Notes and Comment

Preference in linear partitioning: The golden section reexamined

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In its most general form, the golden section (or the extreme and mean ratio) refers to a unique and specific proportion of a geometric figure which requires that the smaller part be about 0.618 of the larger. Moreover, for a number of decades it has been held that configurations possessing such proportions have an intrinsic aesthetic quality manifesting itself in terms of preference judgments (see Woodworth, 1938).

Research on the golden section proportion as an empirically demonstrable preference has most often been applied to the rectangle where the results, on the whole, are negative (see, for example, Schiffman, 1969, and especially the review by Godkewitsch, 1974). Recently, however, the aesthetic significance of the golden section has been investigated for simple line segments (Svensson, 1977).¹ It was reported that subjects, in dividing a line, produced a ratio of the shorter to longer line segment which closely approximated the golden section (group mean setting = .633).

However, one problem with the generality of this result is that the procedure reported suggests that the subjects were instructed to partition the experimental lines into *unequal* segments. This would tend to produce a skewed distribution. (Unfortunately, the brief report did not include the exact task instructions.) At any rate, this would deny the subjects the aesthetic preference choice of bisection. Additionally, the data reported show that the main finding is one of intersubject variability with a modal preference value falling around 0.6 within a range of .5 to .7. Accordingly, the issue of line partitioning within a preference context bears further examination. In the present study, the instructions in a partitioning task did not preclude bisection, and in light of the fact that the orientation of a line segment with respect to the viewer may affect its perception (e.g., Künnapas, 1957, 1959), the orientation of the stimulus line was varied.

METHOD

Subjects

The subjects were 22 (12 male, 10 female) undergraduates enrolled in an introductory psychology course; they were unaware of the experiment's purpose.

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Stimuli

The stimuli were eight 100-mm lines, each line appearing twice in one of four different orientations: horizontal, vertical, 45°, 135°. Each line was drawn on a separate sheet of 20-cm² white paper. The eight sheets of paper were bound together to form two blocks of stimuli, each block containing a random order of the four line orientations.

Design and Procedure

A within-subjects design was employed, with each subject receiving each of the eight stimulus lines. The independent variable was the orientation of the line, and each subject made two judgments per orientation.

The subjects were presented with the stimuli and read the following instructions: "Before you are a series of lines. Your task is to divide each line with a pencil mark so that the resulting two line segments form the most pleasing proportion."

RESULTS AND DISCUSSION

For each judgment by every subject, a ratio of the shortest line segment to the longest line segment was calculated. These ratios appear in Table 1, which also indicates the mean ratio for each line orientation and block, and the mean ratio of each subject's eight judgments.

These raw data clearly indicate that there is little

Table 1
Ratios and Mean Ratios (M) of Shortest to Longest Line Segments for Each Subject (S), and Mean Ratios (M) and Standard Deviations (SD) by Line Orientation and Block

	Horizontal		Vertical		45°		135°		
	Block		Block		Block		Block		
S	1	2	1	2	1	2	1	2	M
1	.82	.92	.18	.09	.89	.02	.23	.11	.41
2	.92	.15	.39	.41	.56	.69	.52	.67	.54
3	.89	.96	.23	.25	.25	.35	.39	.38	.46
4	.69	.27	.18	1.00	.30	.25	.96	.54	.52
5	.82	.96	.27	.32	.49	.49	.28	.22	.48
6	1.00	.92	.75	.89	.64	.69	.64	.96	.81
7	.96	.96	.61	.54	.72	.79	.92	.85	.79
8	.05	.12	.03	.18	.89	.96	.96	.96	.52
9	.92	.19	.20	1.00	.56	.59	.18	1.00	.58
10	1.00	.25	.19	.05	.82	.96	.14	.43	.48
11	1.00	.03	.85	.02	.05	.02	.04	.03	.26
12	.20	.08	.28	.05	.32	.56	.25	.47	.28
13	.96	1.00	.96	.89	1.00	.89	.82	.75	.91
14	.64	1.00	.18	.22	.96	.89	.89	.19	.62
15	.96	.96	.89	.82	.96	.85	.89	.92	.91
16	.49	.16	.89	.38	.47	.92	.61	.38	.54
17	.96	.96	.79	.79	.32	.27	.85	.89	.73
18	.41	.38	.69	.01	.19	.92	.15	.39	.39
19	.96	.92	.96	.47	.92	.18	.85	.45	.71
20	.64	.43	.14	.82	.92	.18	.30	.79	.53
21	.38	.69	.33	1.00	.19	.22	.54	.06	.43
22	1.00	.92	1.00	.96	.89	1.00	1.00	1.00	.98
M	.76	.60	.50	.51	.61	.58	.56	.57	.59
SD	.284	.383	.335	.316	.213	.334	.325	.327	

agreement between subjects as to the most pleasing point of line segmentation; the frequency distribution of ratios across subjects for each condition is flat and the range of ratios is quite large. Moreover, there is little consistency or reliability in intrasubject judgments. Collectively, the results do not demonstrate a preference for the golden section or a preference for any other ratio of line segments.

With respect to Svensson's (1977) study, it is suggested that, in large part, his result is due to the effects of data averaging and, in part, illustrates the central limit theorem; specifically, the distribution of the means of sets of estimates approximates a normal distribution. Hence, and in light of the range of possible ratios, the mean or modal value of ratios obtained in a partitioning task will fall close to the golden section (especially so when bisection is disallowed). Indeed, the grand mean of the ratios presented in Table 1 is 0.59.

The present study demonstrates the need to examine a given subject's judgmental responses to determine their reliability before any further group data transformations are performed. A similar caution has been expressed by Austin and Sleight (1951), who reported that preference for triangles (whose altitude-to-base ratios varied from 0.25 to 3.00) was approximately evenly divided across subjects between the two extreme ratios; yet data averaging in this case produced a preference function

whose modal value was near the midrange of triangle ratios.

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NOTE

1. The golden section proportion as applied to line segments formally states that the total line length is to the larger segment as the larger segment is to the smaller one, or $a + b : a = a : b$, where the total line length ($a + b$) is partitioned into a larger (a) and smaller segment (b), or where a/b approximates 0.618.

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