Relationship among personal space, body image, postural balance regulation and proprioceptive integration areas

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Abstract: In the present research we have examined 30 female undergraduate psychology students, in order to explore the relation between the perception of the so called Personal Space and some processes related to the body image and to some mechanisms hypothetically involved in the regulation of the postural balance, postural attitudes and proprioceptive muscular integrations. The personal space must be distinguished from the interpersonal one and should be considered as the space that subjects perceive around themselves as a well defined area measurable in cm2, as a structural component of the relationship body-environment.

Metaphorically it could be defined as a "*garden around the house*". About the proprioceptive integration area, clinical researches showed that bodily muscular tensions involved in the organization of postural balance, converge in specific areas of the body developing an irreplaceable support function. The postural balance and the level of tension of the proprioceptive integration area were examined through a baropodometer. Discussion is made about the interesting results that appeared between the different examined variables.

Relazione tra spazio personale, body image, regolazione dell'equilibrio posturale e aree di integrazione propriocettiva.

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Abstract: Nella presente ricerca abbiamo esaminato 30 studentesse della facoltà di psicologia, al fine di esplorare la relazione tra la percezione del cosiddetto Spazio Personale, alcuni processi relati alla body image ed alcuni meccanismi ipoteticamente coinvolti nella regolazione dell'equilibrio posturale, degli atteggiamenti posturali e dell'integrazione muscolare propriocettiva. Lo spazio personale deve essere distinto da quello interpersonale e deve essere considerato come quello spazio che i soggetti percepiscono attorno a loro stessi come un'area ben definita e misurabile in cm2, in quanto componente strutturale della relazione corpo-ambiente.

Metaforicamente esso può essere definito come un "*giardino attorno alla casa*". Per quanto concerne l'area di integrazione propriocettiva, ricerche cliniche hanno

dimostrato che le tensioni muscolari corporee coinvolte nella organizzazione dell'equilibrio posturale, convergono in specifiche aree del corpo sviluppando una insostituibile funzione di sostegno-supporto. L'equilibrio posturale ed il livello di tensione nell'area di integrazione propriocettiva sono state esaminate attraverso un baropodometro. L'articolo riporta le riflessioni avanzate a partire dagli interessanti risultati apparsi tra le diverse variabili esaminate.

PERSONAL SPACE, MODULATION OF BODILY TENSIONS AND PRESSURE, AND BODY IMAGE

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In the present research we want to esamine some psychophysiological mechanisms in constructing a particular spatial experience, i.e. the **PERSONAL SPACE** . We hypothesize a relation between Personal Space, postural attitude (mechanisms of their organization) and Body Perception.

WHAT IS A PERSONAL SPACE?

In a previous research we singled out that around subjects a well definited spatial area is present, as a spatial globus involving each subject.

At rest, subjects are not conscious of this area but they become aware of that if the experimenter gives the following instructions: *"each human is placed in an infinite space. In concrete some subjects say that he/she recognizes a particular, definited area. If you place yourself in the center of this room, do you think that a personal space is present?"*

If the subject answers positively, the experimenter says: "*could you define the limits of this area?"*

The experimenter measured whit a rule, the distances between subjects and the edge of the personal space, considering eight horizontal directions releaved at the level of the xiphoid apophysis of the sternum: one forward, two laterally (right and left); one posterior and four obliquous (right and left side of the body, forward and backward).

So, the Personal Space is objectively measurable.

One the basis of those measures the experimenter elaborated the total area of the Personal Space of each subject. This form of Personal Space should not be confused with the interpersonal space described by the non-verbal literature.

About the psychophysiological mechanisms in constructing spatial experience, there are different functions interacting each other, placed: 1) at the encephalyc level and 2) at the periphery of the body, in particular through the organization of the somatic muscular tension.

In the present research we want to consider essentially the so called peripheral level of muscular tonic organization of **HABITUAL POSTURAL ATTITUDES** of subjects, because the experience of space is **ALSO** a **PROJECTION** of the bodily experience (not only a problem of the organization of the visual experience).

About the organization of a postural attitude we will consider two aspects:
1) the **PROPRIOCEPTIVE SUPPORTING INTEGRATION POINT**
2) the **PRESSURE ON THE FEET MEASURED THROUGH A BAROPODOMETER**

In a further research we will present data about the myographic activity in order to complete the study on the muscular distribution tone implyed in a postural habitual attitude.

About the brain level we do not consider now all the cerebral neurophysiological activity of the regulation of the muscular tone but only the **BODY IMAGE.**
Body image is considered as a neurological activity of the parietal lobe not separable from the body scheme and from its subcortical regulation.

About the **PROPRIOCEPTIVE SUPPORTING INTEGRATION POINT,** clinical observations suggested that subjects have habitual postural attitudes that are the result of the distribution of the tensions of the body i.e. of the tonic activity at rest.

In previous researches (Ruggieri, Giustini, 1994) we observed that, in the habitual posture, subjects present important differences in the tone of

muscles of different bodily districts. The tone level was correlated with individual interpersonal contact style and with the modulation of emotions.

So it is evident that muscles have different roles in the organization of bodily static and in posture.

Some muscles, we think, have a determinant role of *support* and they can also act as an area or a point of confluence of bodily muscular tensions. In this way this points are representative of muscular tension distribution giving determinant informations (proprioceptive) for the central nervous system in regulation of total postural attitudes.

We have examined the presence of an hypothetical PROPRIOCEPTIVE SUPPORTING PERCEPTUAL INTEGRATION POINT (P.S.P.I.P) in:

(A) the **BASAL CONDITION**,

(B) searching a **PROPRIOCEPTIVE SUPPORTING PERCEPTUAL INTEGRATION POINT (P.S.P.I.P).**

The researchers asked: "*do you think, concentring on yourself, that there is a part of your body having a determinant role in your standing up, like a bodily point of confluence and support of all tensions".*

If subjects answer "*yes*" they were asked to indicate where. We called this condition: **SEARCHING POINT SITUATION**

(C) Then the experimenter asked: *"now, please, can you concentrate on the point you individuated for a time starting from my starting verbal signal to my stop?"* We called this: **EXPERIENCE OF *HABITUAL* PROPRIOCEPTIVE SUPPORTING INTEGRATION POINT SITUATION CONSCIOUSLY RELEAVED by the subject.**

(D) Then the experimenter said:"*if you had to imagine to loosen this point, what should happen in your feeling and imagery?*". We called this: ***LOOSENING* THE HABITUAL PROPRIOCEPTIVE SUPPORTING INTEGRATION POINT SITUATION.**

Subjects were asked to indicate changings in his/her emotional condition eventually present (writing it on a paper).

(E) In the last condition the experimenter asked subjects if they were able to place **THE PROPRIOCEPTIVE SUPPORTING PERCEPTUAL INTEGRATION POINT** on the abdomen, about three centimeters over the umbilicus (**OVER-UMBILICAL**).

In conclusion we measured the Personal Space in three situations: BASAL (A)

HABITUAL (C)
OVER-UMBILICAL (E)

In all five situations (A, B, C, D, E) we measured the **PRESSURE** of the right and left foot.

For the BODY IMAGE we used the BODY IMAGE TEST that measures the intensity of visual and cenestetic (feeling) of the mean value of all one's own bodily districts indicated in the presented male/female picture of the test.

SUBJECTS:
All the examined subjects were undergraduated right handed, females psychology university students, aged from 19 to 25 years.

RESULTS

1) The personal space was individuated by 24 of the 28 total subjects in the basal condition = **85.71%**

ANOVA Table for personal space anova

	DF	Sum of Squares	Mean Square	F-Value	P-Value	L
Subject	27	21,638	,801			
Category for personal space anova	2	,164	,082	1,974	,1488	
Category for personal space anova * Su...	54	2,242	,042			

Means Table for personal space anova
Effect: Category for personal space anova

	Count	Mean	Std. Dev.	Std. Err.
personal space a	28	,455	,453	,086
personal space b	28	,471	,547	,103
personal space c	28	,555	,616	,116

2) all the subjects individuated a Proprioceptive Supporting Integration Point 28/28= **100%**

2a) asking about their Proprioceptive Supporting Integration Point also other subjects (2) releaved a personal space. Total number: 26 whose
14 subjects showed an amplification of the personal space (14/28=**50%**);
10 reduced their own space (10/28=35.71%);
4 had no changes **(4/28= 14.28)**

2b) asking for changing their P.S.P.I.P. placing it two centimeters over the
umbilical zone 20Ss answered positively; 8 were not able to change it.
The Personal Space was wider for 10Ss;
smaller for 7Ss;
did not change for 2Ss.

3) the Personal Space in the three different conditions did not show statistically significant differences (see table1)

Some subjects experienced a wider Personal Space; some other subjects experienced a smaller Personal Space i.e. there are individual differences.

FEET PRESSURE

Pressure was measured in 5 conditions in relation with the Proprioceptive Supporting Integration Point (see tablet).

- the pressure on the right foot showed statistically significant differences: **F 4.17; P<0.003** (see table)

The highest pressure point on the right foot is in the condition of the habitual conscious P.S.P.I.P. that differentiated also from the condition of assuming an overumbilical Suggeste Supporting Point

The lowest level is from the basal pressure and the pressure during the suggestion of Loosening the Supporting Point)**.**

ANOVA Table for anova pressDX

	DF	Sum of Squares	Mean Square	F-Value	P-Value	Lambda	Pow er
Subject	27	36466,940	1350,627				
Category for anova pressDX	4	1396,601	349,150	4,171	,0035	16,685	,920
Category for anova pressDX * Subject	108	9039,815	83,702				

Means Table for anova pressDX
Effect: Category for anova pressDX

	Count	Mean	Std. Dev.	Std. Err.
press dx base	28	119,700	19,944	3,769
press dx ricerca pip	28	124,411	17,162	3,243
press dx pip	28	126,729	16,532	3,124
press dx sciogliere	28	118,018	20,895	3,949
press dx ombelico	28	121,250	16,829	3,180

- No differences appeared for the left foot in the 5 conditions.

- High differences appeared between the pressure of the right and left foot. The differences are statistically significant always higher in the right foot.

- The foot baropodometrical pressure are correlated with the Personal Space in different Proprioceptive Supporting Integration Point conditions. Basal Space (Personal Space A) is negatively correlated with the pressure of the right foot in searching and loosening point conditions. (see table of correlation). The same negative correlation appeared in the condition of consciously assuming the Proprioceptive Supporting Integration Point (Personal Space B).

Correlation Matrix

	personal space a	personal space b	press dx ricerca pip	press dx sciogliere
personal space a	1,000	,931	-,377	-,508
personal space b	,931	1,000	-,328	-,458
press dx ricerca pip	-,377	-,328	1,000	,814
press dx sciogliere	-,508	-,458	,814	1,000

28 observations w ere used in this computation.

- In constructing Body Image we examined two different components:

  A: the mean of the intensity of the visual perception (level of evidence of perceptual experience on a scale 0-10) of different body districts;

  B: the mean of the intensity of feeling (proprioceptive sensation) of different body districts;

- The Personal Space in basal condition and in the Habitual Proprioceptive Supporting Integration Point is positively correlated with the level of visual perception of one's own body;

- A positive correlation of the Personal Space with the level of feeling during suggestion of the Over-umbilical Integration Supporting Point was revealed.

Correlation Matrix

	spazio a	spazio b	spazio c	vedo	sento
spazio a	1,000	,926	,540	,421	,243
spazio b	,926	1,000	,498	,425	,223
spazio c	,540	,498	1,000	,365	,448
vedo	,421	,425	,365	1,000	,550
sento	,243	,223	,448	,550	1,000

26 observations were used in this computation.

Fisher's r to z

	Correlation	P-Value
spazio a, spazio b	,926	<,0001
spazio a, spazio c	,540	,0037
spazio a, vedo	,421	,0312
spazio a, sento	,243	,2346
spazio b, spazio c	,498	,0088
spazio b, vedo	,425	,0297
spazio b, sento	,223	,2763
spazio c, vedo	,365	,0666
spazio c, sento	,448	,0207
vedo, sento	,550	,0030

26 observations were used in this computation.