

## Chapter 15

# Experimental Body Image Research in Anorexia Nervosa Patients\*

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### SUMMARY

**T**he significance of the disturbed body image as a psychopathological phenomenon in anorexia nervosa patients is quite evident to clinicians. It appears to be difficult to assess this disturbance in a more objective way.

The studies on body image perception discussed here make use of objective psychometric methods of measurement: image marking procedure, visual size estimation apparatus, distorting photograph technique, and video distortion. The results of these studies are presented and the following methodological problems are discussed: reliability, validity, experimental situation, and selection of subjects.

Furthermore, our own experimental data on 52 anorexic patients as well as 210 control subjects, studied with three different perceptual tasks, are presented.

### BODY IMAGE DISTURBANCES IN ANOREXIA NERVOSA

"In its most literal sense body image refers to the body as a psychological experience and focuses on the individual feelings and attitudes towards his own body. It is concerned with the individual's subjective experiences with his body and the manner in which he has organized

these experiences" [1]. The concept of body image is applied to a wide range of pathology especially in the field of neurology and psychiatry. Its notion has become a central theme in the conceptualization of anorexia nervosa which Bruch [2], as early as 1962, defined as a "perceptual and conceptual disturbance or disorder of body image". This aspect of the syndrome has even become a major diagnostic criterion according to DSM-III [3]. Therefore it is no wonder that a great number of researchers have attempted to assess this phenomenon in a more objective way. Several studies have been done on the determination of body image in anorexia nervosa, especially with regard to the accuracy of perception of one's own body dimensions.

The studies on body image perception to be discussed here make use of objective psychometric methods of measurement, which orientate themselves to the different methods and procedural rules laid down by experimental (ie, empirical) psychology, in particular perceptual psychology. The investigations are intended to quantify the clinically observable distortions in self-perception that anorectic patients show and in so doing to make them comparable. In this respect, one can talk of an approach that could just as well be regarded to belong to the field of experimental psychopathological research and—as in the case of evaluative followup stu-

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**Table 15.1 Object and results of studies, which use so-called "objective" methods of measurement to research the body image of anorexia nervosa patients. (AN = Anorexia nervosa patients; BN = Bulimia nervosa; NC = Normal controls)**

No.	Authors	Object of study	Summary of results
1.	Gallwitz (1965)	Is the Photo Distortion Method useful in trying to gain insights into the body self-image and attitude towards one's own body?	AN show stronger emotional involvement, resistance + greater discrepancy between ideal and real body image.
2.	Slade and Russell (1973a)	Do AN overestimate their body-shape more than NC?	AN overestimate versus NC; NC estimate relatively exactly with tendency to underestimate high; positive intercorrelation of perception-indices indicate good intertest-reliability + a general factor g of body-perception.
	(1973b)	Are ANs distortions of body perception a function of a general perceptive disturbance?	Perception of body image and perception of objects are relatively independent of one another; AN's disturbance of body perception can't be caused by a general factor of perceptive disturbance.
	(1973c)	Do AN overestimate their own body height? Do AN overestimate other women's bodies as well?	Exact estimation of height by AN; overestimation of own body more pronounced than that of female model.
	(1973d)	Does the erroneous perception of own body depend on weight and status of illness?	AN: overestimation is being reduced by weight-increase and correlates with unfavorable prognosis upon release.
3.	Crisp and Kalucy (1974a)	Degree of dependency of perception of own body on body weight before and after restoration of normal weight in AN.	AN as well as NC overestimate their body; lesser overestimation correlates with good prognosis; after carbohydrate rich meal overestimation in AN, but not in NC.
	(1974b)	Degree of dependency of perception of own body on meals given shortly before testing in AN.	
4.	Askevold (1975)	Description of various aspects of the Image Marking Method as a procedure for measuring the body image.	Overestimation in AN; difference between real- and estimated measurement especially pronounced in those body regions, in which patients experienced their symptoms.
5.	Gamer et al. (1976)	Hypotheses: a) AN and obese overestimate their body compared with controls, b) AN and obese show feelings of own ineffectivity, c) Disturbances of self-perception relative to feelings of ineffectivity, duration of illness, degree of weight loss.	With Photo Distortion Method relative overestimation in AN; and absolute overestimation in NC; all subjects overestimate when using the Visual Size Estimation Apparatus; AN prove to be more introverted than NC; Overestimation in AN correlates with neuroticism and lack of self control, but not with duration of illness and weight loss.
6.	Garfinkel et al (1977)	Report on course of illness in AN with respect to clinical characteristics, disturbances of self-perception and effectiveness of various types of therapy.	Overestimation in AN correlates with bad clinical values and unfavorable prognosis.
7.	Button et al. (1977)	Are overestimations specific for AN or are self-perception disturbances rather the rule than the exception? Does the exactness of body-estimations increase with weight gain? Does the extent of overestimation relate to a bad prognosis?	No differences between AN + NC estimations; body weight- increase does not correlate with overestimations; overestimation relates to vomiting and early recidivation; sign. correlations between Body Perception Indices suggests a general factor g of body perception.
8.	Fries (1977)	Are the Visual Size Estimation Apparatus and the Anorectic Behavior Rating Scale useful in diagnosing "true" anorexia nervosa.?	AN and patients with a secondary amenorrhea overestimate in comparison with NC; weight has no effect on estimations; positive correlations between extent of perceptual disturbance and the Anorectic Behavior Rating Scale.
9.	Goldberg et al. (1977)	Are there any links between characteristics of AN before treatment and later increase in body weight as a result of the therapy?	Overestimation correlates with denial of illness and resistance to increase of body weight.

**Table 15.1 Object and results of studies, which use so-called "objective" methods of measurement to research the body image of anorexia nervosa patients. (AN = Anorexia nervosa patients; BN = Bulimia nervosa; NC = Normal controls) (continued)**

No.	Authors	Object of study	Summary of results
10.	Pierloot and Houben (1978)	Do AN overestimate their own body? How high is the divergence between the estimations of various body regions with different measuring techniques?	Partially significant overestimation in AN; greater individual variability in AN's estimations; no significant correlations of overestimations with personality traits nor with the variability of estimations.
11.	Wingate and Christie (1978)	Hypothesis: AN overestimate their body; there is an inverse relationship between the extent of overestimation.	AN overestimate more than NC; there is an inverse relationship between the extent of overestimation and ego-strength.
12.	Garfinkel et al. (1978)	Hypotheses: Body image disturbances in AN are related to the visual and gustatory perception of meals. They decrease when watching own mirror-image. As opposed to NC, AN show no saturation-aversion to cane sugar. There is a correlation between disturbances of body image and lack of saturation-aversion.	Tendency toward greater over-estimation and more interindividual variability of estimations in AN; in AN lack of influence of external cues on estimations; in AN no aversion to cane sugar; no clues to a possible relation between disturbances of body-image and individual weight-loss; overestimation relate to lack of saturation-aversion in AN.
13.	Garfinkel et al. (1979)	Replication study to establish long-time-stability of body image disturbances found in AN.	Overestimation lead to bad clinical evaluation and unfavorable prognosis.
14.	Ben Tovim (1979)	Body perception in AN.	All subjects overestimate; AN overestimate more than ND; inverse relationship between decreased exactness of self-perception and actual body width.
15.	Strober et al. (1979)	Characterization of peculiarities of the body image in first-episode AN during the acute and recuperative period with the help of various measuring methods.	No significant differences between AN and control group: all overestimate; possible significant intercorrelation between the AN's and the control group's Body Perception Indices; possible correlation between vomiting and estimation as well as between estimations and weight at AN's commitment to hospital.
16.	Casper et al. (1979)	Relationship between distortion of body image, weight gain during treatment, and selected characteristics of AN.	No significant difference between AN and NC, both groups overestimate; in AN relationship between overestimation and lesser weight-gain, more pronounced denial of illness, psychosexual immaturity and earlier therapeutic failures.
17.	Meermann (1983)	Comparison of body perception in age-matched anorectic patients and ballet- and gymnastic pupils	With Video Distortion Technique AN and NC underestimate their own body* and those of a female display dummy. With Image Marking Method and with Body Image Screening Scale AN and NC overestimate the most of the body-dimensions, significant for AN in the estimates of the hips, lower abdomen, thigh and frontal and lateral calf. No significant differences between AN and NC in the estimation of the display dummy.
18.	Freeman et al. (1984)	Does the body-perception of restricting AN and of BN differ from that of other groups of patients? Does food-intake influence body perception? Which psychological variables does body perception correlate with?	Restricting AN and BN overestimate more strongly and show more variation than those of the two control groups. Food intake has no influence on body perception. All subjects chose a slimmer ideal. BN showed the most difference between ideal and real body estimation. Positive correlations are found between the real- and ideal-estimations and the scores on the Beck's Depression Inventory and the depression scale of the MMPI.

**Table 15.1 Object and results of studies, which use so-called "objective" methods of measurement to research the body image of anorexia nervosa patients. (AN = Anorexia nervosa patients; BN = Bulimia nervosa; NC = Normal controls) (continued)**

No.	Authors	Object of study	Summary of results
19.	Napierski and Meermann (1985)	Changes in body perception in AN during the therapeutic process. Which psychological variables does body perception correlate with?	With Video Distortion Technique AN underestimate* at three points in time. Definite overestimation of nearly all body measurements in Image Marking Method. No uniform trend during course of therapy: increase as well as decrease of estimated measures of own body. With Body Image Screening Scale overestimation of dimensions of own body and that of a display dummy at three points in time. Correlations between overestimation and duration of illness, number of therapeutic failures, lowest weight at time of first treatment, unusual handling with foods and sexual anxieties.
20.	Tipton and Adams (1983)	Comparison of body perception and satisfaction with own body between BN and three NC groups.	BN overestimate their measurements significantly when compared with NC. No significant differences between the experimental groups with regard to dissatisfaction with their appearance.
21.	Touyz et al. (1984/1985)	Comparison on AN's and NC's estimations of the following: - subjective real-image - wished for ideal- image - most aversive self-image - normative image of a model - female model	Subjective real-image: AN show stronger tendency to overestimate and larger SD. Ideal-image: AN and NC chose slimmer image, more pronounced in AN than in NC. Most aversive self-image: endomorphic figure in nearly all AN and NC. AN underestimate normative picture of the model by 16% to 20%, NC by 5%. When confronted with model, AN showed stronger underestimation than NC.
22.	Norris (1984)	Comparison of body perception indices (BPIs) of AN, BN, emotionally disturbed women and NC; Influence of mirror-confrontation on estimations (Pre-/Post-BPIs).	Pre-BPIs of NC lower than in other three groups (ns); NC show tendency to underestimate. Post-BPIs in comparison to Pre- BPIs in AN significant reduced, also reduced in BN (ns) but hardly any reduction in NC. Significant correlations between post-BPIs and positive course of therapy in AN and BN. No significant correlation between BPIs and duration of illness, age, or degree of weight loss.
23.	Ben-Tovim and Crisp (1984)	Reliability of measurements of body perception and relationship between actual body measurements and estimations	NC: correlations between estimations from first and second measurement (after 1 hour) = around 0.82 to 0.96, estimations of first and second measurement (after 14 days) = 0.79 to 0.95. No significant correlation between estimated distances and actual width of body. Estimated distances larger than actual distances and following a body-configuration.

\*Underestimation seems to be due to the method of the Video Distortion Technique and by neglecting the objective standard (the undistorted video picture of the subject) and comparing only mean-differences, AN deliver significant overestimation in comparison with their control group.

dies—to the field of comparative psychotherapeutic research [4-8,40]. The underlying hypotheses, the methodology, and the results of all studies on body image perception in anorexia nervosa using objective psychometric methods of measurement are summarized in tables 1, 2, and 3.

It is often assumed that the denial of illness and the weight phobia, which are typical features of anorexia

nervosa, are reflected in the patient's overestimation of her own body size. Such an overestimation would then be a characteristic and even diagnostic sign of anorexia nervosa. This assumption, however, could not yet be validated.

Table 1 shows that experimental studies of body image perception in anorectic and comparison groups have produced conflicting results. Only few studies re-

ported a significant overestimation in anorexia nervosa patients in comparison with their control groups (study no. 5, 9, 10, 11, 12, 17, 21 and 22 on table 1). In other investigations the anorexia nervosa patients show both underestimation and overestimation, while some normal controls, schizophrenic, and obese patients, pregnant women, ballet, and gymnastic pupils also show the tendency to overestimate their own body size.

Despite of the advantages of experimental procedure and the quantifiable results they produce, a direct comparison of the results is virtually impossible because of the important methodological shortcomings and the diversity of methods chosen for measuring body image perception [8].

### METHODOLOGICAL PROBLEMS IN BODY IMAGE ASSESSMENT

The main methodological problems encountered concern the reliability, the validity, the experimental situation, and the selection of subjects.

#### Reliability

Reliability refers to the internal consistency, stability, and repeatability of a procedure. A test or method is reliable to the extent to which the same results can be reproduced each time it is applied under the same conditions. Reliability is especially critical, since it determines the upper limit on the potential validity or accuracy of the measure.

*Visual Size Estimation Apparatus.* The Visual Size Estimation Apparatus (VSEA) or movable caliper technique [15] consists of two lights mounted on a horizontal bar in such a way that they can be moved to indicate perceived widths of specific regions. In a darkened room, subjects are asked to estimate the dimensions of various body regions and these data are then compared with the actual dimensions resulting in a Body Perception Index (B.P.I.), ie, the perceived size multiplied by 100 and then divided by the actual size.

Halmi et al [16] had 86 female pupils estimate—among other things—the width of their face, chest, waist, and hips as well as their body depth using the VSEA. They regarded the estimations for the various bodily dimensions as test recurrences with a tendency toward over- or underestimation. They determined the retest reliability for the test results of the five measures by intercorrelating the estimates. These intercorrelations varied from 0.38 to 0.65, which is not high enough for the reliability coefficient. However, they were high enough to make the presumption that the measurements of the five areas of the body assess the same underlying dimension. For this reason, Halmi et al [16] determined the mean value for each subject for each of

the five estimates, and, by applying the Spearman-Brown prophecy formula, they were able to establish a reliability coefficient of 0.84 for their test. Other authors also determined the intercorrelations for their subjects' estimates using the VSEA and obtained values from 0.25 to 0.94 [15,17,18].

Ben-Tovim and Crisp [19] calculated coefficients of reliability between initial estimates made by 11 normal females (face, chest, waist, hips) and their estimates after 60 minutes and after 14 days. The coefficients of test-retest reliability were very high and significant (range from 0.82 to 0.96 and from 0.79 to 0.95).

Thus, the reliability of this method appears to be rather variable.

*Image Marking Method.* With this method [20], the subject stands before a sheet of paper mounted on a wall and is instructed to mark the points that correspond to dimensions of specific body regions with a pencil. Pierloot and Houben [18] established intercorrelations of 0.30 to 0.61 for anorexia nervosa patients when using the Image Marking Method (IMM), and from 0.52 to 0.75 for normal controls. Strober et al [21] gained intercorrelations of 0.51 to 0.72 for subjects using the same test.

Our own results [22-24,8] for 262 subjects in table 5 reports with the IMM appear to be rather equivocal, and its utility rests on further studies of reliability and validity.

*Distorting Photograph Technique.* This method [25] involves the subject's estimation of her size using a projected photograph of the body, which can be distorted along the horizontal axis with an anamorphic lens.

Garfinkel et al [26,27] correlated the results of numerous trials using this method: estimates made before and after a high-calorie meal correlated highly in the case of anorexia nervosa patients ( $r=0.90$ ,  $p=0.001$ ); for normal controls the correlation coefficient was  $r=0.51$ ,  $p=0.02$ . The following correlation coefficients were found for estimates before and after a low-calorie content meal:  $r=0.86$ , ( $p=0.001$ ) for anorexia nervosa patients and  $r=0.86$  ( $p=0.001$ ) for normal controls. The anorexia nervosa patients' results also showed the following correlation coefficients:  $r=0.75$  ( $p=0.003$ ) after a week and  $r=0.56$  ( $p=0.02$ ) after a year. In the case of the normal controls, however, these correlation coefficients were  $r=0.14$  (ns) after one week and  $r=0.39$  (ns) after one year [27]. The absence of data on this method obtained by other researchers makes it difficult to judge its repeatability.

*Video Distortion Method.* Allebeck et al [28] proposed the use of a television system for body image research. One may modify a videomonitor (or camera) so that subjects can adjust the proportions of their body picture on the screen. This technique has only recently

**Table 15.2 Demographical characteristics of examined samples (Legend: in= inpatient/ out= out-patient/ f= female/ m= male/ n= neurotic/ h= healthy/ nw= normal weight/ ep= eating problems)**

Study No.	Experimental Group			Control Group				
	No. of subjects and special features	Age (years) x, (SD)	Height (cm) x, (SD)	Weight (kg) x, (SD)	No. of subjects and special features	Age (years) x, (SD)	Height (cm) x, (SD)	Weight (kg) x, (SD)
1	10 AN f	16-30	—	—	none of their own			
2a	13 AN f	19.79	160.2	40.76	20 NCf	25.0	163.0	60.25
	1 AN m	(5.78)	(9.95)	(5.65)		(4.71)	(8.31)	(3.08)
2b	12 AN f in	—	—	—	see Study No. 2a			
2c	9 AN f	20.6	157.0	40.22	see Study No. 2a			
2d	10 AN f	—	—	—	see Study No. 2a			
3	4 AN f in	—	—	—	none			
	5 AN f in	ca. 21	65 in.	—	6 NC f	—	65.6 in	—
4	15 AN f in 21, 18, 37,16, 7, 13 psychosomatically ill	over 18	—	—	20 NC f (Physiotherapists)	over 18	—	—
5	18 AN f in	20.7	161.9	42.8	16 f "thin" without ep	20.6	159.9	40.7
	16 obese f	20.8	164.3	85.3	16 NC f	20.8	163.3	56.0
					16 n	20.6	159.3	53.9
6	27 ANp f				none			
	1 ANp m	20.4	—	—				
7	20 AN f	23.86	159.7	41.23	16 NC f	23.06	166.0	57.24
		(7.23)	(4.42)	(4.59)		(3.13)	(5.78)	(4.88)
	14 AN f (data of Study No. 2)	19.79	160.2	40.76	see Study No. 2			
		(5.78)	(9.95)	(5.65)				
8	21 AN f	20.8	—	78.5	22 NC f	24.3	—	93.7
	17 f with sec. amenorrhoe	—	—	82.8				
				(18.7%)				
9	44 AN f in	20.18	159.8	33.7	none			
		(5.38)	(5.96)	(4.65)				
10	31 AN f in	20.92	162.0	40.99	20 n f in	21.15	165.0	57.94
		(3.89)	(0.07)	(6.75)		(3.84)	(0.05)	(7.21)
11	15 AN f in	20.8	160.9	43.2	15 NC f	20.8	164.3	54.84
					15 NC f	17.4	158.2	53.02
12	26 AN f in	20.8	162.9	42.4	16 NC f without ep	21.8	164.1	55.80
		(0.7)	(1.2)	(1.9)		(0.9)	(1.3)	(1.3)
13	16 AN f out	21.8	162.6	47.5	16 NC f without ep	22.4	163.5	56.3
		(0.86)	(1.34)	(2.3)		(0.98)	(1.4)	(1.61)
14	8 AN in	19.7	161.1	43.3	11 girls	15.4	164.8	53.7
		(3.6)	(7.5)	(5.9)		(0.5)	(5.2)	(0.5)
					11 mothers of girls	44.9	161.4	57.5

						(4.4)	(4.2)	(5.4)
					24 nurses	23.2	166.2	62.2
						(2.3)	(5.9)	(8.8)
15	18 AN f	14.77	160.1	36.17	24 patients nw, f	15.1	162.9	50.5
		(1.01)	(6.45)	(3.7)		(1.3)	(7.14)	(3.4)
16	79 AN f	—	—	—	86 girls	10- 18	—	—
—								
					44 Nc f	20-40	—	—
17	36 AN f in	18.86	166.3	46.4	35 Ballet-&Gymnastic pupils	18.11	166.7	55.0
		(4.18)	(6.4)	(6.86)		(3.3)	(6.99)	(8.7)
18	19 Abstainers	23.7	162.0	41.0	15 NC	22.5	165.5	57.0
		(6.3)	(5.6)	(6.0)		(3.4)	(4.2)	(7.4)
	27 BN	24.1	166.8	51.9	9 psychiatric patients	27.3	165.0	53.8
		(4.8)	(6.9)	(10.6)		(3.4)	(6.4)	(9.6)
19	16 AN	—	—	—	none	—	—	—
20	11 BN	—	—	—	12 “dieters”	—	—	—
					12 “restrained NC”	—	—	—
					12 NC (age-matched)	—	—	—
21	15 AN f	19.06	161.0	44.5	15 NC	20.8	166.0	57.9
		(5.2)	(7.01)	(7.4)		(5.8)	(7.0)	(4.7)
22	12 AN f	16.8	—	71%(norm)	12 emotional disturbed f	16.7	—	102%
		(13-20)	—	(65-77%)		(13-20)	—	95-108%
	12 BN	18.9	—	105%	12 NC f	16.4	—	99%
		(16-23)	—	(88-120%)		(13-20)	—	94-106%
23	see Study No. 14				11 NC f	27.2	163.7	59.6
						(10.7)	(5.3)	(0.3)

**Table 15.3 Empyled methods of measurement and details of testing-procedure**

Study No.	Tests	Test Trials	Adjustments	Estimations of			
				Object	Ideal	Mirror-Confr.	Own body parts
1	Photo Distortion Technique (Gottschalk, 1954)	1	?	no	yes	no	Head
2a	VSEA, Anthropometer	1	4	no	no	no	Head, chest, waist, hips
2b	- as 2a -	1	4	yes	no	no	- as 2a -
2c	- as 2a plus Visual Height Estimation	1	4	Model	no	yes	- as 2a plus body height -
2d	- as 2a -	7 to 18	4	no	no	no	- as 2a -
3	VSEA	4	4	no	no	no	Head, shoulder, waist, hips, thighs
4	IMM	1	1	no	no	no	Shoulder, waist, hips, B- height
5	Adjustable Distorting Photograph Technique, VSEA, EPI, Rotter's Locus of Control Scale	1	2	Vase Model	yes	yes	Photo of body in bikini face, chest, waist, hips
6	- as 5a -						
7	VSEA, Anthropometer	1	2	no	no	no	Face, chest, hips, waist, stomach-deep
8	VSEA, Anthropometer, Anorectic Behavior Rating Scale	1	4	no	no	no	Face, chest, hips, waist
9	VESA, Slade's Anorectic Behavior Scale, Anorectic Attitude Scale, Hopkins Symptom Check List, Psychiatric Rating Scale	?	?	yes	no	no	Face, chest, waist, hips, arm length, body depth
10	IMM, VSEA, Anthropometer, Corrected VSEA, MMPI, Rorschach, Andriesen Question.		1 2	no	no	yes	Face, shoulders, waist, hips
11	IMM, MMPI	1	1	no	no	no	Shoulders, hips, waist, B-height
12	Adjustable Distorting Photograph Technique	2 (7 days)	2	Vase	yes	yes	Photo of whole body
13	- as 12 -						
14	VSEA, Anthropometer, Slade's Anorectic B. Scale	1	2	no	no	no	Face, chest, waist, hips
15	IMM, Body Distortion Questionnaire, Body-Concept- Scale	2(6 month)	1	no	no	no	Shoulders, waist, hips
16	VSEA, Anthropometer, Anorectic Attitude Scale	1	4	yes	no	no	Face, chest, hips, waist, length of arm and foot



17	IMM, Anthropometer, Video Distortion Technique, Body Image Screening Scale, Anorexic Nervosa Inventar zur Selbstbeurteilung	1	6	model-dummy	no	no	Head, shoulders, waist, hips, frontal thigh + calf, lateral head, chest-back, abdomen-back, lower abdomen-posterior, lateral thigh and calf, view of head, whole body frontal and lateral
18	Video Distortion Technique (two Monitors), Eating Attitudes Test, BDI, Hunger & Satiety Scale, MOOS Menstrual Distress Questionnaire, MMPI, Anorexic Rating Scales, Mosher Guilt Inventories	2	2	no	yes	no	Frontal view of body, lateral view of body
19	- as 17 -	2-4					
20	Polaroid photograph with video- setup	1	1	no	yes	no	Lateral view of body
21	Polaroid photograph with video- setup	1	2	model	yes	no	Frontal + lateral view of body
22	Movable Light Line	2	4	no	no	yes	Head, waist, hips, thighs
23	VSEA	3	?	no	no	no	Head, chest, waist, hips
		(1 hour, 14 days)					

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VSEA = Visual Size Estimation Apparatus; IMM = Image Marking Method

**Table 15.4 Correlation between body perception indices for various dimensions**

Author	Method	Body Dimensions	Anorexic N	patients range	Normal N	Controls Range
Halmi et al (1977)	VSEA	Face, chest, waist, hips	—	—	86	.38 to .65
Slade and Russell (1973)	VSEA	"	14	.72 to .93	20	.37 to .79
Button et al (1977)	VSEA	"	20	.52 to .81	16	.66 to .88
Goldberg et al (1977)	VSEA	"	44	.47 to .85	—	—
Pierloot and Houben(1978)	VSEA Corr.	"	31	.29 to .59	20	.25 to .81
	VSEA	"	20	.25 to .59	20	.38 to .59
Strober et al (1979)	IMM	Chest, waist, hips	31	.30 to .61	20	.52 to .75
	IMM	"	18	.51 to .66	24	.49 to .72
Meerman (1983)	IMM	Face, chest, waist, hips	36	.35 to .79	35	.19 to .84

(Corr.) VSEA = (Corrected) Visual Size Estimation Apparatus; IMM = Image Marking Method

**Table 15.5 Reliability Analysis of the Image Marking Method\***

Groups	Body Frontal					Body Sagittal				
	Cronbach's Alpha	F-Prob. Between Measures		Nonadditivity		Cronbach's Alpha	F-Prob. Between Measures		Nonadditivity	
		F	P	F	P		F	P	F	P
39 NC	0.787	33.2	0.0	27.0	0.00	0.556	7.9	0.00	17.1	0.00
52 AN	0.810	32.8	0.0	17.2	0.00	0.856	15.9	0.00	16.4	0.00
34 SCH	0.712	30.4	0.0	0.1	0.78	0.771	5.2	0.00	9.1	0.00
35 BAL	0.752	42.3	0.0	0.5	0.50	0.815	15.7	0.00	3.3	0.07
30 NC	0.785	18.0	0.0	1.4	0.20	0.714	3.5	0.01	0.6	0.44
32 DEP	0.869	4.9	0.0	0.7	0.40	0.878	6.2	0.00	3.8	0.05
40 OB	0.772	26.1	0.0	5.6	0.02	0.860	6.8	0.00	15.2	0.00

NC = Normal Controls; AN = Anorexic nervosa patients; SCH = Schizophrenics; BAL = Ballet-pupils; DEP = depressed patients; OB = obese patients.

\*From Meermann, Napierski and Vandereycken (1986) (8)

**Table 15.6 Reliability Analysis of the Video Distortion Technique\***

Groups	Head			Body Frontal			Body Sagittal		
	Cronbach's Alpha	F-Prob. Between Measures		Cronbach's Alpha	F-Prob. Between Measures		Cronbach's Alpha	F-Prob. Between Measures	
		F	P		F	P		F	P
39 NC	0.900	12.58	0.0	0.945	12.51	0.0	0.926	9.55	0.00
52 AN	0.892	20.39	0.0	0.967	13.76	0.0	0.961	3.64	0.00
34 SCH	0.868	10.56	0.0	0.910	10.64	0.0	0.952	4.94	0.00
35 BAL	0.866	32.07	0.0	0.895	28.78	0.0	0.913	29.44	0.00
30 NC	0.896	14.79	0.0	0.939	22.25	0.0	0.886	8.31	0.00
32 DEP	0.895	4.56	0.0	0.891	8.92	0.0	0.880	2.76	0.02
40 OB	0.927	26.74	0.0	0.943	14.52	0.0	0.921	4.61	0.00

NC = Normal Controls; AN = Anorexic nervosa patients; SCH = Schizophrenics; BAL = Ballet = pupil; DEP = depressed patients; OB = obese patients

\*From Meermann, Napierski and Vandereycken (1986) (8)

been applied to anorexia nervosa patients first by our own research group in Munster [22] and later by other investigators [23,29]. The latter researchers found a high retest reliability of 0.91 for eating disorder patients (anorexia nervosa and bulimia nervosa) and of 0.83 for control subjects.

Table 6 shows the degree of reliability we have obtained using the video distortion method [8,22,30].

Generally speaking, the anorectic patients' estimations of body dimensions seem to remain relatively congruent despite the use of different test measures. This would appear to favor the hypothesis that their body size estimations represent a relatively stable phenomenon that can be measured fairly satisfactorily using the test methods discussed so far.

### Validity

The validity of a test is the degree of accuracy with which the test actually measures the characteristics it states to measure. A test is valid when its results permit a direct and accurate conclusion as to the degree of the characteristics to be measured. The term validity is a general term for different specific types of validity that a test can have. The most widely used form of validity is the *convergent validity*, which is determined by correlating the results with other independent assessments of the same or a similar characteristic.

Garner et al [31], Strober et al [21] and Meermann [22,30] used this form of validity by correlating the results gained by different self-rating scales with each other. Garner et al [31] determined the following values for the correlation coefficients when they correlated the mean scores of their subjects' self-ratings using the photo distortion technique and their VSEA-scores:  $r=0.50$  ( $p<0.05$ ) for anorexia nervosa patients and  $r=0.44$  ( $p<0.05$ ) for obese patients. No significant correlations worth noting were determined for the control groups.

Research by Strober et al [21] could not determine any noteworthy correlations between the results of their subjects in the Image Marking Method, the Draw-a-Person-Test, and the Body Distortion Questionnaire. Other studies found that the degree of body overestimation encountered among anorectic subjects correlated with a number of psychopathological and prognostic variables (see Table 7) such as neuroticism and lack of self-control or external-control orientation [18,31], interoceptive disorders [27], denial of illness and poor response to in-patient treatment [33,34], and vomiting [17,21,29]. Table 8 shows the correlative relationship we found in one of our studies [8,24].

### Experimental Situation

A direct comparison of the results of different studies is not only complicated by the variety of methods used,

but also by the differences in setting and test execution. Variables such as the time of day, the time span since the last meal, motivation and instruction, the subjects' clothing during the estimation procedure, the sex of and the familiarity with the researcher, technical differences in the apparatus used, etc, can all have an influence on the subjects' performance:

Button et al [17] mentioned the possibility that the lack of similarity between their results with the VSEA and those of Slade and Russell [15] could well be the result of different test conditions and influences such as behavior and sex of the researcher, type of instruments used, or even different lighting. In the study of Wingate and Christie [35] using the VSEA, the subject could not record her estimates directly but had to communicate with the researcher, who handled the apparatus. It is quite possible that results have been influenced, for example, by the time that elapsed between the subject's decision, her saying "stop" and the researcher's reaction, which actually stopped the movable caliper device. Furthermore, some authors fail to give a detailed description or to discuss the clothes their subjects are wearing at the time of estimation, even though this variable might be of special importance considering the emotional involvement of the subject and the tactile sensations experienced during the marking of the body regions to be estimated.

Even though some studies were able to show that the body image of anorexics is relatively stable and independent of external stimuli, the question remains, to what extent factors like time of day, testedness of the subject, or the time since the contents of the last meal before the experiment contribute to the high level of variability within the experimental groups.

The person as well as the behavior of the experimenter definitely are some further important influential factors. Especially with these tests of body perception and with mostly female anorexics, an experimenter of the opposite sex could arouse emotional reactions like shame or exhibitionistic actions that could influence the situation considerably. Other psychological influences on the part of the experimenter such as attitude and sensitivity toward the subject, patience, and verbal as well as nonverbal behavior might be of influence. Another thing that must not be neglected is the well-known Rosenthal effect concerning the expectations of the experimenter. Furthermore, the set of instructions given at the beginning of the experiment play an important role. With body image tests, it is necessary to clarify whether the subjects' estimations should be of a perceptive nature or of an objective one, that is, should the instructions be given in such a way, as to induce estimation of the body regions according to their actual size

**Table 15.7a Correlations between body perception and psychopathological data in anorectic patients.**

	N AN	Method	Body Parts				Investigators
			Face	Chest	Waist	Hips	
Activity	44	VSEA	-0.21	-0.93	-0.21	-0.16	Goldberg et al (1977) Meermann and Napierski (1983)
	12	IMM	Composite score body frontal = -0.70* Composite score body sagittal = -0.62*				
Premorbid hyperactivity	44	VSEA	0.41*	0.28	0.52*	0.62*	Goldberg et al (1977)
Denial of illness	44	VSEA	0.28	0.19	0.45*	0.45*	Goldberg et al (1977)
	81	VSEA	Composite score = 0.48*				Casper et al (1979)
Hunger	44	VSEA	0.45*	0.45*	0.48*	0.56*	Goldberg et al (1977)
Loss of appetite	81	VSEA	Composite score = 0.47*				Casper et al (1979)
Psychosexual immaturity	44	VSEA	0.32*	0.37*	0.51*	0.53*	Goldberg et al (1977)
	81	VSEA	Composite score = 0.44				Casper et al (1979)
Ego strength	15	IMM	-	-0.69**	-0.75**	-0.69**	Wingate and Christie (1978)
External control	19	VSEA	Composite score = 0.40				Pierloot and Houben (1978)
Emotional immaturity (FPI)	8	IMM	Composite score = 0.94*				Meermann and Napierski (1983)
Therapeutic failure	52	IMM	Composite score body frontal = 0.47** Composite score body sagittal = 0.61**				Casper et al (1979)
	81	VSEA	Composite score = 0.25*				

**Table 15.7b Correlations between body perception and psychopathological data in anorectic patients.**

	N AN	Method	Body Parts			Investigator
			Head	Body Frontal	Body Sagittal	
Duration of illness	52	Video	-	0.72**	0.67**	Meermann and Napierski (1983)
Therapeutic failure	42	"	0.64*	0.84*	0.77**	"
Denial of illness	12	"	0.70**	-	-	"
Sexual fear	8	"	-	0.85*	0.83*	"
Unusual handling with food	12	"	0.70**	-	-	"
Negative effects on eating	12	"	-	-	0.69*	"
Typical female self-description	8	"	-	0.75*	-0.91*	"
Global clinical score	28	DPT	0.67**			Garfinkel et al (1977)
Neuroticism (EPI)	18	DPT	0.57**			Garner et al (1976)
Extroversion (EPI)			0.34			
Lack of self-control			0.47*			
Total I-E score			0.35			

IMM = Image Marking Method; VSEA = Visual Size Estimation Apparatus; Video = Video-Distortion Technique; DPT = Distorting Photograph Technique; \* = p < 0.05; \*\* = p < 0.01

From Naperski, Meermann and Vandereycken (1986)(8)

**Table 15.8 Correlations between overestimation and other variables in anorexia nervosa\***

	Image Marking Method		Video Distortion Technique		
	Body Frontal/Sagittal		Head	Body Frontal/Sagittal	
Duration of illness	—	—	—	0.72**(a)	0.67**(a)
Prior therapeutic failures	0.47**(a)	0.61**(a)	0.64*(b)	0.84**(b)	0.77**(b)
Admission weight	-0.49*(a)	-0.49*(a)	—	-0.70**(b)	-0.62*(b)
Unusual handling with food	—	—	0.70**(b)	—	—
Hyperactivity	-0.70*(b)	-0.62*(b)	—	—	—
Denial of illness	—	—	0.70**(b)	—	—
Fear of sexuality	—	—	—	0.85*(c)	0.83*(c)
Emotional immaturity	0.94*(c)	—	—	—	—

a = 52 patients; b = 12 patients; c = 8 patients

\*p = <0.05; \*\* p = <0.01

\*From Meermann, Napierski and Vandereycken (1986) (8)

(eg, "Please try to estimate the breadth of your shoulders as accurately as possible") or should the instruction rather refer to the feeling the subject has of her body (eg, "Please indicate, how wide this part of your body feels to you")? Unfortunately, only in very few studies is there any indication of which nature the instructions were. Also most studies left equally unanswered the question of whether any influences of pharmacological medication on the test-outcome can be ruled out.

But even in the case of the best possible standardization, there always remain the intraindividual psychological characteristics of the subject such as attitude toward and foreknowledge of the study and the tests involved. Unenthusiastic and unmotivated patients, who fail to see the meaning of the examination, will probably produce less meaningful estimations than those who see an opportunity for some self-experience in this procedure. The amount of foreknowledge will also influence the results of the estimations, especially if the patient has to fear institutional consequences such as endangering a planned release. Button et al [17] draw attention to the fact that the subject's being informed about the hypotheses and already published findings on body perception could influence anorectic patient's estimates.

In conclusion, researchers must be well aware of the many methodological pitfalls and should pay careful attention to the standardization of the research procedure.

### Selection of Subjects

An important methodological shortcoming of body image research concerns the size and composition of the patient and control groups. Few studies have a sufficiently large sample from which to draw methodologically sound conclusions with regard to the overall population. A decisive factor, which has only been taken into account in recent studies, is the age of the controls.

Halmi et al [16] showed how important the subjects' age is for the exactitude of their bodily perception. They proved that the subject's age and their tendency to overestimate their bodily dimensions correlated negatively; their findings were based on the results of 86 subjects of normal weight, who were both physically and mentally healthy and aged between 10 and 18 years. Askevold [20] also points out that body perception could be dependent on age, as the body image changes parallel to physical and mental development. With regard to this last point, it is important to note that several studies found no significant difference in the estimation of bodily dimensions among their samples [17,31,34,36]. These results rectify the original results by Slade and Russell [15] where the control subjects were significantly older than the anorexia nervosa patients.

When selecting the control group, little attention has been paid to variables such as socioeconomic status, intelligence [18], eating behavior or adherence to diets [34,37,38], or psychopathology [21,31,35]. Akevold [15] forwarded the opinion that intelligence and education have no influence on the estimation of one's own body size. But it remains to be clarified to what extent a differentiated body perception and its transformation into estimates is dependent on cognitive development.

As to the composition of the patient group, many studies lack such relevant demographic data as actual weight, duration of illness, stage of treatment or diagnostic criteria (eg, Feighner criteria [39], DSM-III, exclusion of bulimia nervosa or latent obese patients, etc) used to select the patients. Moreover, the heterogeneity of anorexia nervosa is generally not taken into account when analysing the results of the studies. Research has shown that the estimates of body size were not homogenous within the anorexia nervosa patient's groups. On the contrary, they seemed to be influenced

**Table 15.9 Correlations between body-perception and weight of anorexia nervosa patients.**

	N-Xn	Face	Body Parts Chest	Waist	Hips	Comp. Score	Investigation
Assessment weight	10	-0.21	0.41**	-0.36	-0.29*	—	2
	11	0.33	0.67**	0.56**	0.45*	—	7
Total weight loss	21	—	—	—	—	0.21	8
Pretreatment weight	11	-0.17	0.44*	0.01	0.24	—	7
Admission weight	81	—	—	—	—	-0.24*	16
Amount of weight gain since admission	10	0.25*	0.30**	0.32**	0.34**	—	2
	11	0.33	0.67**	0.56**	0.45*	—	7
	44	-0.31	-0.40	-0.57	-0.55	—	9
	81	—	—	—	—	-0.39*	16
Proportion of weight gain by the time of 1st assessment	11	0.33	0.66**	0.57**	0.46	—	7
Follow-up index:	15	-0.55*	-0.28	-0.51*	-0.61**	(when underweight)	
	10	-0.26	0.13	-0.05	0.15	(when normal w.)	7
	9	0.28	0.68*	0.45	0.47	(on admission)	2
		0.88**	0.72*	0.40	0.57	(average during admission)	2
		0.73*	0.63*	0.48	0.67*	(at discharge)	2

No 2 = Slade & Russell 1973; No 7 = Garfinkel et al. 1977; No 8 = Fries 1977; No 9 = Goldberg et al. 1977; No 16 = Casper et al. 1979

\*p = 0.05  
\*\*p = 0.01

by factors such as regular or occasional vomiting [17], the degree of illness denial, and resistance to previous treatment that had failed [33].

### DISCUSSION

Body image is an extremely complex phenomenon including the schematic representation of parts of the body and personal views (cognitive constructs) as well as subjective experiences of bodily functions, and it seems to be profoundly influenced by the individuals' emotional states. Therefore self-estimation of body sizes can be seen only as a crude measure of the whole complex body image. Experimental studies, on the other hand, might be more useful if the many methodological problems discussed are taken into account.

Slade [40] made group comparisons across studies: (a) in terms of averaged values for anorectic and control groups by using all available studies, and (b) in terms of both the number of individuals overestimating body size and also the number of studies producing significant versus nonsignificant group comparisons. The main conclusions of these comparisons and other specific results of the experimental studies can be summed up as follows:

1. Anorexia nervosa patients tend to overestimate the dimensions of their own body more than non-anorectics do, and they display a large variability of estimates.
2. Because overestimation occurs also in some non-anorectic individuals, it cannot be seen as specific for anorectics and thus lacks clear-cut diagnostic value.
3. While using size-estimation methods (like the Image Marking Procedure, the Visual Size Estimation procedure, and similar techniques) the modal tendency for most groups under investigation is one of overestimation; the trend of individual's estimations using image-distorting methods (like the Distorting Photograph Technique or the Video-Distortion Technique) is toward an underestimation of body size.
4. Comparing different subgroups of eating disorders, patients with bulimia and/or vomiting show a greater tendency to overestimate their own body size than restricting anorexics.

From the results of the experimental studies it can be deduced that the body image concept in its currently researched form (difference between subjective estimations and objective body measurement) needs to be refined. The use of the Body Perception Index (BPI) as a measure of accuracy of self-perception rests on the assumption that the actual body width is being estimated

and that individuals who estimate 100% correct actually have an undistorted body image. But studies show that a 100% correct estimation of one's own "objective" body size apparently is not the norm and that, on the contrary, a certain tendency to overestimate appears physiologically and psychologically sensible. The observation that dimensions of the head, it being one of the "most significant" parts of the body, are mostly overestimated by normal people as well, is in accordance with this hypothesis. The exact experimental basis of self-estimations of body widths remains uncertain.

The methods used to determine body image appear to measure the manifold components of body image with a different degree of sensitivity, reliability and validity. Slade [40] discussed three different hypotheses that could explain the differences in experimental results:

1. The "threshold-difference hypothesis" suggests that the "size-estimation" methods (IMM, VSEA) have lower thresholds for identifying tendencies of overestimation than the methods working with the distortion of the image of the individual.
2. The "state-trait hypothesis" suggests that the "size-estimation" methods measure another, but related, aspect of the body image than the "image-distortion" methods. While the first mentioned techniques possibly reflect a fluid state of body-size sensitivity (which is strongly dependent on situative affective/emotional factors), the second group of methods possibly reflects a relatively fixed cognitive attitude to body size.
3. In the case of anorexia nervosa "size-estimation" techniques possibly reflect "a nonspecific-setting condition of weight sensitivity," ubiquitous in nearly all females of the Western society, whereas the "image-distortion" techniques may reflect an "negative reinforcing factor for weight-loss control."

At present none of these hypotheses can be verified. Also it has not yet been answered conclusively whether or to what extent the large overestimation found in many patients with anorexia nervosa is a conditioned factor, a secondary result of the physical emaciation, or psychological compensatory mechanism in the sense of an avoidance of cognitive dissonance. Of significant interest remains the fact that pronounced body image disturbances in the sense of overestimation appear to be associated with a more pronounced psychopathology and increased risk of therapeutic failure. For future studies on the body image, an increase in the range of data is to be encouraged in three directions:

1. A more exact demographic and clinical description of the sample being studied ("hard" data concerning the illness).



2. An increase in the methods used for measuring body image (at least two perceptual methods and also self-rating scales or questionnaires to measure the patient's degree of satisfaction with her body, the subjective experience of her appearance, etc).
3. The development of other techniques not only to assess body image but also to influence it in a therapeutic sense, for instance by self-image confrontation or video feedback/video playback [41,43].

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