ELSEVIER

Psychiatry Research 101 (2001) 289–301

PSYCHIATRY RESEARCH

www.elsevier.com/locate/psychres

Specific body image pathology in acute schizophrenia

Stefan Priebe*, Frank Röhricht

Unit for Social and Community Psychiatry, St. Bartholomew's and the Royal London School of Medicine and Dentistry, Queen Mary & Westfield College, East Ham Memorial Hospital, University of London, London E7 8QR, UK

Received 24 April 2000; received in revised form 1 November 2000; accepted 30 November 2000

Abstract

Despite a wide phenomenological interest in body image pathology in schizophrenia, there has been little systematic empirical research. This study aimed at establishing the specificity of body image pathology in patients with schizophrenia, its changes during acute treatment, and its association with other symptom factors. Cognitive (thoughts/beliefs regarding the body — body concept), affective (body satisfaction — body cathexis) and perceptual (body size estimation — body schema) facets of body image and psychopathology were assessed in in-patients with paranoid schizophrenia ($N = 60$), schizoaffective disorder ($N = 19$), depressive disorder ($N = 40$) and anxiety disorder ($N = 28$) at admission, and after 2 and 4 weeks of treatment. Body size perception was also assessed in a sample of healthy subjects ($N = 44$). Patients with paranoid schizophrenia/schizoaffective disorder showed underestimation of lower extremities at each time point. They expressed a higher degree of body concept disturbances at admission, but not at later stages. In a factor analysis, body perception and body concept loaded on distinct factors, which were separate from positive symptoms, negative symptoms, and anxiety. Patients with acute paranoid schizophrenia and schizoaffective disorder seem to have a specific and consistent disturbance of body size perception, which might indicate a dysfunction of sensory information processing.

Keywords: Body concept; Body size perception; Body satisfaction; Psychopathology

1. Introduction

When Bleuler (1911) published his original concept of schizophrenia and introduced the term into the psychiatric literature, he emphasised the clinical importance of heterogeneous disturbances of body experience and regarded them as characteristic and frequent accessory symptoms of the illness. Two years later, Kraepelin (1913) also described various bodily sensations as relevant phenomena in schizophrenia. Since then, numerous contributions, mostly clinical reports and phenomenological considerations, have been published on body image pathology in schizophrenia (reviews: e.g. Fisher, 1970, 1986; Kolb, 1975; Röhricht and Priebe, 1997). Schizophrenia patients are reported to suffer from symptoms of disembodiment such as not feeling at home in

* Corresponding author. Tel.: +44-208-5865272; fax: +44-208-5865273.

E-mail address: s.priebe@qmw.ac.uk (S. Priebe).

0165-1781/01/$ - see front matter
PII: S0165-1781(01)00214-1

one's body anymore, feeling disintegrated, or feeling as if the body is torn apart. They frequently present abnormal thoughts about and attitudes towards the body as well as various pathological sensory sensations. Explanations vary and range from neurological to psychological perspectives (Cumming, 1988).

The phenomenological variety of body-related psychopathology led to different classifications (Lukianowicz, 1967; Kolb, 1975; Lipowsky, 1977; Fisher, 1986; Sims, 1995; Cutting, 1997). In order to introduce a consistent terminology, it has repeatedly been suggested to summarise phenomena of body experience under the term 'body image' and to distinguish between different psychopathological facets of it. These include perceptual (body schema, body size perception in particular) and subjective, attitudinal (cognitive: body concept, including thoughts/beliefs and knowledge regarding the body; affective: body cathexis, mainly body satisfaction) components (e.g. Shontz, 1974, 1990; Kolb, 1975; Joraschky, 1986; Röhricht, 1998; Thompson et al., 1990).

Despite the wide literature on the subject, systematic empirical research has been rather scarce. Early studies often yielded inconsistent results. They described incomplete, disintegrated and underestimated Draw-A-Person figures, underestimation and overestimation of body sizes as well as a general inaccuracy of body size perception, experiences of boundary loss and desomatisation. Based on a literature review and research data, Lukianowicz (1967) suggested a prevalence rate of between 15 and 31% of body image disturbances in patients with schizophrenia. If sensory sensations such as somatic hallucinations are also considered, a higher prevalence rate of between 30 and 74% has been reported (Huber and Zerbin-Rüdin, 1979; Kato and Ishiguro, 1994; Röhricht and Priebe, 1996; Bräunig, 1993, 1998).

Some findings suggest that patients with acute paranoid schizophrenia have marked body image aberrations, in particular disturbances of body perception. Symptoms appear to diminish in line with a reduction of acute psychotic symptoms (Röhricht and Priebe, 1996; Röhricht, 1998), but can still be found in chronic states between acute episodes (Wagner, 1984). Patients' underestimation of the lower extremities has been found to be moderately associated with a higher degree of anxiety symptoms, and overestimation with grandiosity (Röhricht and Priebe, 1996).

Many empirical studies in the field have significant methodological shortcomings. Most frequently, they do not distinguish between different aspects of body image pathology, findings are from diagnostically heterogeneous samples, obtained with a variety of different instruments and other psychopathology has not been assessed by standardised methods.

Considering these problems and the often inconsistent findings in the literature, we decided to conduct an exploratory, yet systematic and longitudinal investigation of body image pathology in diagnostically homogeneous samples.

The study addressed three questions:

1. Which symptoms of body image pathology can be identified in patients with paranoid schizophrenia and with schizoaffective disorder, and is the aberration specific for these groups as compared with samples with depressive and anxiety disorders and, regarding body size perception, also with healthy subjects?
2. How does body image pathology change over time during acute treatment?
3. In which way are different facets of body image pathology in patients with paranoid schizophrenia and schizoaffective disorder associated with each other and associated with the main symptom factors of the illness?

2. Methods

2.1. Patients

Two samples with acute schizophrenia, one with a diagnosis of paranoid schizophrenia ($N = 60$) and another one with schizoaffective disorder ($N = 19$), were investigated. Patient samples with depressive disorders ($N = 40$) and anxiety disorders ($N = 28$) and healthy subjects ($N = 44$)

were examined as comparison groups. Patients were consecutively admitted to a general psychiatric hospital with catchment area responsibility in Berlin, Germany. Inclusion criteria were an age between 18 and 60 years, and an ICD-10 diagnosis of paranoid schizophrenia (F20.0), schizoaffective disorder (F25.0-1), depressive disorder (F32.0-3 or F33.0-3), or anxiety disorder (F40.0-1 and F41.0-1). Patients were excluded if they had a history of serious physical illness, a physical disability or a substance abuse/dependency. The healthy sample was recruited from hospital staff and medical students. All subjects gave informed consent.

2.2. Design

This was a longitudinal and comparative study on body image pathology in samples with different acute mental illnesses. The diagnosis was first made by the psychiatrist in charge and then confirmed by an independent research psychiatrist. At baseline, sociodemographic and clinical characteristics and data from patients' history were obtained (gender, age, body-mass index, marital and employment status, accommodation, educational background, length of illness and number of previous hospitalisations).

Body image, psychopathology, medication and side effects were assessed at three times: within 3 days after admission; after 2 weeks; and after 4 weeks of hospital treatment. The interviewer remained the same for each patient and was not involved in treatment. Because of dropouts, sample sizes after 2 weeks and after 4 weeks were smaller than at baseline.

Different facets of body image were investigated using the following methods:

- Body size perception was assessed by the modified Image-Marking Procedure (IMP: Askevold, 1975; Meermann, 1985; Röhricht and Priebe, 1996). Patients marked distances reflecting the size of 10 body segments (frontal: head; shoulders; waist; hip; thigh; lower leg. Sagittal: head; abdomen; thigh; calf) in response to a two-point tactile stimulus by the investigator (using a beam bender similar to an instrument called an 'anthropometer'). The 10 distance scores were summarised into three segment scores (BPI) — as means of the two measures for the head, and of four measures each for the trunk and the legs — reflecting the size perception of 'head', 'trunk' and 'legs'. Patients also marked the perceived size of non-body-related external objects (book cover, ruler, tennis ball); scores were also summarised into one index (PI). The IMP was chosen in order to apply a procedure assessing body parts as opposed to a whole body method. This was based on the theory that schizophrenia patients may generally lack sensory sensation integration and suffer from various dissociative phenomena, which are more directly assessed by a body-part method. Also, this is the only method assessing body size estimation on the basis of direct tactile stimuli. Unlike Askevold (1975), we used an instrument for the tactile stimuli in order to avoid the psychological impact of direct body to body contact. This method is less likely to measure confounding perceptual disturbances (e.g. visual hallucination) because a direct tactile and visually controlled body stimulus towards the skin provides the basis for the body size estimation.
- Body cathexis (how satisfied are you with your body?) was obtained on a 100-mm visual analogue scale (VAS; extreme points: 0 = totally dissatisfied, 10 = totally satisfied). Each 10-mm interval was marked so that the scale combines qualities of a visual analogue scale with features of an 11-point rating scale as it has been suggested to increase reliability in self-ratings of patients with schizophrenia (Guyatt et al., 1987; Priebe and Gruyters, 1995; Priebe and Bröker, 1999).
- The same type of scale was applied for assessing features of body concept called 'small' and 'large' (feeling as if the body or its parts is/are unusually small/large), and 'change of body size' (feeling as if the body size has changed). Each scale had extreme scores of 0 (feeling does not exist at all) and 10 (strong feeling). Other characteristics of body concept were investigated using sub-scales of the Body

Distortion Questionnaire (BDQ; 'boundary loss' and 'depersonalisation' with 10 items each; Fisher, 1970). These sub-scales were taken because they had revealed pathological scores in schizophrenia patients in previous studies (Röhricht and Priebe, 1996).

In healthy subjects, only body perception was assessed longitudinally with the same 2-week intervals between measurements.

Psychopathology was rated in all patient groups on the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962), Clinical Anxiety Scale (CAS; Snaith et al., 1982) and State Anxiety Inventory (STAI-X1; Spielberger et al., 1970). Additionally, in patients with paranoid schizophrenia and schizoaffective disorder, we used the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). Antipsychotic medication was recorded in chlorpromazine-equivalent dosage, calculated according to Kane (1996). Adverse effects of medication were documented on the Extrapyramidal Rating Scale (EPRS; Simpson and Angus, 1970).

2.3. Statistical analysis

Differences between the diagnostic groups were analysed by one-way analysis of variance (ANOVAs). For testing whether differences in body image pathology were consistent over time, ANOVAs with body image phenomena as dependant variables were repeated for each time point (admission, 2 weeks, 4 weeks). Regarding BPIs, medians are presented to minimise the influence of the floor effect (extreme underestimation cannot go below 0%, but there is no limit to overestimation). Subsequently, BPIs were compared using non-parametric tests (Kruskal–Wallis one-way ANOVA). Cronbach's alpha was calculated for assessing internal consistency of the four — or two, respectively — measures forming each of the three BPIs. Retest-reliability was also analysed for the three BPIs. With respect to the main question of the study, i.e. the differences between diagnostic groups, the sample size was sufficient to detect an effect size of 0.25 on a significance level of alpha = 0.05 in 80% of cases (Cohen, 1988).

Changes over time of BPIs, BDQ scores and VASs on body cathexis and body concept in each group were also tested by ANOVA or Friedman's test, respectively. Additionally, two-way ANOVAs with a repeated measures design were computed for the whole sample. In this analysis, we tested influences of the factors 'group' (i.e. diagnostic samples) and 'time' (i.e. three points of measurement) as well as the interaction 'group' by 'time' (establishing whether groups differed significantly in changes over time). The two-way ANOVAs address various questions in one comprehensive analysis without a requirement for Bonferroni adjustment, whilst the one-way ANOVAs are reported to assess the exact results at each time point when the sample size varied.

The association of body image phenomena with other psychopathology was analysed only in the group of patients with paranoid schizophrenia and schizoaffective disorder. A principal component factor analysis with varimax rotation was conducted, and body image phenomena, PANSS sub-scores (general psychopathology, positive symptoms, and negative symptoms), and sum scores of the CAS and the STAI were entered as variables. All analyses were carried out using SPSS for Windows (Version 8.0.0) with $P < 0.05$ as the level of significance (two-tailed).

3. Results

3.1. Characteristics of samples and treatment

Age, gender and body-mass index of the four clinical samples and the group of healthy subjects are shown in Table 1a. Table 1b summarises length of illness and previous hospitalisations in the four diagnostic groups as well as those psychopathology scores that were assessed in each group and at each point of time, i.e. BPRS, CAS and STAI scores.

Patients with depressive disorders were on average older than the other groups, whilst patients with paranoid schizophrenia and schizoaffective disorder had more previous hospitalisations than the other two groups. Throughout the 4-week

Table 1
(a) Age, BMI (body-mass index) and gender of the patient samples and of healthy subjects. (b) Frequency of previous hospitalisations, length of illness, and sum scores of BPRS, CAS, and STAI of the patient samples at each time point[a]

(a)	Paranoid schizophrenia ($N = 60$)		Schizoaffective disorder ($N = 19$)		Anxiety disorder ($N = 28$)		Depressive disorder ($N = 40$)		Healthy subjects ($N = 44$)		ANOVA	
											F	*P*
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)		
Age	35.9	11.1	37.8	8.5	35.8	11.2	42.6	11.5	36.1	8.8	3.1	< 0.05[b]
BMI	23.7	4.6	24.7	3.9	23.8	4.6	24.8	4.1	23.1	3.6	1.1	n.s.[b]
Gender f/m	36/24	9/10	20/8	24/16	31/13	4.2 (χ^2)	n.s.[b]					

(b)	Paranoid schizophrenia ($N = 60$)		Schizoaffective disorder ($N = 19$)		Anxiety disorder ($N = 28$)		Depressive disorder ($N = 40$)		Healthy subjects ($N = 44$)		ANOVA	
											F	*P*
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)		
Frequency of hospitalisation	3.8	3.3	3.8	1.9	0.9	2.0	1.0	1.7	–	–	11.3	< 0.00[c]
Length of illness (years)	6.0	6.3	8.7	8.2	4.9	7.1	6.9	7.7	–	–	1.1	n.s.[c]
Admission												
BPRS	43.2	7.4	39.6	7.0	33.0	4.9	36.7	6.2	–	–	17.3	< 0.001[c]
CAS	7.7	4.8	7.3	4.3	12.1	3.1	10.9	3.5	–	–	10.5	< 0.001[c]
STAI	49.6	11.1	50.2	14.3	54.0	11.7	55.1	10.6	–	–	2.2	n.s.[c]
After 2 weeks												
BPRS	35.0	9.7	33.6	11.0	30.7	7.2	31.2	6.7	–	–	3.0	< 0.05[d]
CAS	5.5	4.3	4.7	4.8	10.2	3.4	8.5	4.2	–	–	8.7	< 0.001[d]
STAI	44.3	9.6	43.6	9.2	49.5	10.7	48.4	12.0	–	–	1.9	n.s.[d]
After 4 weeks												
BPRS	35.2	7.9	33.2	11.7	27.1	4.6	30.7	6.2	–	–	5.2	< 0.01[e]
CAS	4.2	3.9	4.8	4.5	8.2	3.7	7.9	3.7	–	–	7.2	< 0.001[e]
STAI	44.5	12.7	43.6	12.4	49.5	12.2	50.0	11.9	–	–	1.7	n.s.[e]

[a] *Abbreviations:* BPRS, Brief Psychiatric Rating Scale; CAS, Clinical Anxiety Scale; STAI, State Anxiety Inventory; n.s., not significant.
[b] ANOVA: d.f. = 4.186.
[c] ANOVA: d.f. = 3.143.
[d] ANOVA: d.f. = 3.107.
[e] ANOVA: d.f. = 3.93.

in-patient treatment period, BPRS scores were significantly higher in the group with paranoid schizophrenia than in patients with anxiety and depressive disorders. Significantly higher CAS scores were consistently found in patients with anxiety and depressive orders. Other differences failed to reach statistical significance.

During in-patient treatment, all patients received occupational therapy and attended talking groups on the ward and participated in athletic activities. Twelve schizophrenia patients received atypical neuroleptics, and the other 48 patients were on conventional neuroleptics. The mean chlorpromazine-equivalent dosage was 487.0 mg (S.D. 457.5) after admission, 587.4 mg (467.3) after 2 weeks, and 601.8 mg (485.4) after 4 weeks. Only one patient with schizoaffective disorder received a novel antipsychotic, while 18 received

typical neuroleptics. The mean chlorpromazine-equivalent dosage was 532.2 mg (372.1) after admission, 944.6 mg (526.5) after 2 weeks, and 752.2 mg (585.3) after 4 weeks. All depressive patients and 13 of the patients with anxiety disorders received antidepressant medication.

Changes in specific psychopathology ratings for the samples with paranoid schizophrenia and schizoaffective disorder are shown in Table 2a,b.

With the exception of the PANSS sub-scale negative symptoms, in the paranoid schizophrenia sample all symptom scores decreased significantly over time. The group with schizoaffective disorder showed similar changes over time. Yet, differences other than in positive symptoms failed to reach statistical significance because of the small sample size after 4 weeks of treatment.

The 23 patients in the schizophrenia group who dropped out between the first assessment and the 4-week follow-up, had lower baseline scores on the PANSS sub-scale general psychopathology (mean 36.3, S.D. 6.2 vs. 40.7, 9.9; $t = 2.15$, d.f. = 58, $P < 0.05$) than the other 37 who were re-assessed after 4 weeks. There were no other statistically significant baseline differences between the two groups. In the other diagnostic samples, the number of dropouts was too small for a meaningful statistical comparison with the patients who were followed up.

3.2. Body image pathology

In the total patient sample, Cronbach's alpha for the four measures of BPI 'legs' (thigh and calf each frontal and sagittal) was 0.84, for the two measures of BPI 'head' (frontal and sagittal) 0.51, and for the four items forming BPI 'trunk' (shoulder/waist/hips/abdomen) 0.78 (each $P < 0.001$). The retest-reliability was 0.75 for BPI 'legs', 0.75 for BPI 'head' and 0.84 for BPI 'trunk'.

BPIs (body size perception) and PI (estimation of the neutral objects) are shown in Table 3.

BPIs ('head' and 'trunk') and PI of the neutral objects did not differ significantly between the groups at any time point. There was, however, a consistent difference in BPI 'legs'. At each time point, patients with paranoid schizophrenia and with schizoaffective disorder underestimated the

Table 2
Scores on the Positive and Negative Syndrome Scale (PANSS) in patients with (a) paranoid schizophrenia and (b) schizoaffective disorder[a]

(a)	Admission ($N = 60$)		After 2 weeks ($N = 43$)		After 4 weeks ($N = 37$)		ANOVA	
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	F	P
PANSS-general psychopathology	39.0	8.9	32.6	8.7	31.4	7.9	18.4	< 0.001
PANSS-positive symptoms	19.3	5.3	14.6	5.2	13.5	5.7	23.1	< 0.001
PANSS-negative symptoms	14.0	7.0	12.1	4.7	13.1	5.4	0.9	n.s.

(b)	Admission ($N = 60$)		After 2 weeks ($N = 43$)		After 4 weeks ($N = 37$)		ANOVA	
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	F	P
PANSS-general psychopathology	35.2	8.9	30.1	10.0	30.6	11.6	0.9	n.s.
PANSS-positive symptoms	19.6	4.6	14.9	7.2	13.5	5.9	3.9	< 0.05
PANSS-negative symptoms	9.6	4.6	9.3	2.5	9.5	3.0	2.5	n.s.

[a] n.s., not significant; ANOVA d.f. = 2.

Table 3
Body Perception Indices (BPI) and Perception Index (PI) for neutral objects of the patient samples and of healthy subjects at each time point[a]

	Paranoid schizophrenia		Schizoaffective disorder		Anxiety disorder		Depressive disorder		Healthy subjects		ANOVA	
	Median	(S.D)	Median	(S.D.)	Median	(S.D)	Median	(S.D.)	Median	(S.D.)	χ^2 d.f. = 4	P d.f. = 4
Admission												
BPI-head	104.0	27.2	100.3	18.4	111.0	18.2	109.7	24.2	104.1	15.1	6.1	n.s.[b]
BPI-trunk	101.7	26.2	104.7	16.9	108.1	14.5	103.0	23.2	103.5	13.6	4.2	n.s.[b]
BPI-legs	92.1	44.0	85.4	41.5	105.6	22.0	111.0	22.2	105.5	28.5	16.1	< 0.01[b]
PI-neutral objects	102.3	100.9	95.1	45.4	109.3	10.4	104.4	10.3	101.6	14.1	6.8	n.s.[b]
After 2 weeks												
BPI-head	102.4	30.6	113.1	21.5	114.4	21.8	110.3	21.0	109.7	14.5	7.8	n.s.[c]
BPI-trunk	106.5	28.4	116.4	35.1	109.0	13.9	105.9	21.2	105.8	12.7	2.1	n.s.[c]
BPI-legs	89.1	36.2	97.3	24.9	114.4	18.0	113.4	23.5	112.8	18.7	23.0	< 0.01[c]
PI-neutral objects	102.0	19.4	101.7	17.9	105.4	11.2	107.9	13.2	103.0	11.8	3.6	n.s.[c]
After 4 weeks												
BPI-head	102.3	19.1	118.0	30.2	108.7	9.7	112.2	31.3	111.7	23.8	4.8	n.s.[d]
BPI-trunk	104.4	25.4	114.6	15.8	111.6	13.3	102.9	22.5	106.5	14.1	3.5	n.s.[d]
BPI-legs	92.5	29.7	89.0	29.3	115.8	18.2	116.4	26.0	115.6	20.9	18.1	< 0.01[d]
PI-neutral objects	104.5	16.4	96.8	19.9	106.6	9.5	105.4	14.7	103.8	13.6	2.8	n.s.[d]

[a] n.s., not significant.
[b] ANOVA: d.f. = 4.185.
[c] ANOVA: d.f. = 4.150.
[d] ANOVA: d.f. = 4.136.

size of their legs. Single group comparisons revealed that patients with paranoid schizophrenia differed significantly from each of the groups with anxiety and depressive disorders and from healthy subjects at each time point. The same held true for patients with schizoaffective disorder apart from the third measurement when the size of the schizoaffective sample had become so small that differences failed to reach statistical significance.

Body cathexis, VAS scores of 'small', 'large', and 'body size change', and BDQ scores of 'depersonalisation' and 'boundary loss' are listed for the four clinical groups at the three time points in Table 4.

BDQ scores indicate pathological symptoms of depersonalisation and boundary loss in all four diagnostic groups, particularly after admission. These disturbances did not differ significantly between the groups at any time point.

After admission, patients with anxiety disorder and depressive disorder expressed a significantly higher degree of dissatisfaction with their body than the other two groups. At the same time point, patients with paranoid schizophrenia and schizoaffective disorder rated a significantly greater feeling that their body was unusually small and that its size had changed. All these differences disappeared during the course of treatment. After 2 and 4 weeks, there was no statistically significant difference between any of the groups on any scale.

None of the BPIs shown in Table 3 changed

Table 4
Scores of Body Distortion Questionnaire (BDQ) sub-scales depersonalisation and boundary loss, of Visual Analogue Scales (VAS) body cathexis, 'small', 'large' and 'body size change' of the patient samples at each time point[a]

	Paranoid schizophrenia		Schizoaffective disorder		Anxiety disorder		Depressive disorder		ANOVA	
									F	*P*
	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)	Mean	(S.D.)		
Admission										
BDQ depersonalisation	3.1	3.1	3.0	3.3	3.0	3.3	2.5	2.8	0.3[b]	n.s.[b]
BDQ boundary loss	3.6	3.2	4.1	2.8	3.1	3.3	2.8	2.8	0.9	n.s.[b]
VAS body cathexis	5.8	2.7	6.2	3.6	2.9	2.7	3.9	2.3	9.9	< 0.001
VAS 'small'	2.3	3.7	2.3	3.7	0.9	2.4	0.2	0.9	4.7	< 0.01[b]
VAS 'large'	2.2	3.5	1.9	3.7	0.6	2.3	1.2	2.5	2.1	n.s.[b]
VAS 'body size change'	1.8	3.2	2.1	3.9	0.3	1.5	0.5	1.5	3.7	< 0.05[b]
After 2 weeks										
BDQ depersonalisation	1.9	2.5	2.5	3.1	1.5	2.4	1.5	2.1	0.7	n.s.[c]
BDQ boundary loss	2.4	2.6	3.3	3.6	1.9	2.2	2.1	2.5	0.9	n.s.[c]
VAS body cathexis	6.1	3.1	5.7	2.9	5.0	2.6	5.2	2.7	1.0	n.s.[c]
VAS 'small'	1.0	2.7	2.3	2.8	0.3	1.0	0.9	2.1	2.0	n.s.[c]
VAS 'large'	1.7	3.5	1.7	3.4	0.3	1.5	1.1	2.6	1.1	n.s.[c]
VAS 'body size change'	1.2	2.9	1.7	2.7	0.5	2.2	0.7	2.0	0.9	n.s.[c]
After 4 weeks										
BDQ depersonalisation	2.2	2.9	1.6	2.7	1.4	2.3	1.7	2.1	0.6	n.s.[d]
BDQ boundary loss	2.1	2.5	2.8	3.3	1.8	2.6	2.5	2.3	0.5	n.s.[d]
VAS body cathexis	5.6	3.1	6.0	3.6	4.9	3.5	4.7	2.9	0.7	n.s.[d]
VAS 'small'	0.9	1.9	1.6	3.1	0.5	1.9	0.5	1.7	1.1	n.s.[d]
VAS 'large'	1.4	2.9	1.3	2.5	0.0	0.0	0.4	1.4	2.2	n.s.[d]
VAS 'body size change'	1.2	2.9	1.4	2.9	0.5	1.9	0.6	1.7	0.7	n.s.[d]

[a] n.s., not significant.
[b] d.f. = 3.140.
[c] d.f. = 3.107.
[d] d.f. = 3.93.

significantly over time in any sample. Thus, the BPI 'legs,' which was lower in the samples with paranoid schizophrenia and schizoaffective disorder at admission, did not change significantly from baseline in either of these two groups.

Scores on the BDQ sub-scales 'depersonalisation' and 'boundary loss,' reflecting disturbances of body concept, reduced significantly during treatment in all groups, indicating an improvement after the initial acute state of the illness. These changes over time were statistically significant in the groups with paranoid schizophrenia ('depersonalisation': $F = 4.6$, d.f. = 2, $P < 0.05$; 'boundary loss': $F = 8.4$, d.f. = 2, $P < 0.01$), anxiety disorder ($F = 3.9$ and 3.5, each d.f. = 2, $P < 0.05$) and depressive disorder ($F = 8.6$ and 5.5, each d.f. = 2, $P < 0.01$). Body cathexis improved significantly in the groups with anxiety ($F = 3.8$, d.f. = 2, $P < 0.05$) and depression ($F = 7.3$, d.f. = 2, $P < 0.01$) during treatment. The VAS scores 'small' were significantly reduced in the paranoid schizophrenia group during the 4-week period ($F = 4.4$, d.f. = 2, $P < 0.05$), whilst other changes over time were not significant. Yet, it may be noted that the VAS scores 'small' and 'body size change' were still higher in patients with paranoid schizophrenia and schizoaffective disorder than in the other two groups after 2 and 4 weeks, although the difference was no longer statistically significant.

Two-way ANOVAs for all patient groups showed a significant difference between groups for BPI 'legs' ($F = 3.1$, d.f. = 1.3; $P < 0.05$). There was no other significant group effect on any of the other BPIs, BDQ score and VAS on body cathexis and body concept. The factor time was significant — indicating significant changes over time for the total sample of patients from all diagnostic subgroups — for BPI trunk ($F = 4.7$, d.f. = 2, $P < 0.05$), BDQ subscale 'boundary loss' ($F = 10.6$, d.f. = 2, $P < 0.001$), 'depersonalisation' ($F = 11.6$, d.f. = 2, $P < 0.001$), and VAS on body cathexis ($F = 4.1$, d.f. = 2, $P < 0.05$). For the VAS 'small' the time by group interaction was significant ($F = 2.5$, d.f. = 6, $P < 0.05$). There were no other significant effects of the factor time and no significant 'diagnostic group' by 'time' interaction for any of the tested variables.

In the samples with paranoid schizophrenia and schizoaffective disorder, age, body-mass indices, EPRS scores and chlorpromazine-equivalent dosage were not correlated significantly with any of the body image measures nor was there a gender difference at any time point.

3.3. Association with symptom factors

Results of the factor analysis for the combined group of patients with paranoid schizophrenia and schizoaffective disorder are shown in Table 5.

The analysis reveals five factors, each with an eigenvalue of more than one, and explaining a combined total of 68.4% of the variance. The first factor reflects the cognitive aspects of body concept; symptoms of depersonalisation and boundary loss, as well as feelings that the body is unusually small/large or has changed its size, all load on this factor. The second factor reflects anxiety scores plus depersonalisation, boundary loss and negative body cathexis, as well as general psychopathology (also including ratings on anxiety). The third factor represents the perceptual facet of body image with the three BPIs loading on it, plus — consistent with findings on underestimation of body sizes — feelings that the body is unusually small. General psychopathology and negative symptoms and feelings that the body is unusually large describe the fourth factor. The fifth factor has positive symptoms, anxiety score and body cathexis as its only significant loadings.

The factors 'body concept' and 'body perception' are distinct factors with no loadings from non-body-related psychopathology.

A factor analysis only with paranoid schizophrenia patients identified the same five factors with almost identical loadings. A separate factor analysis only with patients with schizoaffective disorder was not conducted because of the small sample size.

4. Discussion

This is a prospective study on body image pathology in patients with acute schizophrenia that has assessed different facets of body image and other psychopathology longitudinally and ap-

Table 5
Factor analysis of body image phenomena and psychopathology in the combined group of patients with paranoid schizophrenia and schizoaffective disorder ($N = 79$)[a]

	One 'body concept'	Two 'anxiety'	Three 'body perception'	Four 'negative symptoms'	Five 'positive symptoms'
BDQ depersonalisation	0.60	0.55			
BDQ boundary loss	0.67	0.38			
VAS 'large'	0.77			0.32	
VAS 'small'	0.75		−0.30		
VAS 'body size change'	0.60				
VAS body cathexis		−0.53			0.58
BPI 'legs'			0.78		
BPI 'head'			0.63		
BPI 'trunk'			0.82		
PANSS-general psychopathology		0.35		0.77	
PANSS-negative symptoms				0.89	
PANSS-positive symptoms					0.82
CAS		0.79			0.35
STAI		0.76			
Eigen value	3.4	2.1	1.7	1.2	01.2
Explained variance	17.8%	15.3%	13.4%	11.9%	10.0%

[a] Factors with Eigen value > 1 and item loadings > 0.30 are shown.

plied the same methods to comparison groups with other mental illnesses. It revealed that there are body image aberrations that appear specific for the groups of patients with paranoid schizophrenia and schizoaffective disorder as compared with the other groups in this study.

The finding that healthy subjects tend to overestimate the size of body parts is consistent with the literature. Patients with anxiety disorder and depressive disorder showed the same tendency, and their body size perception did not differ from that of the healthy comparison group. Patients with paranoid schizophrenia and schizoaffective disorder, however, did differ from the other three groups. Yet, a statistically significant difference occurs only in the estimated size of legs, and not when the sizes of the head, the trunk or the neutral objects are estimated. Thus, the underestimation of legs does not appear due to a general distortion of perception, not even generalised to all parts of the body. The relative underestimation of legs seems reliable since it has been found at three time points whilst no other difference in BPIs has been identified at any time during acute treatment. Moreover, the under-estimation still exists after 4 weeks when the acute psychotic symptoms have improved significantly.

Possibly due to the inconsistent use of different assessment instruments, the literature shows contradictory suggestions and findings on body size perception in schizophrenia (under- and overestimation); however, most studies identified inaccuracy of body size perception (Fisher, 1986). Our results are in line with some previous empirical findings (Wagner, 1984; Röhricht and Priebe, 1996), which were obtained using a similar methodological approach. These indicate that the underestimation of leg size might be consistent over time and not necessarily fluctuate with the severity of acute symptoms. The IMP method, on which the finding is based, is a complex procedure, measuring segmental body size perception due to tactile stimuli. The finding that — in the total patient sample — the degree of overestima-

tion of the trunk changed significantly over time and was highest after two weeks suggests that there may still be methodological problems with the IMP method despite overall satisfactory retest-reliability scores.

Cumming (1988) classified the body schema as 'a fact of perception', relating parietal lobe function to its functionality. He also stressed the 'role of the somatoaesthetic afferent system and the thalamus' for the construction of body schema. Similarly to asomatognosia, the phenomenon of underestimation of lower extremities might be regarded as a neglect syndrome on the basis of impaired central-nervous sensory processing, presumably involving both sensory and association cortex. Perceptual disturbances were also described for other sensory inputs from the periphery such as visual spatial perception (e.g. O'Donnell et al., 1996), proprioception (Ritzler and Rosenbaum, 1974), and pain perception (e.g. Guieu et al., 1994; Dworkin, 1994). Mechanisms leading to these disturbances are still poorly understood, and specific brain dysfunctions, attentional deficits, and inadequate attitudes have been discussed. The results of this study also lend themselves to psychodynamic explanations, speculatively along the lines of Benedetti (1983), who suggested 'scotomising of the body existence' in schizophrenia patients as an effort to prevent a body disintegration.

The factor analysis underlines the relative independence of body concept and body size perception in patients with schizophrenia. They are distinct phenomena and do not seem to be mere epiphenomena of other psychopathology. One may conclude that in research as well as in clinical practice, body concept and body schema need to be targeted specifically and separately. Moreover, the factor analysis shows that depersonalisation, boundary loss and body cathexis are less specific and not distinct symptoms of body image pathology.

The underestimation of legs might be seen as corresponding to the feeling that body parts are unusually small and that the body size has changed. These two disturbances of body concept, however, have been identified in patients with paranoid schizophrenia and schizoaffective disorder — as compared with the other groups — only after admission. At later stages, differences were no longer statistically significant. The overall clinical improvement during acute treatment was associated with a reduction in these body concept disturbances. The two phenomena show a different course over time, and only body size perception pathology is consistent with and independent of other symptom acuity. There were no specific aberrations in any of the two samples with paranoid schizophrenia and schizoaffective disorder regarding affective facets of body image. No association was found between body image phenomena and dosage of medication or degree of side effects. Thus, it is unlikely that the specific pathology found in patients with paranoid schizophrenia and schizoaffective disorder is due to their medication. Nevertheless, studies in non-medicated groups are desirable.

Regarding the three questions of the study, it can be concluded that disturbance of body size perception and a feeling that parts of the body are unusually small and that the body size changed are specific symptoms of body image pathology in patients with paranoid schizophrenia and schizoaffective disorder. Disturbances of body concept do, and disturbances of body size perception do not, change during acute treatment, and disturbances of body concept and body size perception are distinct from other symptom factors.

The findings need to be replicated in other samples and other settings. Further research should investigate other diagnostic samples within the spectrum of schizophreniform disorders including schizoid personality and possibly bipolar affective disorder for establishing whether the findings of this study apply to the whole range of schizophrenia sub-groups and to patients with other psychotic disorders.

Further investigations of neuropsychological and/or neurophysiological correlates of the specific and consistent body size perception disturbance are needed for a better interpretation. The additional assessment of different somatosensory thresholds (e.g. pain and vibration) may be of particular importance as suggested by findings in

patients with eating disorders and non-clinical groups (e.g. Lacey and Birtchnell, 1986; Pauls et al., 1991; Lautenbacher et al., 1993).

Systematic studies might further develop and clarify the methodology for assessing body image pathology and examine additional phenomena of body image as well as patients' perceptions, feelings and thoughts about it. Results from such studies might help to clarify the diagnostic and clinical implications of body image pathology.

Acknowledgements

The authors are extremely grateful to Anka Liebezeit and Wolfram Beyer for their support in collecting the data and organising the study.

References

Askevold, F., 1975. Measuring body image: preliminary report on a new method. Psychotherapy and Psychosomatics 26, 71–77.

Benedetti, G., 1983. Todeslandschaften der seele (Death Landscapes of the Soul). Vandenhoeck & Ruprecht, Göttingen.

Bleuler, E., 1911. Dementia Praecox or the Group of Schizophrenias. International Universities Press, New York (translated 1952 by N.S. Kline).

Bräunig, P., 1993. Coenästhetische schizophrenien. Zur differentialdiagnostik chronischer hypochondrien (Cenesthopathic schizophrenia. On differential diagnosis of chronic hypochondria). Psychopathology 19, 12–16.

Bräunig, P., 1998. Coenästhetische schizophrenie. Prävalenz und symptomatik (Cenesthopathic schizophrenia. Prevalence and symptomatology). In: Röhricht, F., Priebe, S. (Eds.), Körpererleben in der Schizophrenie (Body Experience in Schizophrenia). Hogrefe, Göttingen, Bern, Toronto, Seattle, pp. 55–66.

Cohen, J., 1988. Statistical Power Analysis for the Behavioural Sciences, 2nd ed Lawrence Erlbaum Associates Publishers, Hillsdale, NJ.

Cumming, W.C.K., 1988. The neurobiology of the body schema (Suppl. 2). British Journal of Psychiatry 153, 7–11.

Cutting, J., 1997. Principles of Psychopathology: Two Worlds–Two Minds–Two Hemispheres. Oxford University Press, Oxford, New York, Tokyo.

Dworkin, R.H., 1994. Pain insensitivity in schizophrenia: a neglected phenomenon and some implications. Schizophrenia Bulletin 20, 235–248.

Fisher, S., 1970. Body Experience in Fantasy and Behaviour. Appleton Century, New York.

Fisher, S., 1986. Development and Structure of the Body Image. Vols. 1&2. Lawrence Erlbaum Associates Publishers, Hillsdale, NJ.

Guieu, R., Samuelian, J.C., Coulouvrat, H., 1994. Objective evaluation of pain perception in patients with schizophrenia. British Journal of Psychiatry 164, 253–255.

Guyatt, G.H., Townsend, M., Berman, L.B., Keller, J.L., 1987. A comparison of Likert and visual analogue scales for measuring change in function. Journal of Chronics Disease 40, 1129–1133.

Huber, G., Zerbin-Rüdin, E., 1979. Schizophrenie [Schizophrenia]. Erträge der Forschung, Band 115. Wissenschaftliche Buchgesellschaft, Darmstadt.

Joraschky, P., 1986. Das Körperschema und das Körper-Selbst (The body schema and the body self). In: Brähler, E. (Ed.), Körpererleben in der Schizophrenie (Body Experience in Schizophrenia). Springer, Berlin, Heidelberg, New York, Tokyo, pp. 34–49.

Kane, J.M., 1996. Schizophrenia. New England Journal of Medicine 334, 34–41.

Kato, S., Ishiguro, T., 1994. Clinical courses of hypochondriac-cenesthopathic symptoms in schizophrenia. Psychopathology 30, 76–82.

Kay, S.R., Fiszbein, A., Opler, L.A., 1987. The Positive and Negative Syndrome Scale (PANSS) for schizophrenia. Schizophrenia Bulletin 13, 261–276.

Kolb, L.C., 1975. Disturbances of the body image. In: Reiser, M.F. (Ed.), American Handbook of Psychiatry, Vol. 4, 2nd ed. Basic Books, New York, pp. 810–837.

Kraepelin, E., 1913. Psychiatrie. Ein Lehrbuch für Studierende und Ärzte. 7. Auflage (Psychiatry. A Textbook for Students and Doctors). Barth, Leipzig.

Lacey, J.H., Birtchnell, S.A., 1986. Body image and its disturbances. Journal of Psychosomatic Research 30, 623–631.

Lautenbacher, S., Roscher, S., Strian, F., Pirke, K.-M., Krieg, J.-C., 1993. Theoretical and empirical considerations on the relation between body image, body scheme and somatosensation. Journal of Psychosomatic Research 37, 447–454.

Lipowsky, Z.J., 1977. The importance of body experience for psychiatry. Comprehensive Psychiatry 18, 473–479.

Lukianowicz, N., 1967. Body image disturbances in psychiatric disorders. British Journal of Psychiatry 113, 31–47.

Meermann, R., 1985. Körperschemastörungen [Body schema disturbances]. Habilitations-schrift, Medizinische Fakultät, Universität Münster.

O'Donnell, B.F., Swearer, J.M., Smith, L.T., Nestor, P.G., Shenton, M.E., McCarley, R.W., 1996. Selective deficits in visual perception and recognition in schizophrenia. American Journal of Psychiatry 153, 687–692.

Overall, J.E., Gorham, D.R., 1962. The Brief Psychiatric Rating Scale. Psychological Reports 10, 799–812.

Pauls, A.M., Lautenbacher, S., Strian, F., Pirke, K.-M., Krieg, J.-C., 1991. Assessment of somatosensory indicators of polyneuropathy in patients with eating disorders. European Archives of Psychiatry and Clinical Neuroscience 241, 8–12.

Priebe, S., Bröker, M., 1999. Prediction of hospitalisations by schizophrenia patients' assessment of treatment: an expanded study. Journal of Psychiatric Research 33, 113–119.

Priebe, S., Gruyters, T., 1995. Patients' assessment of treatment predicting hospitalization. Schizophrenia Bulletin 21, 87–94.

Ritzler, B., Rosenbaum, G., 1974. Proprioception in schizophrenics and normals: effects of stimulus intensity and interstimulus interval. Journal of Abnormal Psychology 83, 106–111.

Röhricht, F., Priebe, S., 1996. Das Körpererleben von Patienten mit einer akuten paranoiden Schizophrenieeine Verlaufsstudie (Body image in patients with acute paranoid schizophrenia. A longitudinal study). Nervenarzt 67, 602–607.

Röhricht, F., Priebe, S., 1997. Störungen des körpererlebens bei schizophrenen patienten (Disturbances of body experience in schizophrenia patients). Fortschritte für Neurologie und Psychiatrie 65, 323–336.

Röhricht, F., 1998. Körperschema, körperbild und körperkathexis in der akuten Schizophrenie (Body schema, body concept and body cathexis in acute schizophrenia). In: Röhricht, F., Priebe, S. (Eds.), Körpererleben in der Schizophrenie (Body Experience in Schizophrenia). Hogrefe, Göttingen, Bern, Toronto, Seattle, pp. 91–104.

Shontz, F.C., 1974. Body image and its disorders. International Journal of Psychiatry in Medicine 5, 461–472.

Shontz, F.C., 1990. Body image and physical disability. In: Cash, T.F., Pruzinsky, T. (Eds.), Body Images — Development, Deviance and Change. The Guilford Press, New York, London, pp. 149–169.

Simpson, G.M., Angus, J.W.S., 1970. A rating scale for extrapyramidal side effects (Suppl. 212). Acta Psychiatrica Scandanavica 45, 11–19.

Sims, A., 1995. Symptoms in the Mind. An Introduction to Descriptive Psychopathology. W.B. Saunders Company LTD, London, Philadelphia, Toronto, Sydney, Tokyo.

Snaith, R.P., Baugh, S.J., Clayden, A.D., Husain, A., Sipple, M.A., 1982. The Clinical Anxiety Scale: an instrument derived from the Hamilton Anxiety Scale. British Journal of Psychiatry 141, 518–523.

Spielberger, C.D., Gorsuch, R.L., Lushene, R.E., 1970. State-Trait Anxiety Inventory. Consulting Psychologists Press, Palo Alto.

Thompson, J.K., Penner, L.A., Altabe, M.N., 1990. Procedures, problems, and progress in the assessment of body images. In: Cash, T.F., Pruzinsky, T. (Eds.), Body Images — Development, Deviance and Change. The Guilford Press, New York, London, pp. 21–48.

Wagner, B., 1984. Experimentelle Untersuchungen zur Körperwahrnehmung Chronisch Schizophrener Patienten mit Zwei Zeichenverfahren [Experimental Study on Body Perception of Chronic Schizophrenic Patients with Two Pencil Procedures]. Dissertation, Medizinische Fakultät Münster.