behaviour. They describe schizophrenic illness as characterized by the radical breakdown of the more usual frame of reference which had been developed to give meaning to the environment. These frames become inadequate and inconsistent. When these standards for judgment and action collapse, the ego collapses, because these frames with all the emotional overtones of value judgments they contained were so integral a part of the self.

Disorders of self in its objective aspects are common in clinical literature. Here we include beliefs as to the changed appearance of bodily organs or to their being empty, hollow, or weightless. Angyal (3, 4) makes the interesting suggestion that some of these seemingly bizarre ideas about one's body may have a sensory basis. He uses the example of certain tactile illusions whose localization depends upon the clarity of one's picture of the bodily self. Thus one would expect that the schizophrenic whose schema of his bodily self is impaired would be more susceptible to such illusions as have been described by Pongo and Kohnstamm. In the Kohnstamm illusion, for example, one's arm appears weightless and seems to rise of its own accord.

Some of these changes in perception of one's own body may be attributed to a breakdown of perceptual constancy in schizophrenia. Experimental

* The boundary of self in the "me" or object aspect of self is not really clear-cut. There is a gradient of diminishing ego involvement or ego cathexis from the "centre" to the "periphery" and the transition from self into non-self is gradual. Nevertheless, the outer boundary of the self may be described as a line where the ego involvement becomes very low. Self in its subjective, "I", aspect has really no boundary, because it cannot be represented by a special model; there is rather an autonomy of "I" and of "not I".

evidence (15, 58, 59, 60) has shown that various constancies are impaired, and it would account for believing that one's arms or legs were shrunken, and that limbs or fingers frequently expanded or contracted in size or changed in coloration. Such perceptual phenomena can doubtless produce feelings of estrangement from one's own body. The schizophrenic who claims that the faces of people around him change in colour or size, or that the world moves when he turns his head, may be expressing a view of the world perceived literally, i.e. without the operation of the various constancies of size, colour, shape, etc. As far as we know, no one has investigated the ego and self disturbances in schizophrenia from the standpoint of impaired perceptual functioning. It seems apparent that if the schizophrenic is unable to maintain concepts as well as normals, we should expect him to experience difficulty in recognizing other people and maintaining his self-concept in an ever-changing world.

There is also the view that the schizophrenic experiences a breakdown of the boundaries between self and non-self. Sullivan (56) wrote that the schizophrenic suffers from the fear of becoming "a form of nothingness" by collapse of the self. Balint (6) states that the problem of reality testing in schizophrenia is essentially one of deciding whether a sensation comes from within or without. Such difficulties can underlie delusions of reference, feeling of influence and magical thinking.

Be as it may, the problems of ego boundary, ego identity, ego belongingness, body image and subject-object relationship are crucial for psychopathology of schizophrenia. Similar disturbances occur in mescaline and LSD-induced psychoses: body image is awry, ego-boundary undergoes change and may disappear altogether, subject-object relationship becomes disturbed. Savage (51) made a systematic study of the effects of lysergic acid (LSD) on the perceived body. His subjects reported that their bodies lost symmetry and became plastic with fluid boundaries.

This paper reports several studies which attempt to test experimentally the validity and generality of some of these clinical reports of disturbances of self-concept and body image in schizophrenia.

There are few established methods of studying self-concept systematically. However, many of these clinical accounts do provide some direction as to which avenues may prove the most fruitful. For example, one of the observations made repeatedly in the literature is that schizophrenics react to mirrors in unusual ways. Abely (1, 2) was apparently the first to call attention to this and published several accounts of "le signe du miroir". Delmas (17), Ostancow (41), Galant (24), and Knoos (35) also noted this behaviour in schizophrenic patients, but Rosenzweig and Shakow (48) were the first to study the frequency of the symptom in a sizeable group of patients. However, even these authors did not use the mirrors in any systematic way or obtain verbal reports of the patients' reactions to their reflections. Thus the use of mirrors is a very promising method for exploring self-concept and at the same time a relatively unexplored one when used in a systematic fashion.

METHOD

To explore several facets of the person's self-concept, we employed a number of procedures, some of which are already found in the literature while others are of our own making. The first of these involved the person's reactions to his reflection in a large three-panelled mirror. The dimensions of the two

outside panels were 5 feet 9 inches × 16 inches, while the centre panel was 5 feet 9 inches × 18 inches. The two side panels were at a 120° angle from the centre panel. All subjects stood 12 inches from the centre panel and were asked the following questions:

1. What do you see?
2. What else do you see?
3. How many people do you see?
4. Do all these people look alike?
5. Which is the real you? (Point to it.)

All answers were recorded verbatim. The subjects in the first study were 34 schizophrenic and 18 non-schizophrenic patients in a 1,500-bed mental hospital, and 29 normal subjects, all of whom were employees of the hospital, i.e., painters, secretaries, nurses, accountants, etc. No psychiatrists, psychologists, or physicians were used in the study. The average age of the schizophrenic patients was 38·6 years (range 21–55), of the non-schizophrenic patients 42·3 (range 17–58), and of the normals 37·5 years (range 17–66). All of the schizophrenic subjects had participated in other research studies and were known to be reasonably co-operative and average or above in intelligence.

After these five questions were asked, and the answers were recorded, the subjects were asked to describe the person in the mirror as if they were looking at a photograph of someone else. These descriptions were scored independently and are called "Part B" of the first study, while the answers to the five questions are called "Part A".

As this study had been strictly empirical in that no prior hypotheses had been formulated, it was decided to conduct a second study along similar lines, but with a slightly modified procedure. This is referred to as "Study Two".

In the third study, the subjects were tested with the W-A-Y technique. This involves asking the person to give three answers to the question, "Who are you?" and is considered by Bugental (10) and others to be a promising way to explore the person's concept of his social roles. It was felt that this technique would complement the mirror descriptions which dealt with primarily psychological dimensions.

The fourth study again returned to the three-panelled mirror but used a slightly different procedure. This time the upper part of the centre panel was covered with white paper so that the subject could see the lower part of his body but could not see his head. The instructions were as follows: "You see your reflection in the mirror; the head is missing. Draw the missing head in its real size." When the patient finished the task, the drawing paper was removed and replaced by a larger sheet which allowed the subject to perceive only the lower part of his body up to the waist. He was instructed to draw in the missing parts including his head and left hand, which was placed on his chest. The following body measurements were taken: height and width of head, width of shoulders, length of forearm, and length and width of hand. Next the subject was given the Draw-a-Person test. Finally his left and right orientation was tested. The experimenter pointed to the subject's left arm and asked him whether it was left or right. Then the experimenter faced subject, lifted his own right arm and asked whether it was the experimenter's right or left arm. Next he pointed to one arm of an assistant whose back was turned to the subject and asked whether it was the assistant's left or right arm. Next the subject had to identify his right and left side in three different reflections of himself in the three-panelled mirror.

RESULTS

Study 1

The number of reflections reported by each of the groups is shown in Table I. It can be seen that both of the patient groups reported significantly fewer reflections than the normal group. However, all of the distributions were bimodal.

There was no difference in the location of the real self. It was located either in the central reflection in front of the subject or in the subject himself. The first was more common. The schizophrenics gave poorer and less complete descriptions of their reflections than the other groups. Some of these descriptions given by the schizophrenic patients were quite bizarre.

TABLE I

Number of Images Seen

	Schizophrenics	Normals	Non-schizophrenic Patients
Below 11 images	25	5	12
Above 11 images	9	24	6
Chi-square	$\chi^2=21\cdot88$ (d.f.=2) p 0·01		

The self-description of the groups showed significant differences in the use of first person pronouns. The schizophrenic patients were less likely to use the words "my", "myself" or "me" in describing their images. Although the schizophrenics produced somewhat fewer words than either of the other groups, there was not a significant difference between the three groups in average verbal productivity. These differences were tested by median tests, the results of which are summarized in Table II. "Part A" refers to the answers to the five questions mentioned previously and "Part B" refers to the subject's description of himself as if looking at a photograph.

TABLE II

Number of Words and Self-references

		Part A		Part B*	
		Total Number of Words	No. of First Person Pronouns (Self-references)	Total Number of Words	No. of First Person Pronouns (Self-references)
Schizophrenics		815	78	667	32
Normals		998	123	697	59
Non-schizophrenics ..		314	52	539	48
Median count per subject ..		25·5	3·0	28·0	2·5
Schizophrenics	Above	15	22·5	9	5
	Below	20	12·5	17	21
Normals	Above	19	18·5	15	11
	Below	10	10·5	8	12
Non-schizophrenics	Above	18	7·5	8	7
	Below	10	9·5	10	11
Chi-square		$\chi^2=4\cdot09$ (d.f.=2) non-significant	$\chi^2=5\cdot06$ (d.f.=2) ·05>p>·01	$\chi^2=4\cdot82$ (d.f.=2) non-significant	$\chi^2=9\cdot58$ (d.f.=2) p<·01

* Only 26 schizophrenics, 23 normals and 18 non-schizophrenic patients were included in self-description part of the experiment.

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The pronouns used by the subjects were then classified into those that referred to the self as subject ("I") and self as object ("me", "myself", "my" etc.). The two raters working independently and without knowledge of the identity of the subjects performed the classifying. The reliability between the raters in classifying pronouns was indicated by a Rho coefficient of ·91 ($p < \cdot 01$).

The results of this classification are summarized in Table III.

TABLE III

Number of "I" and "Me" Self-references

		Part A		Part B	
		"I"	"me"	"I"	"me"
Median count per subject		1·5	1·5	0·5	1·0
Schizophrenics	Above	15	25	7	7
	Below	20	10	19	19
Normals	Above	17	19	8	15·5
	Below	12	10	15	7·5
Non-schizophrenics	Above	6	10	6	10·5
	Below	11	7	11	6·5
Chi-square of distribution of three groups		$X^2=2\cdot76$ (d.f.=2) non-significant	$X^2=9\cdot66$ $p<\cdot01$	$X^2=0\cdot47$ (d.f.=2) non-significant	$X^2=9\cdot26$ (d.f.=2) $p<\cdot01$

The table shows that the three groups did not differ significantly in number of subject pronouns ("I") used. However, the schizophrenics used significantly fewer object pronouns ("myself", "me", "mine", etc.) than either normals or non-schizophrenic patients. This occurred in both Parts A and B of this study. The differences are highly significant when tested by median test.

Study 2: Naming of Body Parts

As the previous study had been strictly empirical in that no hypothesis had been formulated beforehand, it was decided to conduct another experiment with a different procedure. The method involved pointing to various parts of the patient's body and asking him each time, "What is this?". The parts used were the subject's (*a*) right hand, (*b*) left ear, (*c*) right foot, (*d*) shirt, (*e*) nose and (*f*) ankle. All the answers were recorded verbatim. The subjects were 32 schizophrenic patients, 31 normals, and 10 non-schizophrenic patients. The score was the number of times each subject mentioned the pronoun "my" before he named the part to which the experimenter pointed. The hypothesis was that the schizophrenic group would use fewer "my" or "me" responses than the normal or non-schizophrenic patient groups. The differences were tested by median test. The results are summarized in Table IV. The results disclosed, as predicted, that the schizophrenics gave significantly fewer "my" responses than the other groups. The schizophrenics were more likely to respond "a hand" or "the hand" while the normals would respond "my hand".

TABLE IV

Possessive Pronouns Used in Naming Body Parts

	Number of "my" Responses per Subject	
	Above Median	Below Median
Schizophrenics	7	25
Normals	22	9
Non-schizophrenics	6	4

$\chi^2 = 13 \cdot 60$ $p < 0 \cdot 01$

Thus the hypothesis has been confirmed by an independent experiment using new samples.

Study 3: Who-are-you Test

The subjects used here were 30 schizophrenic patients and 29 normal controls, all of whom were employees of the hospital (mostly in the non-professional category, although a few social workers and book-keepers were included). The responses to the question, "Who are you?", were scored according to the categories given by Bugental (10) and are presented in Table V. The only differences occurred in the categories of sex and occupation.

TABLE V

Responses to Question "Who are you?"

Response Category	Normals N=29	Schizophrenics N=30
Name	22	22
Personal pronoun	4	2
Person, human being	6	8
Sex	20	10*
Age	3	1
Occupation	19	3†
Family status	9	5
Residence	2	3
Nationality, religion	4	2
Appearance	0	2
Patient	0	3
Miscellaneous	1	8
Don't know	0	6

* Difference between groups significant at 5 per cent. level ($\chi^2 = 7 \cdot 42$, $p < \cdot 01$).

† Difference between groups significant at 1 per cent. level ($\chi^2 = 19 \cdot 73$, $p < \cdot 01$).

*Study 4: Drawing of Missing Parts in Mirror**

This study was purely empirical, although a general hypothesis was formulated that the drawing of the bodily parts not seen in the mirror will correspond more accurately to the real parts of the body in the normals and the non-schizophrenics than in schizophrenics. The following measures of the drawings were used as indices: (1) head, longitudinal, (2) head, transverse, (3) hand, longitudinal, (4) hand, transverse, (5) width of the shoulders. The measurements were correlated with corresponding real measurements of the body. In none of the groups were the correlation coefficients significant. Therefore, the hypothesis was neither proved nor disproved. When the sizes of the body parts in the drawings made by each group were compared, it was found

* Twenty-six schizophrenics, 30 normals and 11 non-schizophrenic patients participated in this study. Apart from one normal, these subjects were used in the previous study.

that the schizophrenics drew smaller hands than did the normals or non-schizophrenic patients. It was first thought that the difference was one of proportions. However, subsequent analysis of the data indicated that this difference was one of absolute sizes. The schizophrenics drew heads and shoulders the same absolute size as the control groups, but drew smaller hands. The statistical significance of this finding was tested by analysis of variance, the results of which are summarized in Table VI.

TABLE VI

The Mean Measurements and Summary of Analysis of Variance

Diagnosis	Mean Measurements: Hand Longitudinal	Hand Transverse	Head Longitudinal	Head Transverse	Shoulders
Schizophrenics	9·7	4·9	19·3	17·4	31·7
Normals	13·6	6·7	20·4	17·8	35·4
Non-schizophrenics	12·9	6·7	17·8	16·8	34·2
Between Sum of Squares (d.f.=2)	215·0	49·9	60·3	8·2	197·1
within (d.f.=64) and d.f.	1388·2	236·5	1034·8	802·7	3062·5
Total (d.f.=66)	1603·2	286·4	1095·1	810·9	3259·6
F-ratios	4·96 p>·01	6·75 p>·01	1·86 n.s.	0·33 n.s.	2·05 n.s.

F-ratios of the measurements of the drawings of the head and of the shoulder are not significant. The F-ratios of the measurements of the drawing of the hand are significant at 1 per cent. level.

The results of "t" tests for the differences between the mean measurements of the drawings of the hand are summarized in Table VII.

TABLE VII

The "t" Tests of the Differences of the Measurements of the Hand Drawings

Groups	Longitudinal: Difference of Means	"t"	Transverse: Difference of Means	"t"
Schizophrenics–normals	3·9	3·12 p<·01	1·8	3·53 p<·01
Schizophrenics–non-schizophrenics	3·2	1·92 ·1>p>·05	1·8	2·61 ·05>p>·01
Normals–non-schizophrenics	0·7	0·42 n.s.	0·0	0·0

It can be seen from Tables VI and VII that the differences between the measurements of the drawings of the hand between the schizophrenic group and the two other groups are statistically significant.*

Thus the empirical finding was that schizophrenics draw statistically significantly smaller hands than normals and non-schizophrenics. There is a possibility that this may be due to a change in the perceived body (body image), schizophrenics perceiving distal parts of their body smaller. Thus their body image shrinks, as it were, on the periphery.

* One "t" ratio falls short of 5 per cent. level, but one has to remember that the non-schizophrenic group was very small.

Study 5: Draw-a-person Test

No differences between the groups could be found with this test.

Study 6: Left-Right Discrimination

There was no difference between the three groups in this procedure. This result does not support the idea of Angyal (3) that the schizophrenic experiences a "vague uncertainty" in distinguishing between right and left.

Study 7: Size of Extremities

In addition to the previous studies, a seventh study was carried out some time later. As it did not involve the mirror, the method used and the results will be described together. This study was designed to test a hypothesis derived from the fourth study. In that study it was found that schizophrenics drew statistically significantly smaller hands than normals and non-schizophrenics when they were asked to draw the upper part of their body in natural size. It was thought that this might be due to a change in the perceived body and that the schizophrenics perceived distal parts of their bodies smaller than normals and non-schizophrenics. As this study was purely empirical, it could not be used as a proof of a *post hoc* hypothesis. A new experiment was set up to test this hypothesis that schizophrenic patients perceived their own hands and feet smaller than controls.

METHOD

Photographs were taken of a young man's left hand and left foot, both from dorsal aspects. Fifteen prints in various sizes were made of the hand and foot photographs. The longitudinal sizes of the hands and feet obtained on the prints are reproduced in Table VIII in centimetres.

TABLE VIII

Sizes of the Photographs in Centimetres

Hand ..	2·4	5·1	8·0	10·4	12·3	13·6	14·5	15·7	16·7	19·2	21·0	23·9	25·2	30·1	34·5
Foot ..	2·0	6·5	7·9	10·1	14·1	16·9	18·4	20·0	21·5	23·0	24·5	26·0	27·6	32·0	35·0

It can be seen that apart from the extreme ranges, the steps by which the sizes of the photographs increased were approximately 1 cm. for the hands and 2 cm. for the feet.

In order to secure a uniform background, the hands and feet were cut out from the prints and glued on green cardboard rectangles 14 inches × 22 inches in size. They were displayed on a stand, the height of which could be adjusted according to the subject's height. The stand was placed against a wall, which was covered with green paper (the same shade green as the cardboard rectangles). This was done in order to produce a homogeneous background and to minimize any effect of the contrast between the size of the rectangle and the size of the photograph. Another stand with a chin support was placed in front of the first stand. The height of the second stand could also be adjusted according to the subject's height. A sheet of green cardboard was attached to the two stands screening off the rest of the subject's body when he placed his chin on the chin support. The subject was instructed to stand in front of the chin support, put his hands behind his back, place his chin on the chin support and look straight ahead at a red dot in the centre of the stand on which the photographs were to be placed. The stands were so adjusted that the red dot was level with the

eyes and the viewing distance was 30 cm. The following instruction was read to the subject: "We shall show some pictures of hands. For each hand we want you to tell us whether it is larger, smaller, or the same size as your own hand." It was stressed that it was the size of the photograph and not the size of the hand originally photographed which was to be compared. Each subject was shown both an ascending and descending series, the sequence of which was varied according to a predetermined random order. A standard neon light was used for illumination.

When the photograph was changed, a green shield was placed in front of the patient's eyes to prevent him from catching a glimpse of the experimenter's hand. On each presentation the subject was asked whether the picture of the hand was larger, smaller, or the same as the size of his hand. The ascending series of presentation was shown until the subject made three consecutive judgments that the photograph was larger than his own hand. The descending series was shown until the subject made three consecutive judgments that the photograph was smaller than his own hand. The subject's score was the mean size of the pictures judged the same size as the subject's own hand in both ascending and descending series. (In cases the subject's judgment changed from larger to smaller without any judgments of equality, the mean size of the two pictures at the point where the judgments changed became the subject's score.)

The same procedure was followed with the photographs of feet, with the subjects having to compare the sizes of the photographs with the sizes of their own feet. There was a short break between the series for the subject to rest a few minutes.

The design of the experiment was controlled for the order of presentation of the ascending and the descending series. There were four orders of presentation:

1. Hand ascending, hand descending, foot ascending, foot descending.
2. Hand ascending, hand descending, foot descending, foot ascending.
3. Hand descending, hand ascending, foot ascending, foot descending.
4. Hand descending, hand ascending, foot descending, foot ascending.

In each group an equal number of subjects was assigned to each order of presentation.

In the second part of the experiment the subject was taken to another room where he stood 22 inches in front of a semicircular rod at a height level with the subject's eyes. On this rod were hung 12 brown men's socks which varied by equal steps from size 7 to size 13. Each sock enclosed a cardboard frame which preserved the shape of the sock. Each sock was marked by letters from A to L, printed on paper discs of the sizes proportional to the sizes of the socks. The subject was instructed to look around and to tell, without touching the socks, which one was closest to the size of sock that would best fit him. At the end of the experiment, the longitudinal size of the subject's left hand and foot was measured by two independent observers.

SAMPLE

As the photographs showed a male hand and foot, only male subjects were used. The sample consisted of three groups: 20 schizophrenics, 20 normal subjects, and 20 non-schizophrenic psychiatric patients. The schizophrenic sample included only patients in whom the diagnosis of schizophrenia had been

firmly established by all psychiatrists who had examined them. Six patients were diagnosed as hebephrenic, three as catatonic, two as paranoid, two as simple, and seven as undifferentiated schizophrenics. The mean age was 39·5 years (S.D.=7·5). The average length of stay in the hospital was 11·7 years (S.D.=6·0). No patient in whose case there was a possibility of mental deficiency or organic brain disease was included. No patient undergoing insulin or electrical shock treatment was included. Only patients who would co-operate in the experiment were included in the sample. The normal group included 20 men who were either workmen or members of the hospital maintenance staff. They were the same social and educational background as the patients and they were paid for participation in the experiment. Their mean age was 34·1 years (S.D.=11·1).

In the non-schizophrenic patient psychiatric group, ten patients were diagnosed as alcoholic, five as psychopathic personality, two as epileptic, one as depressive, one as sexual deviant, and one as a case of situational maladjustment. Their mean age was 37 years (S.D.=13·0). The average length of stay in the hospital was 9 months (range from 3 days to 7 years). In all three groups it was made certain that the subjects understood the instructions. No subjects with gross visual abnormalities were included. If a subject used glasses, he was told to wear them during the experiment.

Results

The pictures were judged as to whether they were larger, smaller or the same as the subject's own hands or feet. Therefore, the judgments depended on the real sizes of the subject's own hands and feet. Taking this into consideration, an analysis of co-variance was carried out in which the mean sizes in centimetres of the pictures judged the same as the subject's own hands and feet were adjusted to the real sizes of hands and feet. The significance of the differences between these adjusted measures was tested by "t" tests.

The results are summarized respectively for the hands in Tables IX, X, and XI, and for the feet in Tables XII, XIII, and XIV.

Table IX

Correlations Between Real and Estimated Hand Sizes

	Mean Real Size	Mean Estimated Size	Correlation
Schizophrenics	18·9	17·5	r=·48 (·05 p ·01)
Normals	19·1	21·2	r=·31 (n.s.)
Non-schizophrenics ..	19·0	21·5	r=·47 (·05 p ·01)

Table X

Variance Table for Hand Estimates

Source of Variance	Sum of Squares of Errors of Estimate	d.f.	Mean Square	F
Total	616·03	58	—	—
Within groups ..	460·19	56	8·21	9·46 (d.f.=2)
Adjusted means ..	155·84	2	77·92	p·01

TABLE XI

"t" Ratios for Differences Between Real and Estimated Hand Sizes

Group	Difference of the Means of Estimated Sizes	Adjusted "t" Ratios	*P*
Schizophrenics–normals ..	3·7	4·08	·01
Schizophrenics–non-schizophrenics	4·0	4·41	·01
Normals–non-schizophrenics ..	0·3	0·33	n.s.

TABLE XII

Correlations Between Real and Estimated Foot Sizes

Group	Mean Real Size	Mean Estimated Size	r (correlation)
Schizophrenics	21·0	20·9	r = ·28 (n.s.)
Normals	20·8	23·8	r = ·30 (n.s.)
Non-schizophrenics	20·8	24·0	r = ·18 (n.s.)

TABLE XIII

Convariance Table for Foot Estimates

Source of Variance	Sum of Squares of Errors of Estimate	d.f.	Mean Square	F
Total	855·41	58	—	—
Within group ..	725·27	56	12·95	5·02
Adjusted means ..	130·14	2	65·07	p ·01

TABLE XIV

"t" Ratios for Differences Between Real and Estimated Foot Sizes

Group	Difference of the Means of Estimated Sizes	Adjusted "t" Ratios	*P*
Schizophrenics–normals	2·9	2·54	·05>p>·01*
Schizophrenics–non-schizophrenics	3·1	2·72	·01
Normals–non-schizophrenics ..	0·2	0·17	n.s.

* When one-tail test is used, this "t" ratio has $p < ·01$.

From the tables it can be seen that all the differences are in the predicted direction and are significant at 1 per cent. level. (The differences in foot estimation between the normal and schizophrenic group is also at the 1 per cent. level when a one-tail test is used, which is a legitimate procedure because the differences were predicted by the hypothesis.) Thus the results quite clearly confirm the hypothesis that schizophrenics perceive the distal parts of their bodies smaller than do non-schizophrenic controls.*

As in the experiment two series of presentation were used—ascending and descending—there was a possibility of "anchor" effect. The "anchor" effect is due to the fact that the judgment of size does not depend only on the size of

* Similar results could be obtained when non-parametic statistics were used. It was found that schizophrenics significantly more often chose as the same pictures which were smaller than their hands and feet. The normals and non-schizophrenics tended to choose as the same pictures bigger than their hands or feet. The differences between the groups were tested by Chi-square test. The differences between the schizophrenics and the two other groups were in the predicted direction and highly significant. The Chi-square for the hand judgments were 10·0 and 14·5 ($p < ·01$) and for the foot judgments, 5·6 and 4·0 ($p < ·05$).

the particular object judged but also, in accordance with Helson's adaptation level principle, on the sizes of the objects which were estimated earlier in the series. Thus in the ascending series there would be a tendency for the subjects to estimate the smaller sized hands as equal to their own hands and feet, and would judge a larger size in the descending series. The difference between the size in the ascending series and the size in the descending series estimated the same as the subject's hand or foot constitutes his "anchor effect". Salzinger (50) has shown marked "anchor effect" in weight judgments of schizophrenic subjects. In our experiment, all the groups showed some "anchor effect" and it was slightly more pronounced in the schizophrenic group. However, the difference failed to reach statistical significance. The schizophrenic subjects also judged a greater number of pictures as being the same size as their hands and feet, but the difference was again not significant.

As far as the second part of the experiment was concerned, it was predicted that the schizophrenic subjects would choose smaller size socks than the controls. There was a slight trend in the predicted direction which, however, was not even near being statistically significant. The range of the choices made by the schizophrenic patients was much narrower than that of the other subjects. This could be accounted for by a positional set (the schizophrenic subjects did not look around) or lack of interest in the experiment. However, in the first part of the experiment it was found that there was a significant correlation ($r = \cdot 48$) in these patients between the real sizes and estimated sizes of the hands. This suggests that the schizophrenic patients were co-operating and were not making random choices anyway in the first part of the experiment.

The other possibility could be that the second task was much more concrete than the first one and, therefore, easier for schizophrenic subjects. Also, all the socks were displayed at the same time and the choice of "an average", neither too big nor too little, sock in the middle could have been influenced by the adaptation level. The latter could be more effective when the stimuli are displayed simultaneously than when they are displayed in succession. Be that as it may, the results of the first part of the experiment establish the validity of the hypothesis beyond any doubt.

In order to find whether there was a relationship between the sizes of the chosen socks and the sizes of the photographs judged the same as the feet, correlations between the two sets of sizes were calculated. Correlations were also calculated between the sizes of the chosen socks and the real sizes of feet. These correlations as well as the correlations between the sizes of the photographs and the sizes of feet, calculated previously, are reproduced in Table XV.

TABLE XV

Correlations of the Sizes of Feet, Socks, and Photographs

Groups	Judged Size (photos) and Socks Choice	Sock Choice and Real Size	Judged Size (photos) and Real Size
Normals	·34	·63	·30
Non-schizophrenics	·12	·11	·11
Schizophrenics	·13	·28	·28

One can see from the table that all correlations are positive. However, only the correlation between the sizes of chosen socks and the real sizes of feet is statistically significant, and this only for the normals.

Discussion

These experiments indicate that in schizophrenia both body image (perceived body) and self concept are changed. In the studies of body image it was found that schizophrenics perceive distal parts of their body smaller than normal controls and non-schizophrenic patients. One possible explanation deriving from the theories of Schilder and Federn is that for schizophrenic patients there is a narrowing of the self boundary with the distal parts of the body being less ego-involved, less cathected, and, therefore, less valued. Bruner and Goodman (9) have shown that children judge valued objects as larger than non-valued objects. Raush (47) has shown that this tendency is even more marked in schizophrenic patients. Thus the fact that schizophrenics tend to draw distal parts of the body small and to underestimate the size of these parts may be due to their lower valuation of their bodies and, therefore, lesser ego-involvement. If one accepts the idea often reported in literature that the ego or centre of oneself is located in the head, we would expect this loss of ego-involvement to be more marked on the periphery of the "physical" ego. The size of the distal parts would therefore be underestimated. However, an explanation of the impaired body image according to libido theory conflicts with Schilder's (53, 54) interpretation of Freud's theory of schizophrenic regression. This interpretation, accepted by Fenichel and others, maintains that the schizophrenic withdraws libido from objects and concentrates it toward his own body. If this is so, we should expect the schizophrenic to be at least as accurate as normals in estimating the sizes of body parts. We might predict that the schizophrenic would tend to *overestimate* the size of body parts, which certainly was not our finding.

There is another explanation which, in the opinion of the authors, is of greater heuristic value and would better satisfy the principle of economy of hypotheses. One can attribute these abnormalities of body image in schizophrenic patients to a breakdown of size constancy and distortions in perception of space. Weckowicz (58) and Crookes (15) have shown that in schizophrenic patients, size-constancy is poorer than in control groups. Weckowicz *et al.* (59, 60) have also shown that distance constancy in these patients is poorer than in control groups. The perceived space of schizophrenic patients lacks in depth. The sizes of the objects are seen more in accordance with their visual angle, because distance is taken less into account than it is with normal people. Distal parts of the body will, therefore, be perceived smaller in relation to the parts near the eyes. It was found that schizophrenics under-estimated the sizes of their hands and feet in comparison with the control groups. If size constancy explanation is true, this difference should be even more pronounced in the case of the feet than in the case of the hands. This is because the hands are customarily nearer to the eyes than are the feet. Thus the perception of feet should be more affected by a breakdown in size constancy than the perception of hands. The results of the experiment have not borne it out. However, the photograph of the foot was somewhat ambiguous in that the heel was missing because the photograph had been taken from above. This could have been a source of confusion for many subjects. Some of them could have made allowance for the missing heel and some could have not. Another experiment with a less ambiguous foot photograph would be indicated. Another possible explanation is that in humans, the cortical area representing hand is much larger than that of foot. Therefore, one would expect the image of hand to be much better developed and differentiated than the image of foot. Since in any generalized pathological process

of the cortex higher differentiated functions are affected earlier than less differentiated functions, the part of the body image representing hand will be more affected than the part of the body image representing foot. Thus there may be a secondary factor modifying the effects produced by the impairment of size constancy alone.

If the "size-constancy" explanation is tentatively accepted, there are intriguing possibilities concerning the relationship between perceived body and perceived space. Since Lotze (36) put forward his "local sign" theory of space perception, there has been a lot of speculation regarding the relationship between bodily sensation and space perception. Most theories of space perception, particularly those of empiricist tradition, explain space perception as being due to association between visual sensations and proprioceptive sensations. An example of such theory is Freeman's Motor-Adjustment Theory (22). This author emphasizes motor posture or set of the organism at the time of stimulation. The "proprioceptive backlash" from the muscles and joints indicates what is to be done with the perceived object and, therefore, what movements are necessary to reach them in space. According to these theories the individual learns about space by exploration. During this exploration he moves around and proprioceptive sensations resulting from these movements and changes of bodily posture become associated with visual percepts. The literature on child development is replete with such accounts. Gesell (25) attaches great importance to the eye-hand co-ordination and co-operation in the infant in his exploration of surrounding space. Piaget (44) attributes the earliest cognitive "schemata" to these early manipulations and eye-hand explorations. The earliest system of spatial co-ordinates is related to body image. Left-right, up-down, in front and in the back, are judged from the point of view of the body position. It is only towards 9–10 years that an independent system of spatial co-ordinates is developed (45). The space directly surrounding the body, particularly the region between the hands and eyes, and around the orifices, is structured first. The farther regions are structured later. Von Uexküll (57) has compared the perceived three-dimensional world to a soap bubble. This "soap bubble" grows larger as the child matures.

More recently some theorists of Gestalt and, therefore, nativist orientation have recognized the importance of body image in space perception. The most striking example is the "Sensory Tonic" field-theory put forward by Werner and Wapner (63). These authors have found that the co-ordinates of perceived space depend on stimulation of the muscles. If this stimulation is not symmetrical, there is a compensatory deviation in the co-ordinates of perceived space.

Neurological investigations also indicate that perception of space is closely related to perceived body. Gerstmann (27) has shown that damage to the dominant parietal lobe produces finger agnosia, acalculia and left-right disorientation. He pointed out that in finger agnosia the knowledge of the manipulatory space round the fingers is affected. Macdonald Critchley (14) in his recent monograph on parietal lobes indicated a close relationship between disturbance of body image (atopognosia, anosognosia) and the disturbances in space perception and orientation and, also, apraxia. In milder cases where space perception and orientation is disturbed, only the third dimension in the perception of depth is affected. (The subject can copy a two-dimensional drawing but finds it difficult to draw or to build three-dimensional figures.) It is obvious that perceived body is closely related to the perception of space and that both of them are related to the function of parietal lobes. Hallucinogenic drugs such as lysergic acid, mescaline, buffotonin and others produce both distortion of the

perceived body and the perceived space. Hoffer (31) has found that adrenochrome (another hallucinogenic substance) affects the perception of space and the perception of the parts of the body. His subjects stated that their hands appeared smaller while they were under the influence of the drug.

Disorders of perceived body in schizophrenia are well known. Some of the descriptions made by clinicians indicate quite clearly that these disturbances are related to constancy of perception and perception of space. Bleuler (8) gives the following descriptions of body image distortion occurring in schizophrenia. "The hallucination of bodily sensations present such kaleidoscopic multiplicity that no description could possibly do justice to them . . . The patients are beaten and burnt, they are pierced by red-hot needles, daggers or spears; their arms are being wrenched out; their heads are being bent backwards; *their legs are being made smaller*; their eyes are being pulled out so that in the mirror it looks like they are entirely out of their sockets; *their heads are being squeezed together; their bodies have become like accordians being pulled out and then again pressed together.*"* The changes of the perceived body described by this author are exactly the changes one would expect in a case of poor size and shape constancy, with the appearance of body parts changing size and shape with each different distance and angle of viewing. One can postulate a close relationship between constancy of perception, the perceived body and perceived space. Angyal (3, 4) makes the interesting point that sometimes the schizophrenic experiences a reduction or elimination of a third-dimension to his body. He cites several such reports of patients: "Nothing is behind my chest, I have no back"; "I feel flat like those signs on the road"; "I feel so thin that clothes hang on to me, like a skeleton."

In infancy and early childhood the development of constancy of perception helps to form a stable body image, moving and oriented in a three-dimensional space. In schizophrenia, drug-induced psychoses and organic damage to the parietal lobes, the physiological mechanisms controlling these functions are affected. With schizophrenia, in comparison with parietal lobe damage and drug-induced psychoses, the impairment is usually mild but, nevertheless, sufficient to colour the "Weltanschauung" of the schizophrenic.

In the area of self-concept the most outstanding finding concerns self-references. The schizophrenic patients gave a smaller number of self references than the control groups when the subjects were describing themselves or naming parts of their bodies. This indicates that their self-concept, when compared with that of controls, is more limited. Their bodies are less ego-involved. Self is poorly delineated and less structured. As has already been mentioned, the emergence of self is a social process. Freud (23), Mead (38), and more recently, Cameron (11), Coutu (16), and Parsons and Bales (42) have postulated that the development of self involves some kind of "internalization" process of the early objects of social interaction. The attitudes and characteristics of significant figures are somehow internalized and become functional directive systems within the individual. This is the idea behind Freud's concept of "super-ego", Mead's concept of the "generalized other" and Parsons and Bales' view that self is a kind of "mirror-image" of the social relationships the individual has experienced. In the view of the authors of this paper, the "internalization" theory, although describing to some extent the socialization process, is inadequate to explain some essential aspects of the development of self. It is important that, together with the socialization process, identification with or internalization of certain

* Our italics.

social values, goes another process, namely the emergence of the individual as a self-conscious independent entity in the matrix of social relations. This is achieved by the ability of the individual to perceive the mutuality, complementarity and reciprocity of social roles and expectations. To put it simply, it is the ability to see oneself, as it were, through the eyes of other people. Piaget (43) has shown that the language and thought in small children are egocentric. The ability to see the other's point of view develops only gradually. This is the most important aspect of "role-taking" described by Mead and "role articulation" described by Cameron (11, 12). This being so, there is an intriguing possibility that the emergence of self may depend on the development of a stable body image and, therefore, on more general cognitive processes, like constancy of perception and the ability to form concepts. The ability to interact in a social situation may depend in the first place on the ability to perceive oneself and others as stable phenomena, having certain continuity in time. Constancy of perception implies the ability to perceive an object, as it were, from more than one point of view in space. In shape constancy it involves "seeing" the object simultaneously at several angles. In distance constancy it involves "seeing" the object simultaneously from several distances. To put it in physiological terms, the stimulus pattern received at a certain point of space is integrated with the traces (memories) of the stimulus patterns received at different points of space. There is a close relationship between points of space and the perceived aspects of an object. This relationship forms an invariance which is responsible for the formation of percept-concept of an object. This awareness of more than one aspect of an object, more than one point of view from which it can be observed, is the essence of perceptual constancy. It may also be the essence of the ability to perceive oneself from outside as a separate object or entity. There may be the same basic mechanisms involved in the perception of stable objects related to each other in space, perception of one's body as a stable object, and perception of other people. The role-taking, role-playing, and other aspects of social relationships may be an abstraction of relationships between perceived human bodies, as geometry is an abstraction of relationships between physical bodies. The roots of the physical and social spaces may be the same. In the fundamental and earliest social interactions, the individual's body is actually the chief participant. One could mention as an example the relationship between the infant and his mother. It is largely a bodily relationship depending on handling and bodily contact.

Koffka (34) has pointed to another factor apart from the social factors which may be responsible for the organization of ego in relation to body image. He has stressed the importance of the coincidence between visual and kinaesthetic perceptions. The visual perceptions of the bodily parts are assimilated into the kinaesthetic perceptions of these parts and, therefore, are perceived as different from the outside objects. A new gestalt emerges which has an ego character and which is responsible for the subject's calling his hand "my hand" and his leg "my leg", etc. This new gestalt is called the ego system.

A very important aspect of self is its boundary. It has been investigated by Fisher and Cleveland (21) who maintain that the definiteness of the self boundary depends on the structuring of relations with early social objects. If the relations were well structured and clear-cut, then the self boundary is well defined and clear-cut. If these relations were poorly structured and vague, then the self boundary is poorly defined and vague. One can see again that it is the complementarity and reciprocity of social roles which is very important. A well-structured social relationship is a relationship where the roles, and, therefore,

their complementarity and reciprocity, are clearly defined. There is a distinct and clear "interface"* between the two reciprocal roles. It allows the individual to "see" himself from the vantage point of the other without losing his identity. Sociologists refer to this as role-taking which is distinct from role-playing in that the latter refers to the individual's ability to fill certain social roles, e.g. policeman, student, etc. (cf. Coutu). The role of the individual and the roles of the others are kept distinct and are not confused. A stable body image, which is clearly defined and separated from a stable outside world, is very important in bringing about well-defined social relationships and social roles. Therefore, it is also important in bringing about a well-defined and clearly delineated self.

In the schizophrenic patient constancy of perception is poor. Objects are poorly defined and lack stability. This applies also to this patient's own perceived body and the perceived bodies of other people. Their social roles and relationships are poorly defined; there is no clear-cut reciprocity and complementarity. The subject may be confused in role-taking and role-playing. The self is poorly defined and delineated. The boundary between self and the external world is loose and may disappear altogether. The individual while looking at himself through another's eyes in the process of role-taking may lose his identity. He may literally identify himself with the other. The autobiography of one former mental patient recounts how a patient he knew was unable to keep his feet distinct from his partner's during a dance. He would continually refer to other people's feet as his own. This could account for some delusions of personal identity. It could also account for phenomena of passivity (*automatisme supérieur*). In this condition the subject feels that he no longer controls his thoughts or his body, and that they are controlled by outside forces. Further, it could account for *hallucinations du double* of the French authors ("autoscopy" of the English authors) in which the subject has an hallucination of another person and recognizes this person as himself. It could also account for the phenomena occurring in LSD and mescaline intoxication when the subject sees his own body from outside. Thus, the disorders in the perceived body (body image) and self-concept can be reduced to a disturbance of perceptual constancy occurring in the subject's phenomenological space, which includes both the perceived physical space and the perceived social space. This would make it unnecessary to use the concepts of "projection" and "introjection" which, from the epistemological point of view are not very satisfactory.

Regarding the details of the self-concept studies, it was found that schizophrenic patients when asked, "Who are you?" significantly less often used sex and occupation in their self-description than the other groups. This is again due to a poorly defined self-concept. It supports the frequent references in the literature to poor sex identification of schizophrenic patients. The paucity of answers referring to occupation may be due to the effects of disculturation, a secondary symptom of mental illness, caused by incarceration in a mental hospital.

Another interesting finding was that although schizophrenics less often used self references than the other groups, it affected only the "me" aspect of their selves and not the "I" aspect. In order to speculate on the meaning of this finding, a philosophical digression may be necessary. The Cartesian dualism maintains that both subject and object are primary and irreducible data of experience. The Kantian idealism maintains that the experienced object is created by the subject. If we take the position repudiating both these views and

* We are indebted to Mr. F. Huxley for this term.

side ourselves with the empiricist tradition of philosophy, we will accept sensory experience as the only primary datum. This position was most forcibly put forward by James (33) as "Radical Empiricism" and also by Mach (37) as "Experiential Positivism". Phenomenologists studied the immediate experience called by Husserl (32) "pure being". It was regarded by them as the ultimate reality. More recently, Russell (49) has expressed similar views. The essence of this position is that sensations are neutral, neither matter nor mind, neither object nor subject. These primary sense data, because of certain regularities of occurrence, are classified either as material "things" of the external world or as "contents" of mind. The external world and mind, or object and subject, are, therefore, only secondary logical constructs from the primary sense data. They are frames of reference for what James has called the "neutral stuff" of experience.

This primary polarity of experience has crystallized in the tradition of Western metaphysics into à highly philosophical antinomy of "mind and matter" or "subject and object". In an unsophisticated form it may occur quite early in life with the primary differentiation of experience into "I" and "not I". It is well known that small children have difficulty in distinguishing imagery from perception, dreams from reality. Next, a segment of the "not I" becomes differentiated. This segment of the external world has a special relationship to "I", perhaps on account of the fusion of the somaesthetic with other sensations. This is the perceived body. It is interposed between "I" and the external world. The "me" appears only later as a result of social interactions with other people. Thus in schizophrenic regression the perceived body and the "me" aspect of self may be affected before the "I" aspect. Whether this "I" aspect of self is ever affected in very sick patients is an open question which might be answered by experimentation.

The last point which has to be discussed is the relationship of the perceived body and self-concept to the perception of the external world. Freeman's Motor-Adjustment theory of perception has already been mentioned. According to this theory the motor posture or set through the proprioceptive backlash gives meaning to the perceived objects. In a recent paper, Gerstmann (28) expresses the same views. He states that "Every new set of afferent impressions in order to serve the orientation and recognition . . . must be brought into proper functional relation with mechanism of body image by the activity of the brain before it rises into consciousness. . . . Without that relation the peripheral sensory impression results in an isolated perception accompanied by a feeling of estrangement and isolation from the body." In schizophrenic patients this may take the form of unreality of feelings or of world destruction delusions. There is some evidence (Weckowicz and Blewett (61) and also Crookes (15)) that schizophrenic perception is literal and lacks the same depth of meaning that it has for normals. In these patients, therefore, a vicious circle is set up. Poor constancy of perception leads to the lack of stability of the perceived objects and of the subject's own perceived body. The objects are lacking in meaning or their meaning is distorted. This is aggravated by the fact that the body image to which the percepts of objects are referred is poorly differentiated. The distortion of object perception affects the perception of the subject's own body and the distorted perception of the subject's own body distorts further the perception of objects. This may be related, as suggested by Eickhoff (18), to the impairment of abstract thinking which would agree with the finding of Weckowicz and Blewett (61) that in schizophrenic patients there is a positive correlation between size constancy and abstract thinking.

The impairment of abstract thinking would affect in its turn the formation of self-concept.

Thus, there is a close relationship between the perception and knowledge of the external world, of one's body, and of one's self. One influences another. All three are affected in schizophrenia probably by a disturbance of some underlying physiological mechanism.

Summary

Body image and self-concept were studied experimentally in schizophrenic patients, normal controls and non-schizophrenic psychiatric patients. Seven experimental studies were conducted.

It was found that:

1. Schizophrenic subjects when compared with non-schizophrenic controls underestimated the size of the distal parts of their bodies.

2. Schizophrenic subjects used self-references less frequently than non-schizophrenic controls when they described their bodies.

The theoretical implications of these findings for the body image and self-concept of schizophrenic patients are discussed.

A hypothesis is put forward which relates the perception of one's body and self-concept to constancy of perception and perception of space. A concept of phenomenological space which embraces both physical and social space is tentatively put forward.

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