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Why do Children Draw Horizontal Arms on Circular Bodies in Conventional Human Figures?

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Abstract. Two accounts have been offered to explain the presence of horizontal arms on the circular bodies that often appear in conventional human figure drawings. The studies reported below, which support predictions from the radial bias account but not those from the Arnheim/Schaefer-Simmern account, suggest that a key factor in determining the angle of departure of the arms from the body might not be the child's attempt to draw the arms at right angles to the midline vertical axis of the body. Instead, the presence of horizontal arms could be due to the child's normal preference for locating the arms midway between the head and the legs combined with an equally normal preference for aligning the arms with the center of the circular body shape.

1. Introduction
The conventional human figure, which is typically drawn by children around four to five years of age, often consists of a circular head, a circular body, two legs, and two arms (Cox, 1992, 1993, 1997; Golomb, 1992; Kellogg, 1970). Of the many unresolved questions concerning the nature of this figure, one of the most puzzling is why children typically position the arms straight out from the circular body rather than down the sides. Thus far there seem to be only two accounts that have been offered to explain this phenomena, both of which lead to different conclusions.

The first account, proposed by Arnheim and Schaefer-Simmern, holds that because the overall figure (head, trunk, legs) is vertically aligned, by positioning the arms in this manner the child is able to "organize the figure along the two dominant axes . . . the horizontal and the vertical (which in turn) . . . renders the relationship between arms and the body in the visually simplest manner" (Golomb, 1992, p. 64). In favor of this account is a considerable body of evidence showing that children are strongly inclined to draw lines that are perpendicular to existing baselines (Cox, 1992, 1997; Freeman, 1980; Goodnow, 1977). Thus it could be that the arms are horizontal because children use the midline vertical axis as a baseline and then attempt to draw the arms in such a way that the arms become perpendicular to this baseline.

The second explanation derives from what might be called a radial bias account. The findings in support of this account show that children as early as three to four years of age, when confronted with a circular shape, often draw lines that radiate from the center of this shape (Kellogg, 1970; Thomas & Silk, 1990). The lines subsequently become "arms" when two are separated from the rest and the circular shape itself is recognized by the child as a "body" (Cox, 1992). The findings further indicate that children usually prefer to locate the arms roughly midway between the head and the legs (Golomb, 1992). Considered together these findings suggest that the arms are horizontal because of the child's normal preference for a midpoint starting position when drawing the arms coupled with an equally normal preference for drawing lines that radiate from the center of a circular shape.

The studies reported below were designed to evaluate these two opposing accounts. Specifically, if children are given an incomplete drawing of a vertically aligned human figure and are asked to locate the arms at different points around the edge of the circular body, the Arnheim/Schaefer-Simmern account suggests that the arms will appear at right angles to the midline vertical axis independent of where the arms originate on the body. In other words, the point of departure of the arms from the body should have no effect on the angle of departure because, according to this account, arms are positioned in such a manner so as to appear perpendicular to the body's midline axis. In contrast to this account, the radial bias account suggests that the angle of the arms will indeed vary as a function of the point of departure in that the angle selected by the children will be such that the arms are aligned with the center of the circular shape. Thus, if the arms originate near the top of the body the arms should slant upward, if they originate near the bottom the arms should slant downward, and only when the arms originate at a point midway between the head and legs will the arms remain horizontal.
Study 1

2. Participants
Twenty-one children (9 female, 12 male) attending pre-kindergarten classes in two elementary schools in London, Ontario, took part in the study. All of the children were right-handed and the mean age of the children at the time of testing was 4 years-8 months.

3. Method
Each child was presented with three drawings, administered in random order, of a vertically aligned incomplete conventional human figure. The drawings, each of which appeared on a separate sheet of paper, consisted of a circular head, a circular body, two vertical legs, but no arms. In place of the arms, dots were located on the circumference of the body at points near the top, near the bottom, and midway between the head and legs (see shape A, B, and C in Figure 1). The children, tested one at a time, were asked to draw the missing arms starting at the dots.

![Shape A](image1)
![Shape B](image2)
![Shape C](image3)

Figure 1. Incomplete conventional human figure drawings with dots located on the circular body near the top (Shape A), near the bottom (Shape B), and midway between the head and legs (Shape C).

4. Results and Discussion
Measurements were made of the angle of departure of the arms from a horizontal baseline drawn through each of the dots shown in Figure 1. To determine if the resulting angles were randomly distributed around the horizontal, or if they occurred significantly more often slanted up or slanted down, sign tests were applied to the data. As reported in Table 1, for both the left and right arm and for both the top and bottom locations, the obtained angles were highly reliable and were slanted in the predicted directions, namely, upward when the arms were drawn at the top and downward when drawn at the bottom. In contrast, the angle of departure of the arms when drawn midway between the head and legs failed to reach significance when compared to the horizontal baseline and, as can be seen in Table 1, the angles themselves were close to zero which means that the arms were indeed nearly horizontal.
Table 1. Mean angle of departure from a horizontal baseline for the left and right arm drawn on a circular body from points near the top, near the bottom, and midway between the head and legs.

<table>
<thead>
<tr>
<th></th>
<th>Left Arm</th>
<th>Right Arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>+44.7°**</td>
<td>+43.6°**</td>
</tr>
<tr>
<td>Midway</td>
<td>-3.9°</td>
<td>+2.1°</td>
</tr>
<tr>
<td>Bottom</td>
<td>-48.3°**</td>
<td>-48.3°**</td>
</tr>
</tbody>
</table>

**p<.001

In short, the outcome of this study favors the radial bias account over the Arnheim/Schaefer-Simmern account as a means of explaining the presence of horizontal arms on the circular body. Before accepting this conclusion, however, it is necessary to rule out a different way of interpreting the data. Specifically, it could be that the arms slant upward when drawn near the top and downward when drawn near the bottom not because the arms are radial extensions from the center of the circular body, but because of where the starting points for the construction of the arms were located. In other words, the same results might have occurred if the children were asked to draw arms near the top and bottom of a non-circular body, such as a square, where radial extensions are not possible. The next study was undertaken to examine this hypothesis.

Study 2

5. Participants
Twenty-four children (11 female, 13 male) attending the University of Western Ontario Preschool were employed. The mean age of the children when tested was 4 years-3 months and once again all of the children were right-handed.

6. Method
The children, tested individually, were given two sets of vertically aligned incomplete human figure drawings. Each set had two drawings apiece administered as before in random order. Also as before each drawing appeared on a separate sheet of paper. The first set consisted of the Shape A and Shape B drawings shown in Figure 1. The second set was used to examine the possibility that the angles obtained with Shape A and Shape B might not have resulted because of the circular body but because of where the dots were located on the body. Hence, in the second set of two drawings the incomplete figure consisted of a circular head, a square body, and two vertical legs with the dots appearing on the body near the top and near the bottom, respectively (see Shape D and E in Figure 2). To ensure an appropriate test of this hypothesis, the dots were located the same distances from the head and legs, independent of whether the body was circular or square (compare the distances in Figure 1 with those in Figure 2).

![Figure 2](image)

**Figure 2.** Incomplete human figure drawings with dots located on the square body near the top (Shape D) and near the bottom (Shape E).
7. Results and Discussion
Once again measurements were made of the angle of departure of the arms from a horizontal baseline through each dot and once again sign tests were used to determine if the resulting angles departed significantly from the horizontal. The outcome of this work, shown in Table 2, revealed that only in the case of the circular body did the dots near the top and bottom generate the predicted angular departures from the horizontal. When the square body was employed the dots in both locations produced arms with angles that not only failed to reach significance, but that were nearly horizontal. Thus it would seem that the controlling variable in determining whether the arms slant up or down when originating near the top and bottom, respectively, is the body shape combined with the point of departure of the arms from the body, rather than the point of departure alone.

Table 2. Mean angle of departure from a horizontal baseline for the left and right arm drawn on a circular vs. square body from a point near the top and near the bottom of the body.

<table>
<thead>
<tr>
<th></th>
<th>circular body</th>
<th>square body</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>left arm</td>
<td>right arm</td>
</tr>
<tr>
<td>top</td>
<td>+41.5° **</td>
<td>+38.9° **</td>
</tr>
<tr>
<td>bottom</td>
<td>-23.0° **</td>
<td>-25.5° **</td>
</tr>
</tbody>
</table>

** p<.001

8. Conclusion
The findings from both studies suggest that a key factor in determining the presence of horizontal arms on the circular body might very well be the children's preference for a specific starting point when drawing the arms from the body coupled with an equal preference for aligning the arms with the center of a circular shape. It is worth noting that these findings are in keeping with a growing amount of evidence which indicates that children's drawings, in general, may have very little to do with children's understanding or perception of the objects that the drawings are said to represent (Cox, 1992, 1993; Freeman, 1980; Goodnow, 1977; Kellogg, 1970). Instead, the drawings appear to be governed by certain naive preferences which, in turn, are generated by cues already on the page, and it is these cue-driven preferences which then determine the nature of the finished product.

References