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BODILY PERCEPTION IN THE ORGANIZATION OF POSTURAL ATTITUDE AND MOVEMENT [1]

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Summary.—In the present research we hypothesized that some particular areas or points of the body play a role in the modulation of muscular (tonic and phasic) activity. In particular, we hypothesized that subjects utilize some bodily points as constant perceptual afferences in organizing the motoric responses of the whole body. The bodily points (called perceptual focal points) could have the same role as the bow of a boat for the sailor in orienting the spatial position of the boat and its movement. We have observed the presence of these perceptual focal points in 85% of a group of undergraduate students of psychology, 21 women and 19 men, during a real and an imagined movement of the whole body. Results indicated also that, if subjects were told to modify their habitual focal points, important modifications in subjective feelings of instability, pleasure, and tension appeared.

The aim of the present research was to verify the hypothesis of perceptual focal points of the body that have a role in the regulation of postural tone and movement. This hypothesis is related also to the physiological model that considers that the afferent information from the body (tactile, proprioceptive, visual, vestibular, etc.) plays an important role in the regulation of the motor activity.

Muscular activity is regulated through reflex pathways or by voluntary programs elaborated in the cerebral cortex. In this last case, afferent sensory messages represent the basis for the correct execution of the programmed movement. Then it is important to say that all the sensorial afferences are synthetized in the cerebral cortex producing a Body Image. We consider the process of Body Image construction as Fisher described, ". . . It no longer makes sense to talk about a simple unitary Body Image or Body Schema. The organization of body experience is multidimensional. At any given moment an individual may be simultaneously monitoring such different aspects of his body as its position in space, the integrity of its boundaries, its relative prominence in the total perceptual field, changes in its apparent size, and so forth" (Fisher, 1986, p. 32). Then, in previous research (Ruggieri, Sapora, & D'Ippolito, 1993) regarding the distinction between Body Image and Body Schema, we suggested that in the cortical areas in which the construction of the Body Image takes place develop two activities: (a) synthetizing of sensory afferences from the body to produce a representation of the

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structure and the activity of the body and (b) modulating of the activity of the body self to maintain correspondence between cortical image and attitudes of the body. Between the two processes (a and b) there is a constant interaction. So, Body Image represents a bridge between input (information *from* the body) and output (control of the tonic muscular activity involved in the postural habitual attitudes of the subjects). But, we remember also that each bodily movement is associated with the basal tone, i.e., with the tonic muscular activity that represents the concrete source of the information necessary for the regulation of the postural attitudes.

The Body Image plays an important role, we think, in modulating the relationship between posture and movement for the movement of the whole body in space. But we hypothesize that in this form of modulation, the cortical centers of the Body Image make an hierarchical selection of the afferent messages that could be important in the organization of the response. For example, for regulation of a motor response of a particular part of the body, the primary information is proprioceptive afferent feedback from the muscles involved in the movement. If we consider, then, the movement of the whole body in space, it is necessary to have, as quickly as possible, information that could be representative of the whole body as a unit.

We suggest that, for the movement of the whole body, the subject must have some particular bodily points of reference. Our hypothesis was that the subject has one or more bodily points that act as perceptual focal points in the regulation of the spatial position of the body at rest and during movement. These hypothesized bodily points could be perceived visually or kinesthetically. We suppose also that there are individual differences in the choice of the bodily perceptual points. We think that bodily perceptual focal points, if present, are not easily detectable because they act automatically and in unconscious ways. So, it was necessary at first to make subjects aware of the possibility of their presence giving particular instructions (see procedure). The instructions make subjects only aware of the possibility of the presence of this point. Subjects were asked to say if they observe their presence. Finally, we hypothesized that the bodily focal points act as organizers also of the postural attitude and that, if we ask the subject to change the bodily area used as focal point, important changes in the subjective feelings of tension, pleasure, and stability would occur. These last phenomena were examined using self-rating scales.

Method

Participants

The research participants were 21 women (age *M*: 22.8, *SD*: 3.14) and 19 men (age *M*: 22.5, *SD*: 2.0) who were undergraduate students in psychology.

Procedure

The subjects sat at an upright station and received the following instructions: "Do you know what the bow of a boat is? When the sailor must move a boat, he looks at the bow to orient the boat in the selected direction." When the subject answered positively, the experimenter presented different stimulus-situations.

Situation A: Perception of body focal points during imagined *movement.*—The instructions were to "try, please, to imagine your body. Can you observe if moving in the space, you utilize some points of your body like the sailor does the bow of his ship, to control and regulate the direction of the bodily spatial displacement? You can try to answer to this question by imagining you turn your body toward the right and left areas of the space. Then you will say if you have observed during movement the presence of bodily parts used as bow, and what those areas are." Then the subject was asked to close the eyes and to perform the suggested instructions.

Situation B: Perception of body focal points during actual and concrete *movement.*—The instruction was "now note please if there are some bodily areas used as the bow when you turn your body toward the right on the left part of the space and then say to me if you also observed the presence of bodily reference points."

Situation C: Perception of body focal points suggested by the experimenter.—In this situation the subject was asked to imagine a movement of spatial rotation of the body utilizing as bodily reference points some specific parts indicated in a random order by the experimenter. The suggested areas were shoulders, navel, chin, sternum, and nape of the neck. After each suggestion, the subject was invited to give an evaluation of the experience by rating his subjective feeling of instability, pleasure, and tension for each.

The evaluation was made for each emotional condition on a 10-point scale where zero indicates the absence and 10 the maximum of feeling.

Results

In Situation A (imagined movement) subjects who observed the presence of focal perceptual points were 16 men and 18 women; in Situation B (actual and concrete movement) these were 15 men and 16 women. The bodily areas used as reference points in the "imagined movement" were, for men, the nose (3), the sternum (3), the arms (2), the feet (2), the front (1), the eyes (1), the pelvis (1), abdomen (1), hands (1), and the shoulders (1). The self-reported reference points for women were the eyes (6), front (3), nose (3), feet (2), navel (1), arms (1), pelvis (1), and the legs (1).

In the actual and concrete movement conditions, men reported using the sternum (3), shoulders (3), pelvis (2), feet (2), eyes (1), arms (1), nose (1), abdomen (1), and central axis of the body (1) as references, and women

reported using eyes (3), legs (3), front (2), pelvis (2), feet (2), nose (1), arms (1), shoulders (1), and thighs (1).

In Table 1A and 1B are means and standard deviations for the subjective reports of feelings of instability, pleasure, and tension during the perception of movement following the suggestion of bodily reference points by the experimenter. For the whole group statistically significant differences appeared among the ratings for the different focal points. The difference was present for the ratings Instability and Pleasure (analysis of variance for repeated measures, $p<.05$). For men, statistically significant differences appeared for scores on Instability only between the nape and shoulders (value of Student t_{18} for dependent means was 2.18 ($p<.05$). For the group of women differences appeared between ratings for the nape and sternum and between the nape and shoulders [values of Student t_{20} for dependent means were, respectively, 2.38 and 2.45 ($p<.05$)].

TABLE 1

MEANS AND STANDARD DEVIATIONS OF RATINGS OF INSTABILITY, PLEASURE, AND TENSION DURING PERCEPTION OF MOVEMENT FOLLOWING FOCAL POINTS SUGGESTED BY EXPERIMENTER FOR WHOLE GROUP (A) AND SEPARATELY FOR MEN AND WOMEN (B)

Suggested Focal Point	Instability		Pleasure		Tension	
	M	*SD*	*M*	*SD*	*M*	*SD*
A. Total Group						
Nape	5.1	2.4	4.7	2.0	4.8	2.5
Chin	4.2	2.2	5.4	2.2	4.0	2.4
Shoulders	4.1	2.5	6.3	2.0	3.9	2.3
Navel	4.5	2.5	5.3	2.4	4.4	2.6
Sternum	3.9	2.4	6.0	2.0	4.0	2.6
$F_{4,39}$	2.63*		5.60*		1.58	

B. Men and Women	Men		Women		Men		Women		Men		Women	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Nape	4.9	2.2	5.3	2.6	4.6	2.0	4.8	2.0	4.6	1.9	4.9	3.0
Chin	3.6	2.3	4.8	2.1	5.8	1.7	4.9	2.5	3.3	2.3	4.6	2.3
Shoulders	3.6	2.3	4.5	2.7	6.0	1.9	6.6	2.0	3.0	1.6	4.8	2.5
Navel	4.2	2.8	4.9	2.3	5.6	2.4	5.1	2.4	3.6	2.7	5.1	2.4
Sternum,	3.9	2.6	3.9	2.2	5.6	2.1	6.4	1.9	3.5	2.6	4.6	2.6
F	$F_{4,18}=1.74$		$F_{4,20}=1.5$		$F_{4,18}=1.97$		$F_{4,20}=5.63$*		$F_{4,18}=2.27$		$F_{4,20}=.33$	

*$p<.05$.

For the scores on Pleasure women showed statistically significant differences among all the suggested focal points (see Table 1B) while the group of men showed differences between the nape and shoulders and between the chin and nape [values of Student t_{18} for dependent means were, respectively, 3.85 and 2.18 ($p<.05$)].

For scores on Tension no statistical differences appeared for the whole

group, but some differences appeared for the men between the nape and shoulders and between the nape and chin [values of Student t_{18} for dependent means were, respectively, 3.45 and 2.15 ($p < .05$)].

Pearson Correlations

In Table 2 are the correlations among the emotional ratings for each of the suggested points. Instability and Pleasure ratings are negatively correlated for the chin and the sternum. Instability and Tension ratings are positively correlated for the nape and the chin. Tension and Pleasure ratings are not correlated.

TABLE 2
PEARSON CORRELATIONS OF RATINGS OF INSTABILITY, PLEASURE, AND TENSION FOR WHOLE GROUP BY SUGGESTED FOCAL POINT ($N = 40$)

Suggested Focal Point	Instability/ Pleasure	Instability/ Tension	Pleasure/ Tension
Nape	−.26	.51*	−.26
Chin	−.47*	.65*	−.35
Shoulders	−.33	.22	−.24
Navel	−.43	.40	−.31
Sternum	−.46*	.37	−.28

*$p < .05$ (with Bonferroni correction).

DISCUSSION AND CONCLUSION

Our results seem to confirm the hypothesis of the existence of bodily focal points that represent perceptual points the subject uses in organization of his postural tonic responses and his spatial movements. Results indicate also that focal points are present in both real and imagined movements.

These results amplify our concept of Body Image and Body Schema. We consider at first Body Schema as a subcomponent of the Body Image. The construct of Body Image is both the result of a "neurological synthesis" of the afferent sensory input *from* the periphery of the body and a central cortical model controlling the postural attitudes expressed through the muscular activity of the periphery of the body to maintain a relatively stable correspondence between cortical image and bodily attitudes. So, Body Image is the cortical representation of the bodily activity. On the other hand, some aspects of the bodily activity (cf. muscular tone related to the postural attitudes) are the reproduction of some aspects of the cortical image. Following this model, we hypothesized that specific bodily focal points play a particular role among these afferent signals: they are important for the postural and motoric activity of the whole body considered as a unit.

The second important result indicated that there are gender and individual differences in the choice of bodily areas used as focal points. For example, in the "real movement" condition, men chose the sternum and

shoulders mostly, while the women preferred the eyes and the legs. For the "imagined movement" condition, men chose the nose and the sternum, women the eyes and forehead.

The third important result is that, if we asked subjects to assume other unusual bodily perceptual points suggested by the experimenter, interesting changes in subjective ratings of Instability, Pleasure, and Tension appeared.

This last observation is consistent with a model (Ruggieri, 1988) that emphasizes in Body Image construction not only the representation of bodily activities but also the linked experience of pleasure. As indicated in the introduction, for us, the experience of pleasure is strictly related to bodily changes in both somatic and vegetative domains (Ruggieri, 1988). The experience of pleasure occurs when the subject synthetizes and integrates the neurological afferences from the different areas of the body at which particular forms of muscular activity take place. The experience of pleasure is the result of the synthesis of sensorial afferences. In particular, for us, an important role is played in this process by the proprioceptive modification produced from the tonic or phasic activity of the muscles. Because we hypothesize that changes in the choice of the bodily focal point determine also changes in postural attitudes with modifications of the tonic activity of the muscles of different districts, it is easy to interpret the modification of the subjective feeling of pleasure. The phenomenon of variations in subjective feeling of pleasure is, following our data, very evident and refers to the whole group for each suggested focal bodily point. Then, our analysis refers also to the subjective experience of stability-instability as related to displacements of bodily focal points. The variations in subjective feelings of tension are not evident for the whole group but positive correlations between tension and instability that appeared only for some points would be of interest. In conclusion, it is important to observe that changing habitual bodily focal points actually modifies the postural equilibrium of the body. Body Image-Schema using the new bodily perceptual points expresses through different muscular patterns concrete postural modifications.

These results are coherent with our model (Ruggieri, 1984, 1988) which hypothesizes that emotional feeling and mood are dependent on the peripheral input from the bodily activities related to different patterns programmed by the central nervous system.

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