

Mental Representation of the Body: Stability and Change in Response to Illness and Disability

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ABSTRACT: Body concept and body esteem were examined across four medical groups (cardiac, spinal-cord injured, alcoholic, and domiciliary). To study body concept, multidimensional scaling was used to extract the dimensions organizing 33 body parts. Three dimensions, Head-Body, Arm-Leg, and Inside-Outside, organized bodily experience for the groups. To study body esteem, a principal components analysis was applied to esteem ratings of the same body parts; Head and Body dimensions emerged, suggesting correspondence between cognition and affect. Body concept was stable across medical groups, whereas body esteem underwent dramatic, illness-related, changes. A *serial chain* model of body concept was proposed to synthesize these and related findings. Body esteem is related to the model and to issues in general self-esteem.

The body self may well be the first aspect of self-concept that develops in the infant (Epstein, 1973). As the individual develops and passes through the states of health, disease, and sometimes disability, that individual's body concept and body esteem must accommodate to such changes. Such alterations are ubiquitous across physical affliction, multivariate in nature, and potentially diagnostic of different diseases (e.g., Thompson, Berland, Linton, & Weinsier, 1986). Body concept and esteem may serve as intervening variables with partial control over health maintenance behavior (Garner & Garfinkle, 1981), and more generally as central aspects of the self-concept. One way to learn more about body concept is to examine its organization and consistency across different physical illnesses and disabilities (Schilder, 1950).

Body concept is here used to mean a symbolic, perceptual/cognitive representation of the body. The most widely studied aspect of body concept is body image. Body-image conceptions propose that there is a mental image of the body that exists as a three-dimensional facsimile of real space, a ". . . tri-dimensional image everybody has about himself . . ." (Schilder, 1950, p. 11), that is measurable in length, width, and depth. One way this

image has been studied is through human figure-drawing. Machover (1949) suggested that "the perception of the body image . . . must somehow guide the individual who is drawing . . ." However, a number of studies have called human figure-drawing results into question because such figure drawing may be confounded with artistic ability or with other motivational and personality variables.

The most innovative and methodologically sound method for studying body-concept may well be to represent stimuli (such as body parts) in a spatial configuration according to the perceived similarity among them. Multidimensional scaling (MDS) is notably successful at such modeling (Shepard, 1980). Working from geographic distances among United States cities, MDS will reliably produce a map of those cities; working from psychological distances among colors, it will recover Newton's color circle (Shepard, 1980); working from psychological distances among body parts, it could well create an imagistic, three-dimensional representation of the body, should one be present. MDS allows the subject to use any perceptually salient qualities to judge distances (or, equivalently, similarities) among body parts. The resulting spatial model then permits the researcher to judge which body-part attributes, be they size, location, function, etc., underlie subjective body concept. For instance, in the case of a true three-dimensional body-image, one would expect to obtain height, width, and depth dimensions from the solution, within which body parts would be arranged. Alternatively, some researchers have concentrated on the role that the large-small dimension may play in organizing body parts (Garner & Garfinkle, 1981; Glucksman & Hirsch, 1969; Shontz, 1969; Thompson et al., 1986; Wilmuth, Leitenberg, Rosen, Fondacaro, & Gross, 1985). Multidimensional scaling also requires no special artistic ability on the part of subjects (unlike human figure-drawing).

Shepard and Arabie (1979) scaled the distances among 20 body parts obtained in a study by Miller (1969), and did not find a body image. Their three-dimensional result suggested that the preeminent dimensions normal college students use to perceive their bodies are not the physical dimensions of height, width, and depth, but rather the psychological dimensions of, "Leg," "Arm," and "Head" (cf. Johnson & Kendrick, 1984). Use of a larger number of body parts than 20 could potentially better articulate the meaning of such dimensions. Thirty-three body parts will be subjected to multidimensional scaling in the present study.

Body Esteem

Body esteem is relatively straightforward to study in comparison with body concept; it refers to the overall positive or negative evaluation of the body. Whereas body concept is primarily cognitive, body esteem is affective and denotes the satisfaction people experience with their bodies (Berscheid, Walster, & Bohrnstedt, 1973; Secord & Jourard, 1953; Noles, Cash, & Win-

stead, 1985). Major scales used to assess body esteem ask subjects to rate the pleasantness (or worrisomeness, etc.) of individual body parts, the whole body, or both (Berscheid et al., 1973; Mayer & Eisenberg, 1982a; Plutchik, Weiner, & Conte, 1971; Secord & Jourard, 1953). Factors of body-part satisfaction sometimes found are: (I) face, (II) extremities, (III) torso, (IV) breast/chest, and (V) sex organs (Berscheid et al., 1973; Franzoi & Shields, 1984).

In addition to body concept and body esteem there are several personality dimensions related to the body including "body boundaries" (Fisher & Cleveland, 1968; Halligan & Reznikoff, 1985); "body concern" (Secord & Jourard, 1953), and others. Because these personality dimensions deal less directly with representation of the physical body, an understanding of them can be enhanced by first understanding direct cognitive and affective aspects of body perception under examination here.

Introduction to the Present Study

In the present study the relationship between body-concept and physical disability and illness will be studied among four medically and psychiatrically disordered groups: *cardiac*, *spinal-cord injured*, *alcoholic*, and *psychiatric*. A multidimensional scaling procedure will be used to determine dimensions underlying the perceived organization of body parts; good-bad body part ratings will be used to measure body esteem. Hypotheses to be tested include: 1) Can an imagistic representation of the body be obtained through MDS procedures? The Miller-Shepard-Arabie results would suggest not, but perhaps with a broader body-part sample a picture will emerge. 2) If not, will the use of somewhat larger selection of body parts better articulate the meaning of previous findings? 3) Do patients' illnesses provide an organization for illness-affected body parts? In other words, do medical patients see their body parts' going together according to "illness" clusters? If so, this might indicate a blending of affective with conceptual body representation. 4) Will body esteem ratings coincide with MDS dimensions, or be similar to them? 5) Will body-esteem ratings distinguish among variously ill medical groups?

METHOD

Subjects

Four comparison groups were composed of 147 male patients treated at the Hampton, Virginia Veterans Administration Medical Center. The *cardiac group* (N=34) were participating in a three month cardiac rehabilitation program. All had a myocardial infarction within six months prior to testing. The average group member was 58 years old, had completed high school, and had experienced heart-related problems for 17 months. The *spinal-cord injured group* (N=33) were quadriplegic inpatients paralyzed and anesthetic below the C6 level. All had participated in an

acute rehabilitation facility prior to being transferred to their present long-term custodial unit. The average group member was 57 years old, had an 11th grade education, and had been disabled for 14 years. The *alcoholism group* (N=37) was composed of inpatients in a 45-day residential alcoholism rehabilitation program. The average group member was 45 years old, had a 10th grade education, and had experienced his condition for five and one-half years. The *domiciliary group* (N=43) were ambulatory and capable of complete self-care. The majority could be described as psychosocially disadvantaged whose primary problems were vocational or who lacked sufficiently sound social supports or emotional resources to be successfully integrated into the community. Some had psychiatric histories, some were on psychotropic medication at time of testing; many had MMPI profiles associated with characterological defects. The average member was 53 years old and had an 11th grade education.

Materials

To select body parts for scaling, lists of body parts used in earlier studies (Berscheid et al., 1973; Miller, 1969; Secord & Jourard, 1953) were combined into a total of 43 body parts. Body functions such as *appetite* were excluded. Based on their frequency of use across the three lists, and experimenter judgment, 33 body parts were retained: *ankles, arms, back, buttocks, cheek, chin, ears, elbows, eyes, feet, fingers, forehead, hair, hands, head, heart, hips, knees, legs, lips, lung, mouth, muscles, neck, nose, sex organs, shoulders, skin, thighs, toes, waist, and wrists.*

Procedure

Body Part Sorting Procedure. Subjects were given the 33 body parts, each part printed on a 3×5 index card. Instructions followed Rosenberg, Nelson, & Vivekananthan (1968), "to put those parts of your body which tend to go together in the same category. Each body part may be used in one and only one category. You may use as many categories as you wish, but try not to use any more than 10 categories." The task was self-paced, and changes in sorting were allowed at any time.

Body Part Evaluation Questionnaire. This questionnaire contained the 33 body parts in alphabetical order, each followed by a 7 point scale anchored by "GOOD" at "1" and by "BAD" at "7." Subjects rated each body part according to "how good or bad you feel about it."

Testing the Spinal-Cord Injured. The experimenter arranged body-part cards and filled out forms according to the verbal instructions of the spinal-cord injured group.

RESULTS

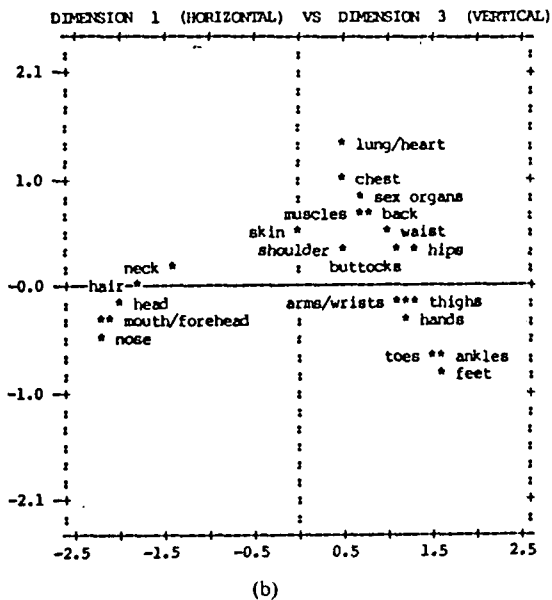
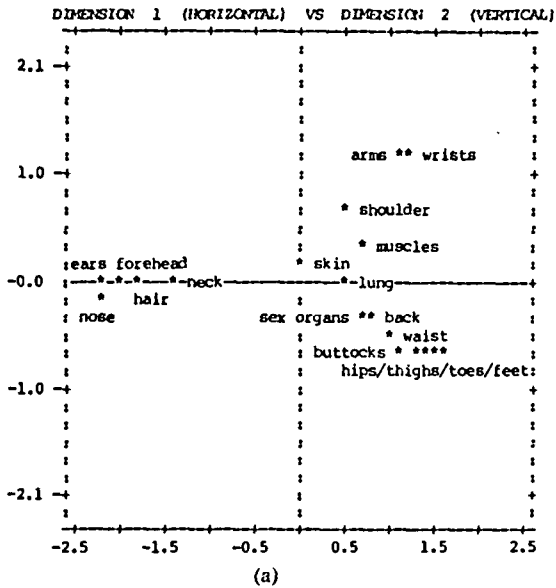
Preliminary Data Preparation

The measures of the body-part proximity (obtained by the body-part sorting) were transformed into four 33×33 proximity matrices, one for each

clinical group, according to a profile similarity scheme outlined in Rosenberg et al. (1969). Each cell of a given matrix represented the adjusted squared Euclidian distances between body parts for its group. All MDS analyses were also conducted with a Minkowski ($r=1$) city-block distance metric used in the original Shepard & Arabie work. The results were virtually identical to those from the Euclidian distances and therefore only the Euclidian results are reported.

Do Body Parts Go Together to Form a Body-Image Representation? A non-metric multidimensional scaling replicated across the four patient groups was used to extract a spatial model of body-concept. There was a slight elbow in stress values at the three-dimensional solution (root-mean-square of the four stress values was 0.065); this three-dimensional solution was also the most obviously interpretable. The first of the three dimensions represented a Head-Body continuum with an *ear-mouth-nose-cheek-etc.* cluster at one end, *neck* in the middle, and *trunk-limbs* on the other end. The second dimension was an Arm-Leg dimension with *arms-wrists-hands* on one side and *legs-toes-feet* on the other. The third dimension was an Inside-Outside dimension with *lung-heart* on one side and *legs-nose-hands* on the other. This three-dimensional solution recovered by MDS indicates a body concept organized according to serial connections or chains among body parts. The results of this analysis can be seen in Figure 1.

Is There Differential Weighting of Dimensions? An Individual-Differences Scaling (INDSCAL) analysis of the above data was also conducted. This procedure is similar to standard multidimensional scaling in many ways, but it permits a comparison among groups to see if the dimensions recovered are equally salient across groups. (For instance, it is possible that cardiac patients might use the Inside-Outside dimension more in their perceptions of body parts because of their greater concern over their internal organs.) For the combined groups, the above three-dimensional finding was replicated by the INDSCAL analysis except that dimensions II and III were interchanged in order. If a particular group (e.g., cardiac patients) placed greater or lesser stress on a particular dimension than the combined groups, it should show up in an elevated *weirdness* coefficient for that group. These coefficients, which can range from 0 to 1.0, denote group deviations from the overall mean. The coefficients were overall low (spinal cord, 0.36; cardiac, 0.16; alcoholic, 0.27; domiciliary, 0.10), indicating that the differences in body perception across groups were small. The modest differences that did appear suggested that the spinal cord group placed less weight on the Arm-Leg dimension; more on the Inside-Outside dimension. The alcoholic group placed less weight on the Head-Body dimension, compared to other groups. But overall it appeared that the four groups had highly similar conceptualizations of their bodies despite substantially different illness and disabilities.



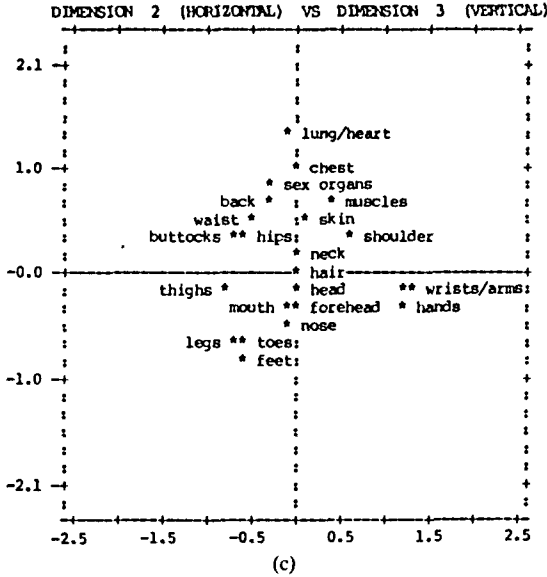


Figure 1. Non-metric multidimensional scaling replicated across four groups. The figure shows approximate locations of body parts. When two body parts occupy the same position in the coordinate-space, only the later body part in the (alphabetical) stimulus list appears. The three dimensions illustrated are labelled (1) Head-Body, (2) Arm-Leg, and (3) Inside-Outside.

Is There Clustering According to Illness? Another way to test whether body parts are clustered by illness is through cluster analysis, a technique that reveals how body parts are grouped together. Because the assumptions and non-dimensional output of cluster analysis are different from those in MDS, the technique provides an alternative perspective on body perception which is also potentially useful. The four proximity matrices used in the MDS analyses were used here with the results standardized within groups so that the largest cluster was formed at 25 distance units (see Figure 2).

The first, *small clusters*, from 0-5 distance units, were almost identical across groups. These were the HEAD (*cheek, forehead, mouth, nose, eyes, lips, ears, chin, head, hair, and neck*), ARMS (*fingers, hands, arms, wrists, elbows, and shoulders*), LEGS (*knees, feet, toes, ankles, legs*), LOWER TRUNK (*buttocks, hips, waist, sex organs*), and UPPER TRUNK clusters (*heart, lung, chest*). A few body parts (*back, skin, muscles, thighs*) alternated between two clusters.

The next, *midrange*, level of clustering, from 6-15 units, is the most variable from group to group. Yet there is only minimal suggestion of the influence of illness on clustering. One such suggestion occurs among the

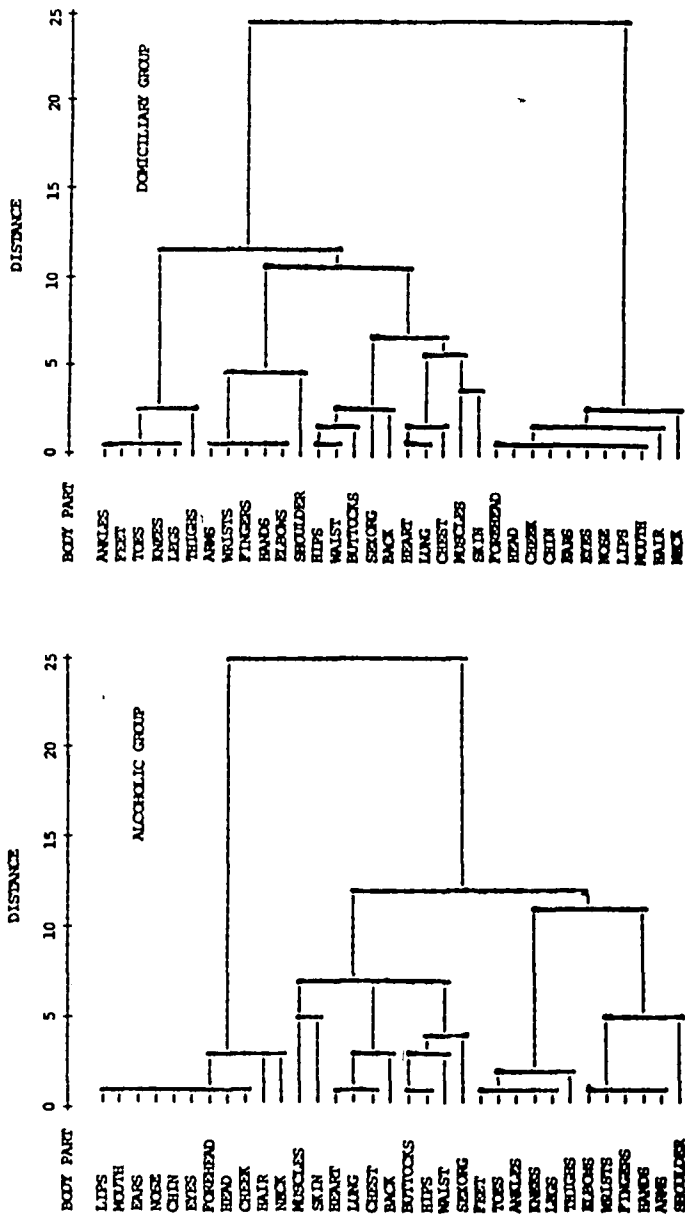


Figure 2. Cluster analyses for the four clinical groups.

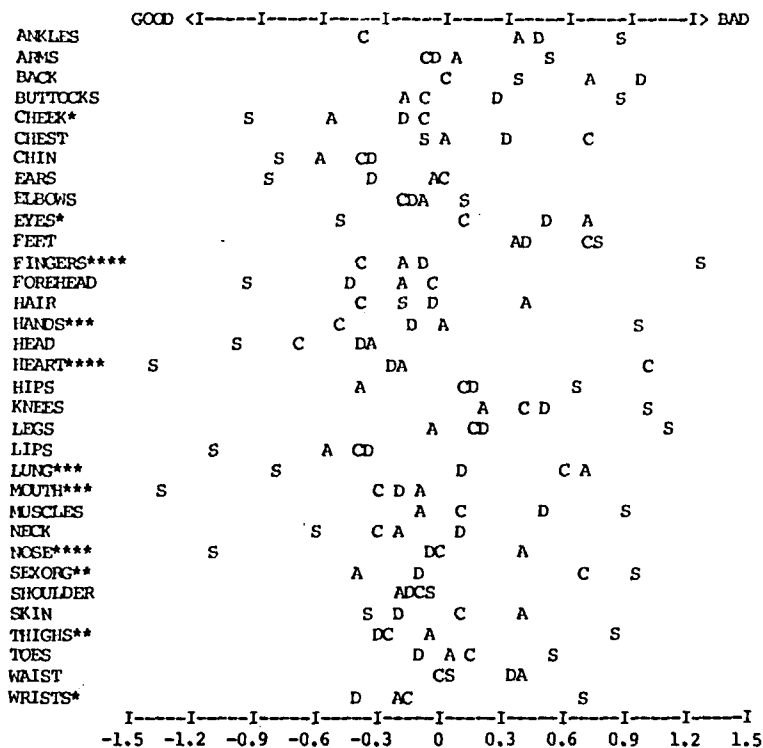
cardiac group, who indicate that their UPPER BODY (including *heart and lungs*) and SEX ORGANS/BACK cluster (unique to this group) are more different from other body parts. Suggestions of disability also arise within the spinal-cord group, in which there is less differentiation between TRUNK and LIMB clusters than in other groups. It should be noted, however, that due to the modest number of subjects in each group some differences among the groups will be expected by chance alone.

The final, *large*, BODY and HEAD clusters, are formed at about 15 standard distance units; they are combined into a complete body in a further 10 standard units. This suggests, as with the MDS solutions, that the BODY-HEAD division is the most potent of the body subdivisions. Despite the suggestive differences among middle range clusters, the present study yields little evidence that a person's body concept is distorted by severe illness.

Do Body-Esteem Ratings Distinguish Among Different Medically Ill Groups? Recall that the good-bad ratings of body parts ranged from 1 (Good) to 7 (Bad). A one-way ANOVA for mean body-part rating across the 33 body parts demonstrated that body concept was overall most positive among the alcoholic group ($M=2.3$), followed by the domiciliary ($M=2.8$), the spinal cord ($M=3.3$), and the cardiac ($M=3.6$) groups. These differences are highly significant ($F(3,144)=8.95$, $p<.0001$). Because of the mean difference among groups, one-way ANOVA's for almost every body part, considered individually, reached statistical significance (for all but two of those F 's that were significant, $p<.001$). Body parts that did not show group differences were those for which normals have frequent complaints (e.g., *waists* and *backs*), those thought to reflect personality (*eyes*), and those over which all groups have high control (*hair*).

Group Differences in Relative Body-Part Evaluations. Given the above finding that the medically ill and disabled groups have poorer body esteem than alcoholic or domiciliary groups, the next question is whether such differences are global or are differentially negative for illness-affected body parts. Because overall group differences obscure differential ratings for individual body parts, a second analysis was conducted in which a given group's good-bad rating of a body part was transformed by subtracting out from it that same group's mean good-bad rating for the 33 body parts. In this way, each group's transformed good-bad ratings of the 33 body parts had equivalent overall means (of zero). Examining these transformed scores (Figure 3), the spinal-cord group gives especially negative evaluations of such body parts as *fingers, hands, legs, sex organs, thighs, and wrists*, but rated head-parts and internal organs such as *heart and lungs*, relatively more positively. The cardiac group deviates to extremely negative evaluations for *heart and sex organs*. Unlike body concept, these good-bad part evaluations are quite sensitive to physical disturbance actually present or imagined as present in the different groups.

C = CARDIAC S = SPINAL CORD A = ALCOHOLIC D = DOMICILIARY



* p < 0.05, ** p < 0.01, *** p < 0.005, **** p < 0.001, for 1-way ANOVA

Figure 3. Evaluative ratings for the 33 body parts across the four groups. Group means (cardiac: M=3.6; spinal cord: M=3.3; alcoholic: M=2.4; domiciliary: M=2.8) are subtracted out for comparison.

Principal Components Analysis of Evaluation Ratings. A principal components analysis of good-bad ratings for the body parts yielded decreasing eigenvalues in a pattern suggesting that a two- or three-component solution was optimal, by the scree criterion (Eigenvalues: 15.6, 3.0, 1.3, 1.2, 1.1). The unrotated solution (Table 1) shows a first, overall esteem component, followed by two difficult-to-interpret components. When rotated to a varimax criterion (Table 1), two components, Head and Body, emerge reminiscent of the first MDS dimension. The third component loads *eyes*, *feet*, and *lung*, at a high level suggesting it is not a conceptually useful grouping. Solutions pushing beyond three components change the picture in a less satisfying way: using a Kaiser criterion (five components, with varimax rotation) yields a difficult-to-interpret sequence that extends from Body, to Head, Limb, Internal or Trunk, and Sense-Organ. What is most apparent is

Table 1. Unrotated and Varimax-Rotated Principal Components Extracted From Good-Bad Ratings of 33 Body Parts*

Body Parts	Unrotated			Varimax			Body Parts (Continued)	Unrotated			Varimax		
	I	II	III	I'	II'	III'		I	II	III	I'	II'	III'
Thighs	81	-33		82			Back	56			56		
Hands	70	-37		78			Skin	70		27	55		46
Knees	76			77	29		Lips	66	46	-25	27	80	
Fingers	70	-32		76			Forehead	70	44		30	80	
Wrists	79			76	34		Chin	68	41	-35	33	80	
Ankles	67	-37		73			Cheek	71	45		28	78	
Hips	73		-27	73	34		Mouth	59	58			77	32
Legs	67	-34		73			Nose	48	53			68	
Toes	76	-26		72		28	Head	65	30		33	63	
Buttocks	70		-30	69	35		Lung	66	33			59	43
Feet	76		30	67		50	Heart	67	32		26	59	42
Elbows	78			65	37		Ears	56	37			56	41
Shoulder	76			64	34	26	Neck	67			39	55	
Sex organs	73			64	33		Chest	80			51	51	38
Muscles	73			63		35	Hair	50			31	43	
Arms	64			60		32	Eyes	55		60	27		74
Waist	69			56	37		Variance	47%	9%	4%	47%	9%	4%

*N = 147; decimals omitted and loadings below 0.25 are left blank.

that the two substantial components of the present solution closely correspond to the first dimension of the multidimensional scaling solution for Body Concept.

DISCUSSION

The multidimensional scaling conducted here yielded three highly interpretable dimensions which collectively suggest that body parts are organized according to serial connections or chains. The three dimensions are Body-Head, Arm-Leg, and Inside-Outside. They partially overlap with the earlier Shepard and Arabie scaling. The present dimensions appear more interpretable than the earlier scaling based on the smaller body-part set. The most likely reason is the use of a larger number of body parts in the analysis, although it also is possible that the larger number of subjects or the use of clinical groups contributed to the different result. The latter possibility is most unlikely, however, because equivalent dimensions and clusters were found within each group. In contrast, the Head and Body esteem dimensions may be less generalizable owing to the differences in body esteem demonstrated among medical groups.

The Meaning of the Three Body-Concept Dimensions. Each of the three MDS dimensions captures a different psychologically perceived continuum among body parts. The Head-Body dimension contrasts the internal-sounding and largely invisible head with the externally-perceived quality

of the lower body's sights and sounds. The Arm-Leg distinction contrasts arms' use for manipulating smaller objects, bringing things to the mouth, ears and eyes, and tool-use, with the legs' use for locomotion of the whole body. Also, arms are high on the body near the head and neck, and legs protrude from the lower trunk. The Inside-Outside dimension contrasts the inaccessible and involuntary control of internal body parts with the accessible, voluntary control of external parts.

A Serial-Chain Model of Body-Concept. In the present section, it is proposed that body parts are mentally represented in a serial fashion. The obtained dimensions of the multidimensional scaling are not the same as would be expected from a strict "body image" conception of the body. The most obvious violation is the Arm-Leg dimension, which holds no privileged place in a physical three-dimensional spatial representation of the body. Arm-to-leg is neither a height, width, or depth dimension. Rather, the dimension is a serial connection that runs along major body regions. The Arm-Leg dimension runs up the *hands-arms-shoulder*, down the *lung-back-waist-buttocks* area of the trunk, and finally down the legs through the *hips-thighs-feet-toes*. The Head-Body dimension exhibits this serial quality as well in its *head-neck-body* organization. Despite the use of fewer parts, a serial organization is also discernible in the earlier Shepard and Arabie MDS solution.

Information-processing demands posed by the human body may make such serial representations particularly efficient for body parts. Determining the exact location of such constantly moving parts may involve knowing their positions relative to one another. To know the position of one's hand (without looking) is in part dependent on knowing the position of one's wrist, arm, and shoulder. Maintaining a record of such positions presumably requires a certain constant rate of information exchange between neural networks that represent the respective body parts. Placing representational networks close to one another may minimize processing demands because the information needs to travel less far between them.

A remarkable manifestation of this serial organization of the body parts arises in the well-known motor- and sensory-homunculi of Penfield and Rasmussen (1950, Figure 9, p. 24). By stimulating portions of the brain, these authors charted the location and cortical area allotted to each body part. In their diagram (reprinted here as Figure 4), the body parts appear ordered across the cortex from head to body. Within the body portion of the Head-Body ordering, body parts are ordered from arm to leg. This order is remarkably similar to the present findings. In fact, the serial position of a body part in the cortex can be directly compared with its serial position recovered in the present MDS solution.

To accomplish this, body-part labels overlapping between the present body-part list and Penfield and Rasmussen's figure were identified. Differences in singular versus plural forms of body parts were ignored, and individual fingers charted by Penfield and Rasmussen were matched to the

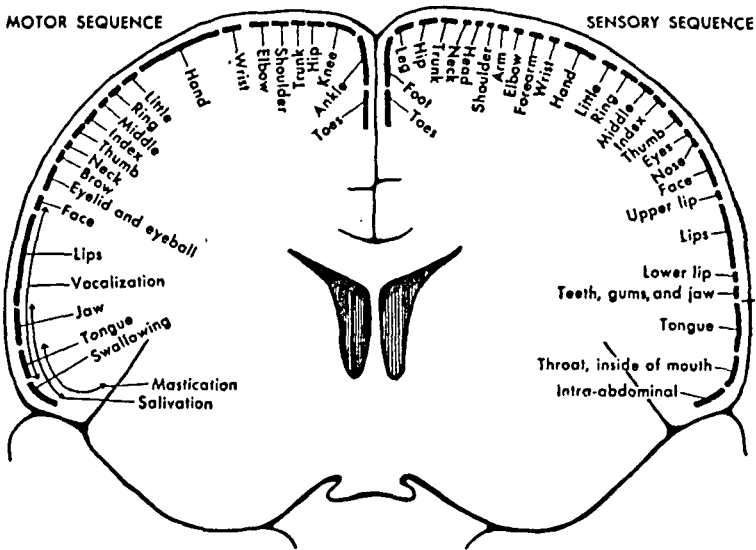


Figure 4. Cross section of the cerebral cortex with the motor and sensory sequences indicated. The lengths of the solid bars represent an estimate of the average cortical areas from which the corresponding responses were elicited. (Reproduced with permission from *The Cerebral Cortex of Man* by Wilder Penfield and Theodore Rasmussen, Macmillan Publishing Company, 1950, renewed in 1978 by Theodore Rasmussen.)

body-part *fingers*. Next, the relative positions of body parts were numbered along the motor cortex from toes (1) to salivation (25), and along the sensory cortex from toes (1) to intra-abdominal (28). Four values for each body part were then intercorrelated: 1) position of the body part on the MDS Head-Body dimension (e.g., X coordinate), 2) position of the body part on the MDS Arm-Leg dimension (e.g., Y coordinate), 3) the sequence of the body part in the motor cortex, and 4) the sequence of the body part in the sensory cortex. The correlation between body-part position along the MDS Head-Body dimension in this study and its serial position in Penfield and Rasmussen's motor homunculus is $r(12) = 0.86, p < .001$, and with the sensory homunculus $r(12) = 0.60, p < .05$. Position of body parts (below the neck) on the MDS Arm-Leg dimension correlated $r(10) = 0.91, p < .001$ with their serial position along the motor cortex and $r(12) = 0.91, p < .001$ with the sensory cortex. To the best of the authors' knowledge, these are the first correlations ever reported between mathematical dimensions extracted through a multivariate technique from a behavioral experiment, on the one hand, and known brain structure outside the optic nerve, on the other. The correlations show strong correspondence between brain and behavior, and although the observed brain structure is unlikely to cause body-concept perceptions directly, the similarities in form may both reflect the information-processing constraints discussed above.

Another remarkable correspondence to this serial chain of body parts exists in the memory system. Johnson, Perlmutter, and Trabasso (1979) have noted a serial organization of children's memory for, drawing of, and linguistic representation of body parts. As an example, in some of their studies, children learned associations between body parts and to-be-recalled stimuli. During recall, stimuli paired with body-dimension endpoints such as head, feet, and sometimes arms, were better recalled than stimuli paired with such midpoints as shoulders, hips, or knees. This yielded a "serial position" memory curve in which the serial position was defined according to serial chains of body parts almost identical to those extracted here (and yet extracted through memory performance). The same serial organization of body parts seems, therefore, to underlie motor and sensory projection areas in the cortex, body-related memories, and body-concept.

Body Esteem and Body Concept Follow Similar Clusters. In contrast to earlier studies of body-concept disturbances in illness (e.g., Schilder, 1950), it appears that, in the typical case, body concept undergoes only small changes in response to disability or illness. In concert with earlier studies, however, the *esteem* portion of body concept changed readily with physical affliction (Mayer & Eisenberg, 1982b). Both body esteem and concept seemed organized by similar body-part clusters, although body esteem does not generate as many clusters as does body concept, and can, in fact, be treated as unidimensional.

Implications for Body Concept and Body Esteem Research. Given this apparent connection between body cognition and affect, it may make sense to assess an individual's body esteem according to a set of serial chains, including Head-Body, Arm-Leg, and Inside-Outside chains. It may be that the esteem of body parts occupying endpoints of such chains contribute relatively more to overall satisfaction with one's body than body parts occupying midpoints. Because the hands and feet, for instance, occupy endpoints in a chain relative to the middle buttocks, waist, and hips, the individual may be more sensitive to illnesses that strike hands and feet rather than the middle areas. Either the number of chains disrupted by an illness, or the importance of chains disrupted by an illness may provide a better way to conceptualize bodily disruption and dissatisfaction than examining individual body parts with no such organization. Given that body esteem changes with illness, its further study in relation to illness seems a promising area for continued research (Glucksman & Hirsch, 1969; Mendelson & White, 1985; Thompson et al., 1986; Wilmuth et al., 1985).

Body Esteem and Personality. As noted at the outset, body concept and esteem may be among the first elements of self-concept to develop, and they remain a central aspect of self-concept throughout one's life. Self-relevant aspects of a person, such as a person's body, are most deeply involved with an individual's emotional well-being and personality processes (Mayer & Salovey, in press). Like many emotion-laden concepts, body es-

teem can be fairly well described by taking account of its first Pleasant-Unpleasant principal component (e.g., Mayer, 1986; Mayer, Mamberg, & Volanth, 1988). Because body esteem is represented along the same Pleasant-Unpleasant dimension as many other mood-related phenomena, it is probably easily influenced by long-term mood, and also probably contributes to mood; both of these suppositions are supported by current findings concerning the relation between body esteem and depression (Noles et al., 1985), and suggest that good body esteem can make an important contribution to subjective well-being.

SUMMARY AND CONCLUSIONS

Two complementary findings as to the nature of body concept and body esteem were obtained from this study. Body concept, assessed by multidimensional scaling, yielded three bipolar dimensions: Head-Body, Arm-Leg, and Inside-Outside. These dimensions are more serial than spatial, and bear an interesting correspondence to the serially arranged Penfield & Rasmussen (1950) sensory and motor homunculi, and serial memory organization of body parts. This serial representation of the body appears to be so fundamental that paradoxically, severe physical incapacitation yields only modest change in it. Individual differences in bodily perception across medical groups are mostly reflected in the affective dimensions of body esteem. These results clearly show how the *heart* becomes "bad" for cardiac patients, the *arms* become "bad" for spinal-cord injured, and so on. Such findings suggest new approaches to studying the mental representations of disease and illness; in turn, an understanding of such representations may be useful in diagnosing and treating medically-related behavioral disorders, as well as in understanding a person's more global self-concept.

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