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# Graphic Representation of Organs ond Organ Systems: Psychological View and Developmental Patterns

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The objective of this exploratory study is to characterize by means of drawings if the developmental patterns in the graphic representation of organ and organ systems progresses related to age of participants. Secondly, whether there is an integration of sex organs into the internal body image. The drawings representing the inside of the body in the conception of 396 Brazilian children of both sexes aged 5 to 11 year-olds and 237 adolescents boys and girls of ages 12 to 14 year-olds were classified according to a guide for qualitative scoring criteria. The relationship between age and drawings was found consistent with developmental patterns. The integration of sex organs into the drawings representing body images, were equally evident with pre-adolescents of both sexes and are discussed both on the perspective of psychoanalytical theory and mental models.

*Keywords*: Drawings, Mental Models, Organs & Organ Systems, Sex Organs, Development Patterns

## INTRODUCTION

Our understanding of how children become progressively aware of the development of their body scheme were contributed by classical studies carried out mainly by Piaget (1952), Gellert (1962), and Zazzo (1948). Drawings of the human outline by children and adolescents have been adopted in psychological, development of body image, and emotion studies, and seems to follow precise development patterns (Di Leo, 1970a; Cox, 1997b; Van Kolck, 1981; MacPhail & Kinchi, 2004).

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Traditional psychoanalytical theory has viewed sexual development in terms of fantasies and sensations given substantial importance to libidinal drives and erogenous zones on the human body. It has postulated that the human sexuality obeys significant laws and that the anatomic sexual differences between individuals may have psychic consequences (Stoller, 1993; Roudinesco, 2000; Lima, 2002).

S. Freud defined the Ego as primarily, a corporeal ego once the limits between the self and no-self are initially established with sensorial, affective and motor experiences. (Bloss, 1988; Dolto, 1984; Freud, 1923/2000).

The body image is defined by the lived-body, throughout the affective experiences and the perceived-body when it is involved with the tactile and kinesthetic sensations, through the corporeal schema (Le Bouch, 1986).

***State of the literature***

- There is scarcity of studies that revealed how knowledge of human inner organs is depicted by drawings related to pupils´age in different cultures.
- Few studies connect psychoanalytical theory and developmental patterns with graphic representation of human organs and organ systems.
- Published papers pointed out that the general public has a confusing knowledge of the anatomy and physiology of human sex and reproductive organs.
- Pupils and adults still have difficulties into integrationg sex organs representations in their body image.

***Contribution of this paper to the literature***

- This is the first study conducted in Brazil whose analysis adopted a grade scheme and elicited mental models on the perspective of Luquet´s "intellectual realism".
- Schools should improve their practices representing human organs and organs systems, having in mind further integration of biological, social and affective aspects in their curricula.
- These findings suggest that pre-service and in-service teachers should be provided with outreach courses to clarify the shortcomings of their content knowledge of the human body.

For Lacan, (1998) in the beginning of life, the child experiences his or her body as a disrupted entity and only with experiences and the interchange with the world he or she will experience it as it is unitary. The recognition of his or her own image promotes a feeling of unification. This is the base for the constitution of the corporal image itself.

The conscious body experiences sensations either from the unconscious and or from the external world. This difference between the inner and the outer world, the anatomic and the psychic reign generates a cleavage, where the distinction of what is perceived is not what is impressed on the psychic level (Harris, 1998; Andrade, 2003). That is a reason why the body image in not a simple outstanding projection, but it is a mind interpretation and imprint of the person´s idea of their own image. Thus, the inner body image is the image a person has of his or her own internal body, organs and systems, as well as its functionalities.

A contemporary approach has stressed the meaning of the perception of an "inner space" that is shaped based on the body schema until the establishment of an inner body image. For girls, the "inner space" comprises the primitive idea of the female genitals, such as the vagina, clitoris, uterus, ovaries and Fallopian tubes. These define the cavity covered by internal structures and included in the whole body image (Erikson, 1964; Hägglund & Hägglund, 1978; Hägglund, 1981). The psychological basis for girls' genital inner space is present in the early stages of psychosexual development. Some authors confirm that not only girls but also boys have an initial knowledge of the meaning of vagina (Breen, 1998). However, some authors have postulated that as the body image is a reflex of the physical state and once the female genital organs are in an invaginate shape, its anatomic structure prevents its sensorial, visual and tactile access making the observation of her sexual organs less concrete and direct as are to boys (Bloss, 1988; Gibeault, 1998; Bernstein, 1998; Brandão, Aranha, Chiba, Quayle, de Lucia, 2004).

The consistent study of the development of internal body image owns a great deal to early concepts proposed by Schilder & Wechesler, (1935). More recently the interior of the body was investigated on male adults by Tait & Acher (1955) and in children and adolescents using the technique of drawings by Gellert, (1962); Brumback, (1977) in different cultures Steward et al., (1982), with deaf children Gibbons (1985) as well as in cross-section studies with children and adolescents (Amann-Gainotti, 1988; Nenci, Di Prospero, & Amann-Gainotti, 1989; Amann-Gainotti & Antenore, 1990).

On the other hand, a more clinical concern is expressed on numbering and identification by means of labelling the internal body parts (Porter, 1974; Williams, 1979; Bibace & Walsch, 1981; Glaun & Rosenthal, 1987; Schmidt, 2001). A literature review of children´s understanding and knowledge of their bodies was identified (Frändberg, Aldman, & Hjorth, 2004).

Drawing as a research technique is an useful tool to probe understanding and collect large amount of data without disturbing participants during their regular class activities. Most of the methods adopted emphasize that participants express their opinions on certain topics by writing or talking in the interviews. The latter has an inside-process limitation which might influence those participants (especially pupils) who are introspective, or not well articulated in conversation with a stranger interviewer. Drawing also allows spontaneous representations without a massive resistance interception once it may act as mediator, permitting the expression of conscious and unconscious contents. Therefore, among other goals, drawings depicted human figures done by children Goodnow, (1977); Cox, (1993a, 1997b); van Kolck, (1981) as well in different cultures. For instance, Prokop & Fancovicová, (2006) investigated undergraduate students´written responses and drawings in Slovakia, Cox, Perara, Koyasu, & Hiranuma, (2001), evaluated psychological aspects with adolescents, Eng, (1954 ), verified

development of body image and emotion, Di Leo, (1970a; 1983b), the interprettion of children´s drawings, on women´s sexual organs Blum, (1978); and Nenci et al., (1989). All approaches seem to follow a precise development pattern related to age.

However, there is a scarcity of studies that systematically examines how knowledge, as revealed by drawings of organs and organ systems, depend on participants age (Cuthbert, 2000; Reiss & Tunnicliffe, 2001; Reiss et al., 2002; Gatt & Saliba, 2006; Óskarsdóttir, 2006). We examine and classified according to a scale of values the pupils´ drawings as a means of investigating a school-based experience, namely the human body. The goal of this study, adopting a cross-sectional approach, is to investigate qualitatively the developmental patterns through visual representations, seeking what children and pre-adolescents think is inside themselves. What they believe is inside themselves is represented as their mental model i. e. a mental representation of an object or event (Gentner & Stevens, 1983; Johnson-Laird, 1983; Glynn, 1997; Borges; 1999; Krapas, Queiroz, Colinvaux, & Franco, 2001). Mental models only exist inside the mind of the subject. However, they can be collected as express models by means of drawings (Buckley & Boulter, 2000).

We are unaware of any other study carried out in this perspective in Brazil.

### Research questions and design

The main purpose of this exploratory study is:

*To investigate whether graphic development patterns in the representation of organ and organ systems are related to the age of the participants in this sample.*

*To evaluate whether there is an integration of sex organs into the internal body image drawn.*

### Sample

Fieldwork was carried out in southern Brazil in Curitiba city, Paraná State at two Schools of Infancy Education (kindergarten) and at two state funded (non fee paying) Secondary Schools. The first group comprised 396 Brazilian children from both sexes ranging in age from 5 to 11 years old. The second group was formed by 237 Brazilian pupils of both sexes aged 12 to 14 years old. All participants were attending public (non fee paying) schools in classes corresponding to their ages.

### Procedure

The data was collected at the school premises. Pupils were told to write their first names, age, and gender, with a black pencil on the top of an A4 sheet of blank paper. Then, they were asked using the pencil to draw what they thought was inside them taking themselves as models. Pupils were not examined under formal examination conditions but were told to perform the drawing by their own, without copying from their close classmate drawing.

They were given 10 to 15 minutes to complete the drawing. Many pupils spontaneously labelled the internal biological structures represented on the outlines.

The teacher wrote labels on the drawings for the 5 and 6 year-olds pupils (kindergarten) when requested, but only the exact words in places on the outline pointed by the children. The fieldwork was conducted in whole class settings.

The Ethical Research Committee of the Higher Education Institution approved the main goals of the present research project. All data were collected subjected to the full consent of parents, teachers, head masters, and principals of all educational institutions involved in the project.

### Data Collection and Analysis

A total of 633 drawings were collected. Scoring of the drawings to evaluate the different levels of the biological internal structures attained by these pupils sample, was done independently by the first two authors, following criteria developed in the ranking protocol formulated by Amann-Gainotti & Antenore (1990) and presented on Table 1.

### Developmental trends

Drawings of both groups of participants were examined carefully and scored by the raters, taken as a guide the scale of levels described in Table 1. Table 2 indicates the distributions of the drawings of children (kindergarten to primary school). Table 3 represents the level attained by adolescents (12 to 14 year-olds).

The researchers classified the drawings of children and adolescents according to a level on a descriptive manner. The drawings of the inside the body made by children and adolescents are distributed according to levels 1 to 4b.

It was noticed in children a reduction in graphic representation of levels 1 and 2 and a progressive increase towards levels 3a. to 4b. This has not occurred at the age of 7 years-old, when the level 3a has decreased instead. This may be related with the changes that are presented in the end of the Oedipal Phase that happened in the final of the early childhood, when the children may reorganize his/her new "maturity status". The same situation has happened at 11 years old, when children must again be faced with a new organization of body image once they are moving from childhood to adolescence.

**Table 1. Qualitative scale adopted to score the biological quality of each drawing considering the representation of a body organ or organ system**

| | |
|---|---|
| LEVEL 1 | Scattered organs without an outline of the body. Internal organs inside or outside the body outline. Participants appear not to understand the instructions given. [Figure.1,a,b, c] |
| LEVEL 2. | One or more internal organs placed at random inside body walls. Drawings may include external parts (hair, navel) or decorative elements (flowers, ear-rings). [Figure. 2, a,b]. |
| LEVEL 3a. | Four or more internal organs placed inside body walls without appropriate positions. External or decorative elements often absent. [Figure. 3]. |
| LEVEL 3b. | Four or more internal organs placed inside body walls with approximately appropriate positions, no organ system connection. [Figure 4] |
| LEVEL 4a. | Representation of organ systems but in a partial or non-functional way. [Figure. 5, a, b]. |
| LEVEL 4b. | At least one organ system indicated (e. g. respiratory: two lungs, two bronchi, windpipe which joins to mouth and/ or nose). [Figure. 6]. |

**Table 2. Levels of representation of inside the body organ or organ system achieved by children in percentage (%)**

| Level/age | 5 (n=99) | 6 (n=78) | 7 (n=20) | 8 (n=36) | 9 (n=38) | 10 (n=37) | 11(n=88) | N (Σn) | % (N/396) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 46.5 | 20.5 | 50.0 | 11.1 | 26.4 | 29.7 | **35.2** | 128 | 32.32 |
| 2 | 48.5 | 39.7 | 30.0 | 38.9 | 23.6 | 29.7 | 25.0 | 141 | 35.61 |
| 3ª | 3 | 37.2 | 15.0 | 36.1 | 44.7 | 24.3 | 19.3 | 91 | 22.98 |
| 3b | 2 | 2.6 | 5.0 | 2.8 | 2.6 | 0 | 12.5 | 18 | 4.55 |
| 4a | 0 | 0 | 0 | 2.8 | 0 | 0 | 3.4 | 4 | 1.01 |
| 4b | 0 | 0 | 0 | 8.3 | 2.6 | 16.2 | 4.5 | 14 | 3.54 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 396 | 100 |

Note: *n indicates number of pupils.*

**Table 3. Levels of representation of inside the body organ or organ system achieved by early adolescents in percentage (%)**

| Level/age | 12(n=75) | 13(n=97) | 14(n=65) | N(Σn) | % (N/396) |
|---|---|---|---|---|---|
| 1 | 30.7 | 22.7 | 21.5 | 59 | 25 |
| 2 | 21.3 | 16.5 | 23.1 | 47 | 20 |
| 3a | 34.7 | 21.6 | 21.5 | 61 | 26 |
| 3b | 2.7 | 3.1 | 3.1 | 7 | 3 |
| 4a | 2.7 | 16.5 | 10.8 | 25 | 11 |
| 4b | 8.0 | 19.6 | 20.0 | 38 | 16 |
| Total | 100.0 | 100.0 | 100.0 | 237 | 100 |

Note: *n indicates number of pupils.*

The drawings achieving level 4b which refers to an "organ system" are mainly observed with participants of 10 years of age or older.

In addition, the results indicate a relative difficulty into putting the internal organs inside the contour of the human body. Placing the internal organs occur outside the outline of the body, which in a few cases, seems to persist up when the child is 10 years-old.

It was noticed in the pupils´ drawings about 8 to 9 year-olds that the internal organs were placed inside the contour of the body, in approximately correct positions especially when they are in the range of 10 to 11 year-olds. These developmental trends in the drawings of the inside the body made by children, were also observed in the graphic depictions of the participants in the range of 12 to 14 year-olds, but in a less linear mode as represented on Figure 2a, Figure 2b, and Figure3.

However, the levels 1 and 2 attained by the adolescents in their drawings is quite equivalent to those achieved by children, but even with few cases found when they are on their 14th years-old. The major part of the graphic representation was distributed in levels 2 and 3a. On the other hand, the distribution of the drawings which scored 4a and 4b was more frequent in adolescents than those done by children, particularly in the level 4b as depicted for example on Figure 5a,

Figure 5b, and Figure 6. At no age there was a significant difference between boys´ and girls´ drawings with respect of the type of drawing of the inside the body, neither among children nor with the group of adolescents.

**Integration of sex organs into drawings.**

An analytical description of the numbers of participants who indicated sex organs in their drawings of the inside the body is presented in Table 4. Munari et al., (1976) investigated a sample of 635 children in France, both sexes, aged 5 to 11 year-olds and observed that 18,5 % of the participants spontaneously represented reproductive sex organs, and boys were more prone to do so.

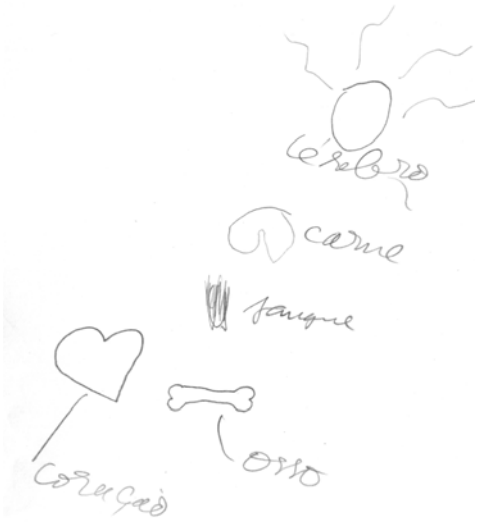


***Figure 1a.*** **A drawing by a 5 years-old girl which scored as level 1 (Captions read: cérebro=brain, carne=flesh/muscle, sangue=blood, osso=bone, coração=heart)**


***Figure 1b.*** **A drawing by a 10 years-old girl which scored as level 1 (Captions read: coração=heart, intestino=intestine, cérebro=brain, bixiga=bladder, laringe=larynx, fígado=liver, rins=kidneys, costela=rib, ossos=bones, veias=veins)**

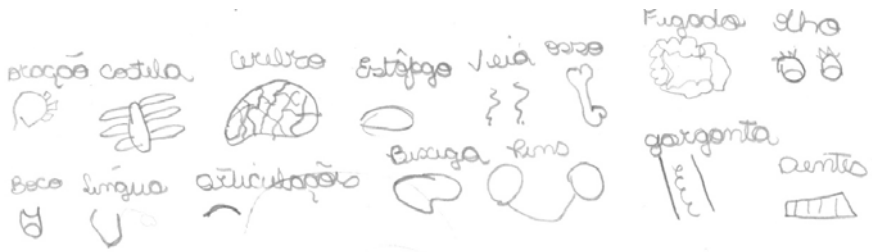


**Figure 1c. A drawing by a 10 years-old girl which scored as level 1 (Captions read: coração=heart, costela=rib, cerebro=brain, estômago=stomach, veia=vein, osso=bone, olho=eye, boca=mouth, língua=tongue, articulações=joints, bixiga=bladder, rins=kidneys, garganta=throat, dentes=teeth).**

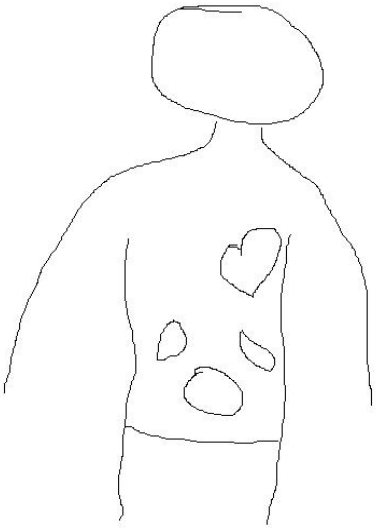

**Figure 2a. A drawing by a 12 years-old boy which scored as level 2. (Captions read: coração=heart, pulmão=lung, estôgamo=stomach)**

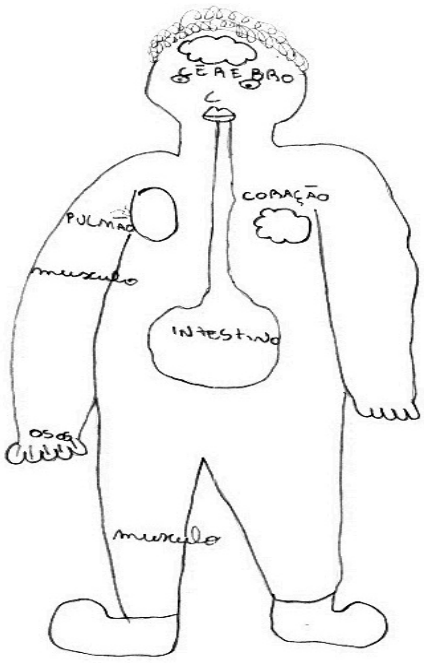


**Figure 3. A drawing by a 8 years-old boy which scored as level 3a. (Captions read: cérebro=brain, pulmão=lung, músculo=muscle, osso=bone, intestine=bowels, coração=heart)**


**Figure 2b.A drawing by a 14 years-old girl which scored as level 2 (Captions read: cérebro=brain, coração=heart, pulmão=lungs)**

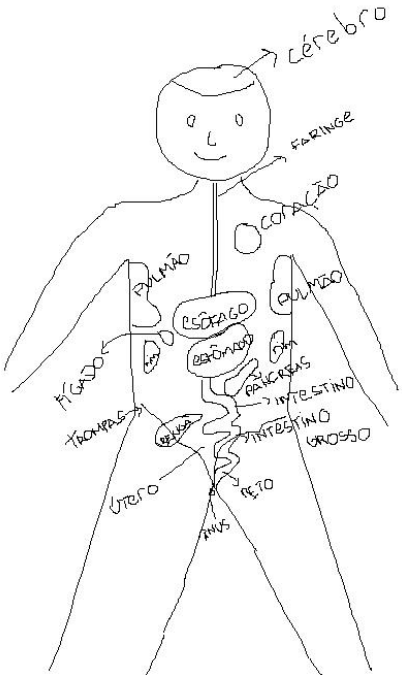


**Figure 4. A drawing by a 13 years-old girl which scored as level 3b. (cérebro=brain, pulmão=lung, coração=heart, esôfago=esophagus, fígado= liver, estômago=stomach,**
**rim=kidney, intestino intestine, intestino grosso = large intestine, pâncreas=pâncreas, reto=rectun, anus=anus, trompas= fallopium tubes, útero=uterus, bexiga=bladder).**

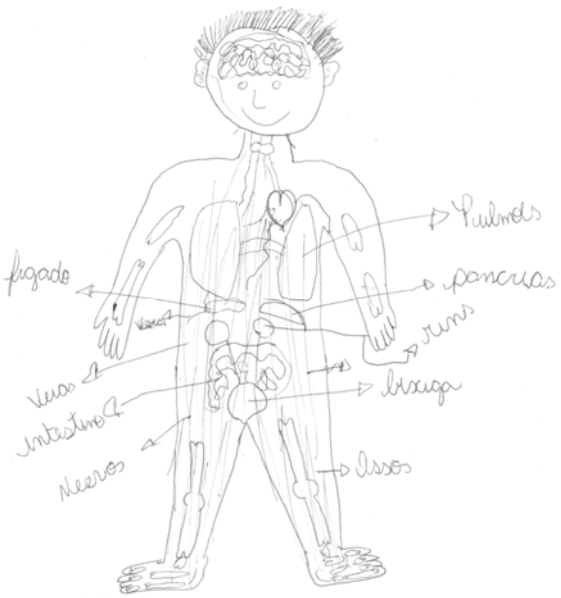


**Figure 5a. A drawing by a 11 years-old girl which scored as level 4a (Captions read: fígado=liver, veias=veins, intestine=intestine, nervos=nerves, pulmões=lungs, rins=kidneys, bixiga=bladder, ossos=bones)**

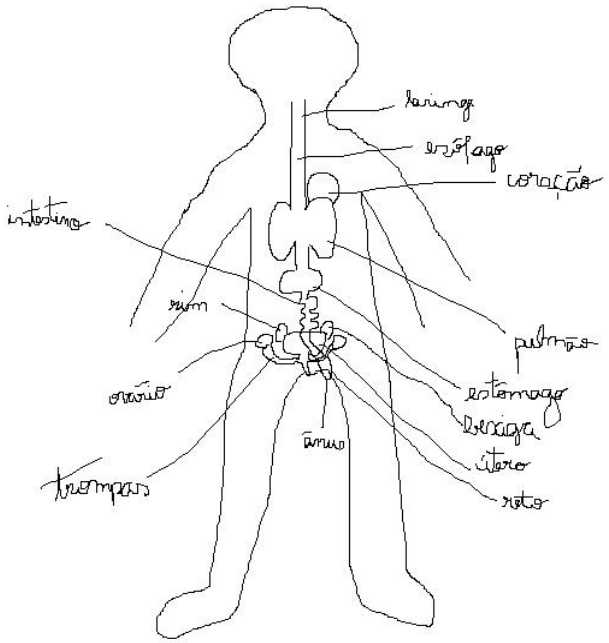

**Figure 5b. Drawing by a 14 years-old girl which scored as level 4a(Captions read:laringe=larynx, esofago=esophagus, heart=coração, pulmão=lung, estômago=stomach, bexiga=bladder, útero=uterus, reto=rectum, ânus= anus, trmpas=fallopium tubes, ovário=ovaries, rim=kidney, intestine=intestine)**

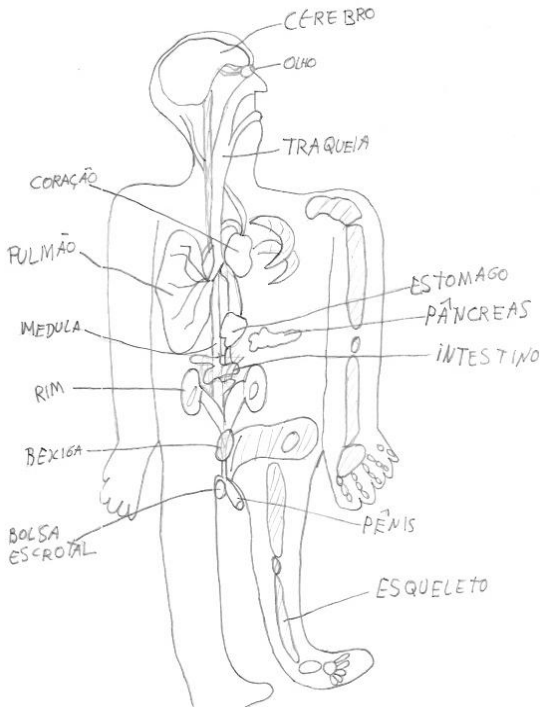


**Figure 6. A drawing by a 13 years-old girl which scored as level 4b (Captions read: coração=heart, pulmão=lung, medulla=spinal cord, bexiga=bladder, bolsa escrotal= scrotum, estomago=stomach, pancreas=spleen, intestino=intestines, pênis=penis, esqueleto=skeleton/bone)**

Amann-Gainotti, Nenci, & Di Prospero, (1989) in Italy has found in a study referring to adolescent girls´ representations of their genital inner space, that there was a progressive increase related to age in the number of participants who depicted reproductive organs in the drawings of the inside the body. In our sample, the percentage of the participants who represented genital organs started to increase with children from 9 to 10 year-olds and was more evident with those of 14 year-olds. There was a slightly reduction at ages 11 (14.8%) and 12 years-old (16%), and a slightly amplification at age 6 years old (12.8%). A previous study (Bartoszeck, Machado, & Amann-Gainotti, 2008) has found a decrease of the genital organs representation on the premenstrual phase, which occurs mainly at 12 year-olds in female Brazilian population. The slightly increase of the representation on the age of 6 year olds we hypothesize may be related to the peripheral end age of the Oedipal Phase, where the attention is focused mainly on genitals .

**Table 4. Numbers of participants in this study who represented sex organs on their drawings of inside the body in percentage**

| Age | 5 (n=99) | 6 (n=78) | 7 (n=20) | 8 (n=36) | 9 (n=38) | 10 (n=37) | 11 (n=88) | 12 (n=75) | 13 (n=97) | 14 (n=65) | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| n | 4 | 10 | 1 | 0 | 8 | 9 | 13 | 12 | 39 | 35 | 131 |
| % | 4.0 | 12.8 | 5.0 | 0.0 | 21.1 | 24.3 | 14.8 | 16,0 | 40.2 | 53.8 | 192.0 |

Amann-Gainotti, (1988) in a previous developing study also in Italy pointed out that children at the age range of 5 to 10 year-olds drew sex organs in 8% of the drawings and increased to 26,7% in the case of adolescents.

Reiss & Tunnicliffe, (2001) in a similar study carried out in England found the children of both sexes aged 10-11 year-olds, drew reproductive organs in 54% of the drawings, although they worked with a small sample of pupils.

The percentage of children who represented sex organs in their drawings in our sample started to increase between ages 9 to 10 and had a surprising increased at 13 to 14 year-olds (Table 4). Many drawings of both sexes depicted the bladder which we suspect could be an early reference to genital inner structures as found in a similar study carried out in Turkey (Özsevgeç, 2007).

## DISCUSSION

The results of this exploratory study characterizing the development of internal body image, by means of identification of organs & organs systems by participants living in a developing country in southern Brazil with a proper culture, allow some remarks.

Inspecting the drawings of the very young aged 5 to 7 year-olds revealed the same difficulties children have into drawing the human body and internal structures as previous found (Munari et al., 1976; Amann-Gainotti & Antenore, 1990; Reiss & Tunnicliffe, 2001; Manokore & Reiss, 2003). The same trend was observed on inspection of our collected data from pre-adolescents and adolescents, particularly those participants aged 11 to 12 years-old. A tendency was observed in younger participants to depict body parts externally from the body outline, as well as sometimes decorative elements, such as ear-rings, necklaces and chains.

As would be expected older children from 8 to 10 years-old and participants from 12 to 14 were more successful into placing organs and organ systems inside body walls on the outline, many on appropriate positions. However, few participants represented overall complete organ systems, particularly appearing the digestive and the respiratory systems. Probably, we may speculate that older participants had experience sessions for learning internal anatomy from basic science lessons or from visits to science museums and TV films or documentaries.

Besides, most pupils drew isolated organs instead of organ systems even those in the age range of 11 to 14 years-old in our sample. Among children the most frequent organ depicted was the heart and the brain, whereas very few drew sex organs, except when they are older than 8 years as also indicated in a similar study in Brazil, but with a smaller sample of pupils (24 pupils aged 12 and 13 years old) with few mentions of sex organs (Mokwa et al., 2005).

Several pupils, in the present study, drew the bladder, perhaps a faint reference to what they understood as part of the inner genitals. Older pupils represented in a larger percentage their sex organs (Table 4), similar to earlier observations in Italy and England respectively (Amann-Gainotti et al., 1989; Reiss & Tunnicliffe, 2001).

## CONCLUSION

The percentage of represented sex organs from our 5 to 7 years-old pupils is very limited. We advance the hypothesis that as the pupils get older they were exposed to more educational and out of school experiences and informal learning, having more ideas what comprises the human body. However, it is also important to note that most adults, still nowadays have difficulty to deal with sex organs representation and integration of their body image as well as some may have difficult to deal with sexual contents due to shame and social repression. This may also contribute to the difficulty children may have in their own representation of their body, once they have adults as a role model. Adults also educate children not only in formal settings as teachers but also in the daily life, passing them their own perspective of their experiences, ideas, conflicts, and own knowledge. A study carried out in Brazil with school teachers showed that 21% of them considered that the correct age to access educational contents in sexuality is when pupils are between 9 to 11 years old and 13% between 11 to 13 years old. This study also indicated that 45% of the teachers do not tell their students themes that involve sexuality, and 21% said that they do not know how to talk about the subject. Jardim & Bretas, (2006), pointed out, in this study, how educational themes that involve sexuality are still a difficult area for children and adolescents education.

The developmental hypothesis regarding the integration of genital inner parts in the representation of the inside the body is equally present in our findings. An increase was particularly observed with the adolescents of our sample, who spontaneously included reproductive organs in their drawings of the inside de body. However, although these representations appear in a small number of pupils, near to 10-15% for older children and having a noticeable increase, around to 50% in early adolescence, the absence of genitals representation is still reduced in all phases of life. Besides, rare are adults who really know where are localized the organs and organs systems inside their body, how they function properly, and few do not represent any genitals in drawings as it happens in previous phases of life with children.

The ordinary fellow projects on his own body a confuse knowledge, a vulgar version of the anatomical and physiological model by means of a heterogeneous simplified representation of the body (Le Breton, 1985, 1992). Men´s drawings of women´s reproductive system tended to include mainly external body parts ( breasts and vagina) in contrast to women´s representaions (vagina, uterus, Fallopian tubes, ovaries) which were more commonly depicted as indicated in an earlier study in shantytowns in southern Brazil (Víctoria & Knauth, 2001). Thus, when sexual organs are represented on the drawings made by children and adolescents, it is a contributing factor during the adolescent period to reorganize their inner body image, including the genitals in a more mature perspective (Laufer & Laufer, 1984). Therefore, schools should take advantage and practice with the representations of internal body image as a way to approach the theme and favour an integration of biological, social and affective aspects in the curriculum. However, to this end, pre-service and in-service teachers who will work with children and adolescents, should be provided with up-dating meetings to review their knowledge of human organs and organs systems, as they seem to have difficulties in particular with the circulatory and urinogenital systems (Patrick & Tunnicliffe, 2010).

A further study is planned with adolescents in our Brazilian environment and should compare timely aspects in drawings made by both sexes, since data reported in England by Reiss & Tunnicliffe, (2001) indicated that girls tended to represent and understand reproductive organs earlier than boys.

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