

Spatial Depth Relationships in Young Children's Drawings

M. V. Cox

University of York, England

Previous research suggests that young children do not attempt to represent depth relationships between objects in their drawings. The present study, however, showed that when both objects are visible and the children's attention is drawn to the depth relationship between them, most 5-, 6-, and 7-year-olds *do* attempt to portray this relationship.

The representation in a two dimensional drawing of a spatial depth relationship between two discrete objects (i.e. one behind the other) has been studied by Freeman, Eiser, and Sayers (1977). When asked to draw one apple *behind* another, 5- and 6-year-olds drew the objects separately, side by side; 7-year-olds drew them with the further object vertically above the nearer one; children of 9 years and older drew one object partially obscuring the other to indicate depth. When the same children were asked to draw one apple *in front of* another the results were less clearcut; because the further object was drawn first, partial occlusion of the further object by the nearer one as a possible means of indicating the depth relationship is not possible without the latter appearing transparent. Nevertheless, as in the "behind" condition, the tendency to separate the apples in the drawing declined with age.

This study suggests that although the youngest children drew the two apples they made no attempt to represent the depth relationship between them. Since no model of the relationship was presented, the lack of depth relationships in the drawings may have resulted from the children's difficulty in understanding the verbal terms; they may simply not have known what it means for one object to be *behind* or *in front of* another. No information is available about whether or not young children can portray a depth relationship if they can see what such a relationship is like.

In the experiment reported here, 5-, 6-, and 7-year-olds were asked to draw one object *in front of* or *behind* another when the two objects were visible throughout the experiment. Children were divided into "in front of" and "behind" groups to ascertain any differences in performance related to the spatial terms used.

Requests for reprints should be sent to the author, Department of Psychology, University of York, Heslington, York, England YO1 5DD.

METHOD

Subjects. Subjects were 55 children aged 4;9–5;5 (Mean 5;1), 35 children aged 6;2–6;6 (Mean 6;4), and 40 children aged 7;6–8;1 (Mean 7;9). There were roughly equal numbers of boys and girls in each age group and subjects were randomly allocated to an “in front of” or a “behind” group.

Apparatus. Two plastic balls (one red, one blue) were placed on a baseboard. Paper and crayons were provided for drawing. A predrawn picture of a yellow and a green ball arranged vertically was also used.

Procedure. Each child was individually tested in a room adjacent to his classroom. The child and the experimenter sat beside each other at a table. After the child had successfully identified the colors of the two balls, the experimenter placed them one behind the other on the baseboard. To draw the child’s attention to the spatial relationship between the objects he was asked, “Which ball is in front (behind)?” (This was called the Identification Task). He was then told, “Draw a picture of them just as you see them with the red (blue) ball in front of (behind) the blue (red) one.” Children received *either* the “in front of” *or* the “behind” instruction. For each instruction, the respective position of the blue and red balls was randomized.

At the end of the session each child was shown a picture of a yellow and a green ball arranged one above the other. The positions of the balls were randomized. The child was asked to point to the ball which was in front of (or behind) the other one. Again the child received the same instruction (“in front of” or “behind”) that he had already heard in the experiment.

RESULTS

In the Identification Task, most children pointed to the nearer ball when asked which one was “in front” and to the farther ball when asked which one was “behind” (5-year-olds: [$\chi^2 = 13.03$, 1 *df*, $p < .001$]; 6-year-olds: [$\chi^2 = 21.04$, 1 *df*, $p < .001$]; 7-year-olds: [$\chi^2 = 15.14$, 1 *df*, $p < .001$]). See Table 1.

TABLE 1
OBJECT SELECTED IN THE IDENTIFICATION TASK

Age level	“In front of” instruction			“Behind” instruction		
	Near object	Far object	<i>N</i>	Near object	Far object	<i>N</i>
5-year-olds	.77	.23	30	.28	.72	25
6-year-olds	.93	.07	15	.15	.85	20
7-year-olds	.74	.26	23	.12	.88	17

In their drawings, most children drew the objects in a vertical arrangement (5-year-olds: [$z = 2.96$, $p < .001$]; 6-year-olds: [$z = -3.72$, $p < .001$]; 7-year-olds: [$z = -4.90$, $p < .001$]). Table 2 shows the percentages of children responding with a vertical and a horizontal arrangement; these results are compared with those of Freeman *et al.* (1977).

Whereas the majority of children did not draw vertical arrangements until age 7 in the Freeman *et al.* study, most children in the present study drew vertical arrangements at age 5.

Freeman *et al.* do not report any results when children were asked to draw one object in front of another. In the present study, however, the results for this instruction are similar to those for the "behind" instruction (5-year-olds: [$V = .73$, $H = .27$]; 6-year-olds: [$V = .73$, $H = .27$]; 7-year-olds: [$V = .93$, $H = .07$]).

The proportion of horizontal to vertical arrangements did not differ significantly with the type of instruction given ("in front of" and "behind").

When asked to indicate on the ready-drawn picture which ball was "in front of" or "behind" the other, most children regarded the lower object as the one in front and the upper object as the one behind (5-year-olds: [$\chi^2 = 13.29$, 1 df , $p < .001$]; 6-year-olds: [$\chi^2 = 20.57$, 1 df , $p < .001$]; 7-year-olds: [$\chi^2 = 8.94$, 1 df , $p < .01$]). See Table 3.

Generally there were no significant age trends.

DISCUSSION

When two objects are placed one behind another, not only can young children identify which object is "in front" and which is "behind", they can also make some attempt to represent the spatial depth relationship in their drawings; they draw one object *above* the other. In all cases the objects were drawn as separate; no attempt was made at enclosure or occlusion.

Freeman *et al.* (1977) found that most children did not indicate the depth relationship between two objects in this way until the age of 7 years. The

TABLE 2
ARRANGEMENT OF ONE OBJECT DRAWN BEHIND ANOTHER

Age level	Present study		Freeman <i>et al.</i>	
	Vertical	Horizontal	Vertical	Horizontal
5-year-olds	.68	.32	.33	.67
6-year-olds	.94	.06	.46	.54
7-year-olds	.84	.16	.74	.26
8-year-olds	—	—	.69	.31

TABLE 3
 CHILDREN'S SELECTION OF THE OBJECT IN FRONT AND THE OBJECT BEHIND
 IN A PREDRAWN VERTICAL ARRANGEMENT

Age level	"Which ball is in front?"			"Which ball is behind?"		
	Lower	Upper	N	Lower	Upper	N
5-year-olds	.73	.27	30	.24	.76	25
6-year-olds	.87	.13	15	.10	.90	20
7-year-olds	.65	.35	23	.18	.82	17

results of the present study, however, indicate that most 5-year-olds have this ability and can demonstrate it if the objects to be drawn are visible and the children's attention is drawn to the relationship between them.

It is suggested that young children may be more competent than they appear simply because verbal instructions given in experimental tasks are often in themselves not sufficient to enable the child to grasp the nature of the task. In other words, the procedure may become a test of verbal comprehension rather than of the ability ostensibly being tested. The child may be capable of performing the task required of him but as a result of his incomprehension or misunderstanding does something different from what has been requested by the experimenter.

REFERENCE

- Freeman, N., Eiser, C., & Sayers, J. Children's strategies in producing three-dimensional relationships on a two-dimensional surface. *Journal of Experimental Child Psychology*, 1977, 23, 305-314.

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