Perceptual and Motor Skills, 1983, 56, 799-806.

BODY PERCEPTION IN RELATION TO MUSCULAR TONE AT REST AND TACTILE SENSITIVITY TO TICKLE

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Summary.—Two aspects of body image (body perception and body acceptance), muscle tone at rest, and disposition to perceive positively connoted stimuli (tickle) were studied with 35 female subjects. Our hypothesized relation of muscle tension and body perception was confirmed by an inverse correlation between these variables. Also evident was the link of the good acceptance of the body with the disposition to perceive pleasurable stimuli (tickle perception) longer and the link of level of body awareness and resistance to change (latency to tickle). Also a direct relationship between body perception and body acceptance emerged.

The aim of the present research was to examine the role of basic afferent information of muscle tone at rest and of some features of information coming from the skin in determining conscious body perception. In fact, we think that, in regard to the perception of the body and its parts, the somesthesic experience which, in a wider sense, is at the basis of body schema formation, plays an important role. With regard to cutaneous afference, we examined tactile sensitivity to tickle which allows us to measure resistance to psychophysical change induced by tickle stimuli, as indicated in our previous research (Ruggieri & Milizia, 1982). In fact, light, superficial skimming of the skin, that is, a tickle, produces the following sequence of events: (a) simple tactile sensation (latency), (b) a peculiar sensation of tickle with a pleasurable emotional connotation (tickle perception), and (c) adaptation. In this context we are especially interested in latency which, when it is a shorter or a longer period, gives us information on the pre-stimulus organization of tonic background, the basic condition of the skin. The resistance to change represented by latency is closely related to an inhibitory process, as we have indicated elsewhere (Ruggieri & Milizia, in press). We decided to study the relationship between muscle tone, latency and tickle perception on one side, and body perception on the other. With respect to subjective perception of body size (Shontz, 1963, 1969), we recall that different aspects have been pointed out, from the study of perception of bodily boundaries, e.g., Barrier Score of Fisher (1970). In addition to these cognitive aspects of body-image cathexis has been considered (Jourard & Secord, 1954), that is, the degree of acceptance or no-acceptance of the body's parts.

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We think it is also important to evaluate the intensity of body perception in strictly cognitive terms. In other words, the subject may perceive various parts of his own body with different intensities or rather the body's parts represent a continuous source of information of which one is not conscious in a uniform way. In fact, elaboration of body image does not necessarily coincide with awareness of body parts because it is obvious that, for good adaptation and responsivity to the environment, the conscious perceptive field is mostly occupied by external rather than internal stimuli to which the subject tends to respond. Body image constitutes a background of which the subject is relatively unconscious until he directly pays attention to it. This operation of focusing on the body is not the same for all subjects, because the focusing is modulated by inhibitory systems closely related to individual experience of the body. When the subject focuses on his body, different components or images of body parts, of which the subject himself usually is unconscious, can emerge.

To study this aspect of body perception we directly asked subjects to evaluate on a scale of 1 to 10 points the intensity of perception of body areas. We also compared this perceptual component with the degree of acceptance or rejection of the body and its parts.

We also had reason to believe muscle tension at rest was important in the determination of level of body perception. We hypothesized that particularly high levels of muscle tension (within a range of values lower than the contraction) indicate a disposition to react which is interpreted by us, in accordance with Pribram, *et al.* (1975), as activation or readiness to respond. Researches of the group of sensory tonic theory (McFarland, *et al.*, 1962) have shown that perceived location of one's own body under two types of conditions, supported and unsupported body tilt, was more accurate when the body is unsupported tilted. We think that in this specific case the increase of muscular tone to adopt and maintain a position of body tilt is voluntary and focuses the attention of the subject on his own body. This condition differs from ours in which we hypothesized that the increase of muscular tone represents a "preparedness" to action. When this is the case, the subject makes external responses and is less centered on himself. In this sense we think also that levels of postural adjustment of the muscle system, representing in some way a psychophysiological personality trait, may constitute a pattern of adaptive responses to the environment (postural reflexes). With regard to the inhibitory role of the muscle system on sensitivity, we refer to a previous study (Ruggieri, *et al.*, in press). We recall that very high levels of muscle tension do not reflect simple activation but paradoxically become, through a feedback mechanism, an inhibitory system which may block sensorial and emotional experience. We also hypothesized positive relationships among levels of body acceptance, body perception, and disposition to experience pleasure. This last aspect is indicated for us by the duration of tickle perception.

METHOD

Subjects

Subjects were 35 female undergraduates in psychology, aged between 20 and 30 yr., with a mean age of 25 yr. The group included only right-handed subjects.

Procedure

Muscle tone at rest was measured by electromyographic equipment using surface bipolar electrodes. The electrodes were tin cups 8.5 mm. in diameter and spaced one every 7 mm. They were filled with electrode jelly and strapped on with adhesive plaster. The changes in frequencies of the EMG potential, amplified by an amplifier with band passing between 60 and 1200 Hz, were transferred into a digitalized signal by means of zero-crossing apparatus. The digitalized signal was converted into a tension-signal by an integrator, expressing a difference in potential as proportional to the EMG potential frequency. The tension signal was sent to a tension-frequency converter and then to a decoding counter. The decoding counter showed the mean integrated frequencies appearing in 1 sec. The method of zero-crossing used by us is suggested by literature for measuring relaxed muscles (Budzinsky & Stoyva, 1973).

Left and right myographic scores of zygomatic, sternocleidomastoid, pectoral, rectum of abdomen, adductor, and brachio-radialis muscles were taken in random order. For the zygomatic muscle the electrodes were placed both on the right and left cheeks immediately under the zygomatic bone; for the sternocleidomastoid muscle both on the right and left midway between the mastoid apophysis and the sternum; for the pectoral muscle both on the right and left hemiclavear linea about 10 cm. from the clavicle bone; for the rectum muscle both on the right and left plane passing through the umbilicus about 3 cm. from the umbilicus itself; for the adductor muscle both on the right and left medial faces of thigh about 5 cm. from pubic synphisis; for the brachio-radialis muscle both on the right and left two-thirds superior of the forearm. The earth electrode was placed on the right wrist. For each muscle a mean score based on five measures was obtained, each measure lasted 1 sec. Electromyographic recordings were taken after a 5-min. relaxation.

Tickle sensitivity was measured by stimulating vertically the body parts corresponding to the examined muscle areas along an area of about 5 cm., with a wad of cotton weighing 3 mg. The frequency of stimulation was 1 skim a second for a maximum of 120 sec. Each subject was instructed to signal by the word "yes" the appearing of the tickle sensation as pleasurable, different from simple touch, causing "goose pimple" and slight disquiet, and by the word "no" the disappearance of the tickle sensation which was replaced by a simple tactile sensation. Two scores were obtained: a latency score (from the beginning of stimulation to the beginning of tickle perception) and a tickle percep-

tion score (from the beginning of tickle to its modification). When the tickle perception did not occur, we assigned a time of 130 sec. as the maximum latency. If the tickle perception was not replaced by other sensations, either negative or neutral, we assigned a maximum of tickle perception of 130 sec.

Body perception was evaluated by presenting a drawing of a nude human figure to the subject. This figure was depicted in full, in anterior and posterior perspective, with such adequate particularities to be identified as a figure of the same sex as the subject. Moreover, in the figure the right and left halves of the body and, transversely, several body parts in cephalon-cadual direction were identified by hatch marks. The subject was given the following instructions: "After you have relaxed and taken a position as comfortable as possible, pay attention to the way you perceive your body and those body parts of which you are aware. Indicate on the drawing by a score from 1 to 10 the degree of intensity of the perception of the parts of your body, no matter if in a pleasurable or painful way. You can indicate by zero the parts you do not perceive."

The level of body self-acceptance was carried out by Body Cathexis Test (Fisher, 1970; Jourard & Secord, 1954): the subject was asked to evaluate each of the 25 parts of the body listed in the test on a scale of 7 points. The highest score indicated the most negative evaluation.

All the measures were carried out in the morning and in random orders on different days by three female experimenters, respectively, one for Body Cathexis and Body Perception Tests, one for myographic scores, one for tickle scores. For the myographic and tickle sensitivity measures, the subjects individually tested lay on a medical-type cot in a laboratory-room wherein the temperature was always 26°C.

RESULTS

In Table 1 means and standard deviations of muscle tone on the right and left sides, latency, tickle perception, anterior body perception, and total body perception are indicated. In the same table means and standard deviations of body cathexis score, total right plus left-side muscle tone, latency, tickle perception, anterior body perception, and total body perception are also given.

In Table 2 Pearson's correlations between muscle tone, latency, and tickle perception on one side and body perception and body cathexis on the other are indicated. As can be observed all myographic scores are negatively and statistically significantly correlated with all body-perception scores. In other words, when muscle tone increases, the body-perception scores decrease, indicating that a high level of muscle tone corresponds to a low awareness of own body and vice versa. No correlation was found between myographic scores and body-cathexis score. We examined the frequency of electric activity of muscle at rest by the method of zero-crossing suggested by literature (Budzinsky & Stoyva,

TABLE 1

MEANS AND STANDARD DEVIATIONS OF ALL VARIABLES

Measure	*M*	*SD*
Myographic score		
Right	88.13	17.36
Left	88.47	18.78
Right+left	88.30	21.39
Latency		
Right	6.01	8.74
Left	15.03	14.27
Right+left	10.52	10.01
Tickle perception		
Right	48.82	40.36
Left	45.01	38.77
Right+left	46.92	38.66
Anterior body perception		
Right	48.57	26.02
Left	46.77	29.42
Right+left	95.34	54.60
Total body perception		
Right	85.22	49.53
Left	80.57	53.58
Right + Left	165.80	102.56
Body cathexis	82.65	17.35

TABLE 2

PEARSON'S CORRELATIONS OF RIGHT AND LEFT MYOGRAPHIC SCORES, LATENCY AND TICKLE PERCEPTION WITH BODY PERCEPTION AND BODY CATHEXIS; PEARSON'S CORRELATIONS BETWEEN BODY CATHEXIS AND BODY PERCEPTION SCORES

Measures	Body Perception						Body Cathexis
	Anterior body perception			Total body perception			
	Right	Left	Right+ left	Right	Left	Right+ left	
Myographic score							
Right	−.35*	−.28*	−.32*	−.34*	−.31*	−.33*	.06
Left	−.46*	−.45*	−.46*	−.49*	−.49*	−.49*	.19
Right+left	−.37*	−.34*	−.36*	−.44*	−.42*	−.43*	.19
Latency							
Right	.14	.12	.13	.19	.11	.12	.01
Left	−.52*	−.51*	−.52*	−.50*	−.51*	−.51*	.26
Right+left	−.31*	−.31*	−.32*	−.30*	−.32*	−.32*	.19
Tickle perception							
Right	.18	.24	.22	.11	.13	.12	−.33*
Left	.18	.26	.23	.08	.13	.11	−.31*
Right+left	.18	.26	.23	.10	.13	.12	−.33*
Body cathexis	−.36*	−.42*	−.39*	−.41*	−.42*	−.42*	1

*$p < .05$.

1973). The integration of amplitude, which has a role in the activity of muscle at rest, is not considered by the method of zero-crossing. It is possible that a measure of amplitude, which appears when changes of muscle activity are present, can provide interesting results which will complete ours.

Moreover, we noted a relationship between latency and body perception, but it is interesting that a statistically significant and negative Pearson correlation ($p < 0.01$) was obtained only on the left latency. This high correlation probably explains also the significant negative correlation ($p < 0.05$) between right plus left latency and all body-perception scores. This datum suggests that muscle tone and latency show the same relation to body-perception scores: both are negatively correlated with body-perception scores, but in this case especially left latency is involved. It is also interesting that there is a statistically significant and positive correlation, not indicated in Table 2, between left muscle tone and left latency ($r = 0.33$, $df = 33$, $p < 0.05$). No relationship was found between latency and body cathexis.

Tickle perception scores, which were not correlated with any of the body perception scores, were on the contrary statistically significantly and negatively correlated ($p < 0.05$) with body-cathexis scores (we remember that a high score on body cathexis indicates a low self-acceptance of the body), indicating that the stronger the disposition to perceive pleasurable stimuli, the better the affective attitude towards one's own body. In Table 2 Pearson's correlations between body-perception scores and body-cathexis scores are presented. As can be observed there is a statistically significant, negative correlation ($p < 0.05$) between body perception and body cathexis, which indicates that good body perception is accompanied by a good affective attitude towards the body.

We want to point out that in body-perception scores we have not considered the scores relative to the posterior part of the body, except for total right plus left score, because we have measured only myographic response, latency, and tickle perception scores on the anterior part of the body.

Discussion

An inverse relationship between muscle tension at rest and body perception clearly emerges from our research. We can affirm that in the perception of body parts the increase in level of muscle tone does not represent a source of information favouring the perception, but, on the contrary, a system of relative inhibition. In this context we remember the literature on autogenic training (Schultz, 1976) which affirms that a good perception of the body and its parts is accompanied by muscle relaxation. Our question is whether, in the case of autogenic training, good body perception and relaxation are artificially correlated features induced by the particular stimulus situation or systems always interact. In other words, is it possible to have good body perception with very high levels of muscle tension? Further research should clarify these questions.

It is important that, while statistically significant correlations exist between body perception and level of body acceptance (datum according to one of our hypotheses), the latter does not correlate with level of muscle tension. Muscle tone, which directly affects the level of body perception, has no direct role in body acceptance. As we have already indicated in the introduction, the increase in muscle tone corresponds to activation which we distinguish from arousal and, with Pribram, *et al.* (1975), interpret as readiness to action. Within this definitional framework, our hypothesis is confirmed: a polarization of the subject toward the environment, of which level of muscle tone would be an indicator, reduces body perception. Concerning this we point to some research in the same direction: attention to an external task is associated with an increase in the level of muscle tone (Courts, 1942; Eason & Branks, 1963; Eason, 1963).

Also interesting is the inverse relationship between body perception and latency of tickle for the left half of the body. In other words, body perception is greater the lower the resistance to change in the experience of tickle, that is, the greater the disposition to perceive positively connoted stimuli. The fact that this relationship is present only for the left half of the body is consistent with the results of our previous research (Ruggieri & Milizia, in press), in which we have hypothesized the left half of the body is more stable with regard to emotional tactile stimuli. This role of the skin of the left half of the body reduces the disposition to perceive stimuli, pleasurable in the case of tickle. From our data it is suggested that, to perceive the body, the disposition to perceive stimuli must also increase. Body image could be formed by an integration of these two processes of opposite direction: resistance to change and receptiveness to stimuli. The necessity of integration of these different processes is supported also by the lack of a clear relationship of body perception and tickle perception, while it is very evident between tickle perception and body cathexis, in the sense that the higher one's tickle perception the greater is the acceptance of the body. We remember that a higher level of body acceptance is represented by a lower score on the Body Cathexis Test, and this explains the negative correlation between the two variables. This finding indicates that a positive affective attitude toward the body is accompanied by a disposition to perceive pleasurably connoted stimuli longer. These data emphasize the close direct relationship between body perception and body acceptance. Research by Fisher (1970) has shown a relationship between body perception and Barrier Scores for female subjects. We intend to examine in our future research the relationship between responses to our Body Perception Questionnaire and Barrier Scores.

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Accepted March 9, 1983.