

LAST BUT NOT LEAST

Demystifying the Poggendorff: A start

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Received 10 July 2006; in revised form 9 June 2008

Abstract. As is well known, little or no illusory misalignment occurs in a reduced Poggendorff pattern which consists of only the two acute angles, a failure which has been a problem for various proposed explanations of the misalignment seen in the complete classic pattern. Happily, however, that failure (as well, more important, as the power of the classic pattern) can be explained by a theory which encompasses both pictorial height-in-scene and illusory rotation-of-the-diagonals as contributing factors.

Gillam (1971) ingeniously showed that the classic pattern for producing the Poggendorff illusion of misalignment (bold lines in figure 1a) may be seen as part of a more complex scene if certain other lines are unconsciously added (thin lines). In that event, she proposed that the perceived misalignment would be due to the fact that the right-hand diagonal is higher on its pictorial wall than is the other diagonal on its wall, a factor which can be impressively strong (Parks and Hui 1989, figure 2, but see also figure 3). One result could be that the former diagonal would then appear to intersect its vertical line at a higher point (and the latter diagonal should intersect it at a lower point) than is actually the case—a prediction which finds confirmation in data obtained more recently by Morgan (1999, experiment 6).

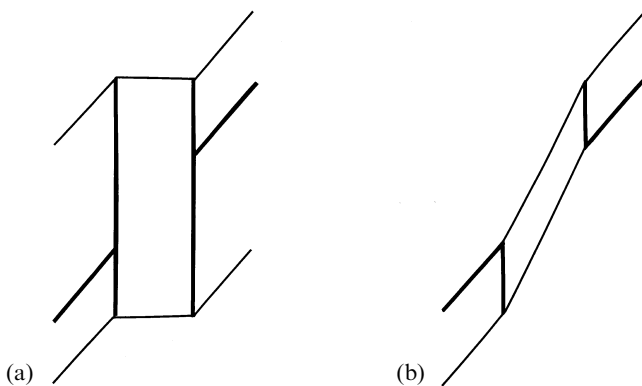


Figure 1. The classic Poggendorff pattern [bold lines, (a)] and reduced version [bold lines, (b)] along with pictorial scenes within which a viewer might subconsciously embed those patterns (thin lines). The latter are constructed according to the same rules in both cases: the upper and lower extremities of the vertical lines are connected and diagonals are extended outwards from those extremities wherever one is not already present.

Gillam also showed that a truncated version of the classic pattern—one that consists only of the acute angles (bold lines in figure 1b)—may also be unconsciously perceived as part of a similar construction (thin lines), but in this case the diagonal to the right would be lower in pictorial space than the diagonal to the left. As a result, we would expect the truncated pattern to reverse the usual direction of perceived misalignment. However, as she realized, although it is true the usual illusion does not seem to occur here (Day 1973), any reversal is unexpectedly weak.

Of course, this failure could be accounted for by the additional assumption that pictorial height is simply less potent in the second case, but that would be unsatisfactorily ad hoc. Rather, I would like to suggest that this difficulty for Gillam's proposal can be easily and completely overcome if we consider that there are other factors involved in either of the present patterns. Specifically, there is a well-established tendency for diagonal lines to appear to be slightly more horizontal than they actually are (Zehender 1899), such illusory rotation being augmented here by the additional tendency of diagonal lines to rotate towards horizontal when a vertical line segment is also present (Solomon et al 2004).⁽¹⁾ If so, the effectiveness of the classic pattern in producing misalignment in one direction and the relative inability of the truncated pattern to produce misalignment in either direction is understandable. That is, as illustrated diagrammatically in figure 2, the two effects—pictorial height and rotation of the diagonals—would cooperate in the classic pattern, but would work in opposition in the truncated case.

The fact that the present factors are, in combination, sufficient to explain the differing perceptual results of the two present patterns and, furthermore, that these same factors can also explain the relative effectiveness of various other patterns, strongly recommends this particular unified theory to our considerations.^(2,3)

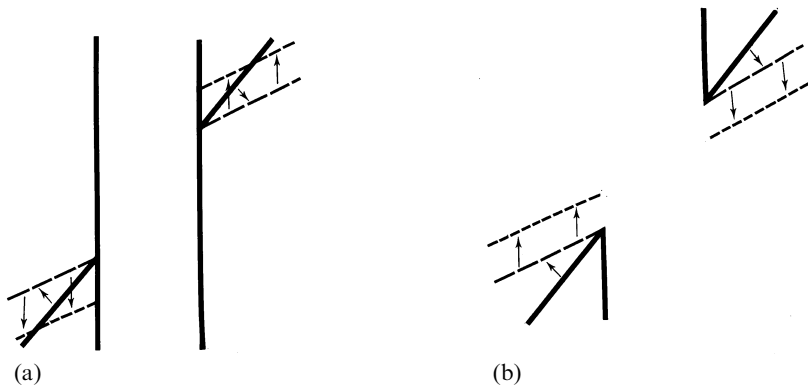


Figure 2. Illustrations of the effects (greatly exaggerated) of the proposed factors on the perceived alignment of the diagonals in the classic pattern (a) and the truncated version (b). In the classic pattern the rotation of the diagonals produces misalignment (long dashes) which is enhanced by the pictorial factor to produce even more apparent misalignment (short dashes). By contrast, in the truncated pattern the illusory misalignment produced by rotation (long dashes) tends to be counteracted by the pictorial factor, thus reducing perceived misalignment (short dashes).

⁽¹⁾ These rotational effects would, in combination, tend to produce the appearance of an enlargement of the acute angles in either of the present patterns, an expectation which is in accordance with a suggestion of Blakemore et al (1970), although not for the discredited reason they proposed (Morgan 1999, experiment 8), and, of course, not as a complete explanation of the Poggendorff (Gillam 1998, page 104).

⁽²⁾ For instance, Hotopf and Hibberd (1989) astutely observed that the reduction in the illusion that occurs when the classic Poggendorff pattern (figure 1a) is rotated 90° can be explained by the fact that the Zehender effect would then act *against* illusional misalignment. It should be noted that this suggestion stands as an important antecedent to the general approach of the present proposal.

⁽³⁾ Another factor that was considered, but rejected from this consolidated approach, was the possibility that Müller-Lyer effects increase the apparent space between the vertical lines in the acute-angles-only pattern (figure 1b) and compress that space in a pattern consisting only of the obtuse angles (not shown here). Such tendencies would, respectively, decrease and increase the classic illusion, but direct tests disconfirm the possibility that such changes in apparent inter-parallel distance occur (eg Day et al 1992).

References

- Blakemore C, Carpenter R H, Georgeson M A, 1970 "Lateral inhibition between orientation detectors in the human visual system" *Nature* **228** 37–39
- Day R H, 1973 "The Poggendorff illusion with obtuse and acute angles" *Perception & Psychophysics* **14** 590–596
- Day R H, Stecher E, Parker A L, 1992 "The Poggendorff illusion and apparent interparallel extents" *Perception* **21** 599–610
- Gillam B, 1971 "A depth processing theory of the Poggendorff illusion" *Perception & Psychophysics* **10** 211–216
- Gillam B, 1998 "Illusions at century's end", in *Perception and Cognition at Century's End* Ed. J Hockberg (Orlando, FL: Academic Press)
- Hotopf W H N, Hibberd M C, 1989 "The role of angles in inducing misalignment in the Poggendorff figure" *Quarterly Journal of Experimental Psychology* **41a** 335–383
- Morgan M J, 1999 "The Poggendorff illusion: a bias in the estimation of the orientation of virtual lines by second-stage filters" *Vision Research* **39** 2361–2390
- Parks T E, Hui L, 1989 "Pictorial depth and the Poggendorff illusion" *Perception & Psychophysics* **46** 465–468
- Solomon J, Felisberti F, Morgan M, 2004 "Crowding and the tilt illusion: towards a unified model" *Journal of Vision* **4** 500–508
- Zehender W V, 1899 "Über geometrisch-optische Täuschungen" *Zeitschrift für die Psychologie* **20** 65–117

ISSN 0301-0066 (print)

ISSN 1468-4233 (electronic)

PERCEPTION

VOLUME 38 2009

www.perceptionweb.com

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