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Notes and Comment

A note on apparent displacement of lines and dots on oblique parallels

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In the first of three recent experiments (Day & Kasperczyk,1985), subjects were required to position a short vertical line or a dot on one oblique parallel so that it appeared vertically to bisect the space between two lines or dots on another. The stimulus figures were based on Tolansky's (1964) version of the Poggendorff figure and are shown in Figures 1A-1D. Although significant displacements from exact bisection in the expected direction for the Poggendorff effect occurred with all four figures, they were not significantly different from one another. The results for Figures 1A and 1D were confirmed in a second experiment with separate groups of subjects. In a third experiment, the results were much the same when the task was that of positioning a line or a dot on one parallel so that it appeared to be in the same vertical axis as a line or a dot on the other, a version of the Poggendorff alignment task. In a later series of experiments, Day, Watson, and Jolly (1986) showed that displacements from exact bisection occur with dots and lines alone, that is, without parallels (Figures 1E and 1F). The displacements also proved to be of about the same size as those for lines intersecting parallels (Figure 1A).

These outcomes have been interpreted in terms of a perceptual compromise between bisection (or alignment) in the vertical axis and in an axis defined by the figure itself. The figure axis is one at right angles to the oblique parallels or, in the case of Figures 1E and 1F, at right angles to the oblique orientation of the two lower elements. It is proposed that when the upper element is positioned for apparent vertical bisection, the right-angle axis "intrudes," so to speak, and causes a slight shift away from bisection or alignment in the vertical axis in the direction of bisection or alignment in the right-angle axis. That is to say, there is a compromise in perception between bisection and alignment in the two axes.

Wenderoth, O'Connor, and Johnson (1986) have taken issue with the outcomes of these experiments. They argue that although it is plausible that a perceptual compromise could occur with an all-dot display, it is less likely to do so with lines that clearly define the axis of vertical bisection. In support of this argument, they draw attention to the fact that the standard deviation is larger for the three-dot condition (Figure 1D) than for the three-line condition (Figure 1A). Wenderoth et al. therefore conducted another experiment, using 16 figures derived from the original Tolansky figure (Figure 1A). Eight had oblique parallels and 8 did not, and, of each of these 8, 4 were oriented as in Figure 1 and 4 were inverted. Instructions aided by diagrams strongly emphasized that vertical bisection was required and that right-angle bisection was to be avoided. Of 15 planned orthogonal contrasts between means, 8 involved the presence or absence of parallels and, of these, 3 proved significant. The latter involved conditions in which the single element on a parallel was a line or a dot and showed that a single line intersecting a parallel resulted in a greater displacement

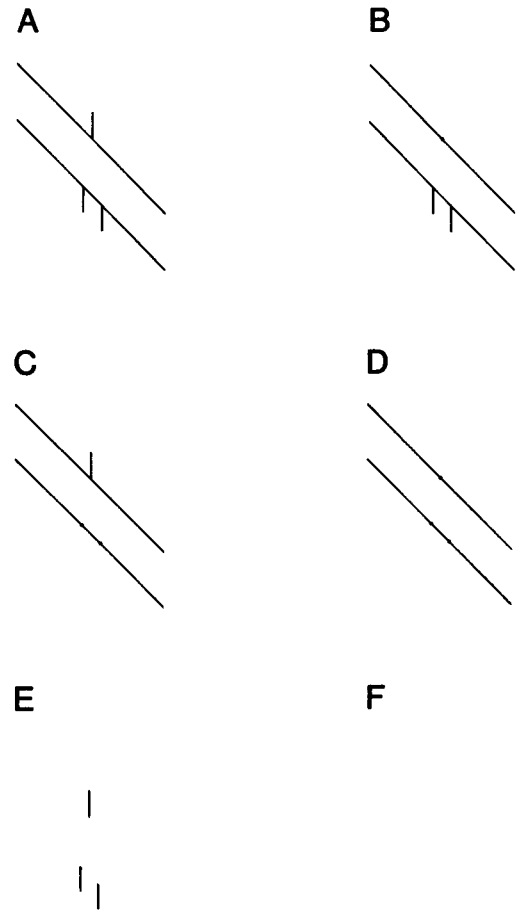

Figure 1. Stimulus figures. Subjects were required to position the upper line or dot so that it was "apparently" or "objectively" in the axis of vertical bisection of the space between the two lower lines or dots.

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from exact bisection than a single dot on the parallel. Thus, Day and Kasperczyk found no differences in apparent displacement from exact bisection between lines and dots on oblique parallels with "apparent" instructions, whereas Wenderoth et al. found some differences with "objective" instructions.[1]

Two points can be made about the two experiments. First, the emphatic instruction in the experiment by Wenderoth et al. to avoid right-angle bisection was tantamount to directing subjects to avoid a perceptual compromise between bisection relative to the two axes. If perceptual compromise, like numerous other perceptual processes, can be brought under cognitive control by appropriate instructions (see below), it is reasonable to expect that it will be reduced or eliminated by instructions to avoid it. Second, for the eight inverted figures in the experiment by Wenderoth et al., subjects positioned the *upper pair* of elements for vertical bisection by the lower element. Thus, for half the figures, an upper single element was positioned vertically to bisect a lower pair, and for half, an upper *pair* of elements was positioned so that a single lower element bisected the pair. Only the former procedure was followed in the original experiment by Day and Kasperczyk (1985). Since two of the three significant differences between means occurred with the latter procedure, it is conceivable that it was implicated in the outcome either alone or by interaction with the instructions.

To check the reliability of Day and Kasperczyk's (1985) results and to ascertain whether the two types of instructions differentially influence displacements from exact bisection, another experiment was conducted. Two groups of 12 subjects positioned the upper element in Figures 1A, 1D, 1E, and 1F, the same figures used by Wenderoth et al. Instructions were read out to subjects and clarified by reference to diagrams. If questions were asked, the instructions were read again. For the first group, the *appearance* of vertical bisection was stressed (apparent instructions). For the second group, *objective* vertical bisection and the avoidance of right-angle bisection were stressed (objective instructions). Otherwise, the apparatus, procedures, and other conditions were essentially the same as before (see Day & Kasperczyk, 1985). The results are shown in Table 1. Although the mean displacements were smaller than in the first of the three earlier experiments reported by Day and Kasperczyk, they were more or less the same as those for the second and third experiments. Although there were no marked differences between the means for the two instruction conditions, the standard deviations were consistently smaller for the objective condition than for the apparent condition. It can also be seen that the smallest means and standard deviations were those for Figure 1E, which consists of three vertical lines. Separate *t* tests showed that all means were significantly different from zero, and an analysis of variance showed that the differences in means within and between the two groups were not significant. In summary, there were no differences in displacement from exact bisection between figures with all dots or all vertical lines with or without oblique parallels. However, standard deviations were generally smaller for the objective instruction condition.

Table 1
Mean Displacements from Exact Vertical Bisection (in Millimeters) and Standard Deviations in Three Experiments for the Stimulus Figures in Figure 1

	Stimulus Figures					
	A	B	C	D	E	F
	Experiment 1					
Apparent						
Mean	1.33	1.14			.95	1.13
SD	.98	.93			.69	.82
Objective						
Mean	1.38	1.37			1.07	1.31
SD	.68	.64			.35	.40
	Experiment 2					
Mean	.66	.32	.66	.71		
SD	.65	.99	.93	.88		
	Day & Kasperczyk (1985)					
Mean	2.40	2.37	2.75	3.39		
SD	.67	.83	1.12	2.06		

As a further check, the original experiment (Day & Kasperczyk, 1985) was rerun with the original figures (Figures 1A, 1B, 1C, and 1D) but with very emphatic diagram-aided instructions to make objective vertical bisections and to avoid making right-angle bisections. These instructions were repeated from time to time during the experimental session. The results are shown in Table 1 along with those for the original experiment. It can be seen that the means were markedly smaller than originally and, in the case of Figures 1A and 1B, consistently smaller than in the experiment described above. Separate *t* tests showed that three of the mean displacements were significantly different from zero (Figures 1A, 1C, and 1D) and one was not (Figure 1B). In the latter figure, the element on the upper parallel was a dot. An analysis of variance showed that the difference between means was not significantly different. The *F* ratio (2.69) was slightly less than that (2.89) required for $p < .05$.

Considering the original experiments of Day and Kasperczyk (1985) and Day et al. (1986), that by Wenderoth et al. (1986), and those described here, the following conclusions are warranted. When subjects are instructed to position an element so that it *appears* to bisect the space between two others in figures like those in Figure 1, no differences are evident in the size of displacements from true bisection between lines (Figures 1A and 1C) and dots (Figures 1B and 1D) on the upper parallel. When subjects are *emphatically* instructed to position the element so that it objectively bisects the space and to avoid a tendency to right-angle bisection, differences between lines and dots do emerge. With such instructions, standard deviations are also reduced, suggesting less of a tendency to compromise with bisection in respect to the alternative axis.

If, as proposed by Day and Kasperczyk (1985), perceptual compromise is the basis of the Poggendorff effect and its variants, the data reported here suggest that it can be modified by instructions. This is not surprising. It has for long been accepted that both illusions (see Hochberg, 1972) and perceptual constancies (see Carlson, 1977) can be considerably modified by instructions. This is not to doubt that such stimulus-induced perceptual phenomena occur, but to recognize that they can be modulated by cognitive factors invoked by instructions. The data reviewed and reported here indicate that apparent displacement from true bisection—a variant of the Poggendorff effect—can likewise be so modulated. It is therefore likely that the compromise occurs at the cognitive-processing stage of perception.

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NOTE

1. More recently, Wenderoth and O'Connor (1987), using the same instructions as in Day and Kasperczyk's (1985) experiment, largely confirmed the results of the latter experiment and those reported by Day et al. (1986). However, they prefer to interpret their data in terms of confusion on the part of the subjects rather than in terms of a perceptual compromise between bisection in the two axes.

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