Notes and Comment

Stimulus duration and grating persistence: An instance of the 100-msec rule?

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Recently, Bowling and Lovegrove (1980) presented data on the persistence of sine wave gratings varying in spatial frequency and exposure duration. Persistence was measured as the blank interstimulus interval (ISI), which, when alternated with the grating, produced a criterion judgment of a gap between presentations of the grating. For each spatial frequency (1, 4, and 12 cpd), persistence decreased linearly with a slope of approximately $-.75$ as duration increased for short durations. For longer stimulus durations, the rate of decline in persistence with increasing duration was reduced, the slope being approximately $-.13$. The authors fitted two linear regression lines by the method of least squares to the data points for each spatial frequency. They do not report whether a better fit could be obtained with a nonlinear continuous function, but the case for the two-limb linear function is made in terms of the change in function occurring at approximately the critical duration obtained using threshold measures of critical duration with increasing spatial frequency (Breitmeyer & Ganz, 1977; Legge, 1978). However, the authors do note that the values of critical duration so obtained are somewhat shorter than those obtained by Legge (1978). The point of these comments is that although Bowling and Lovegrove (1980) develop a plausible case for their analysis, it is not wholly convincing and another interpretation is possible.

The purpose of the present note is to show an alternative analysis of their results that would lead to different conclusions about the relationship among spatial frequency, stimulus duration, and persistence. Bowling and Lovegrove (1980) use ISI as their dependent variable, thereby following a precedent set by Meyer and Maguire (1977). Boynton (1972) has

Table 1
ISI and SOA Values for Gap Detection for Each Stimulus
Condition Estimated From Figure 1 of Bowling
and Lovegrove (1980)

Duration	Stimulus Condition					
	1 cpd		4 cpd		12 cpd	
	ISI	SOA	ISI	SOA	ISI	SOA
50	198	248	240	290	320	370
75	182	257	214	289	285	360
100	178	278	193	293	265	365
150	181	331	220	370	240	390
200	165	365	200	400	220	420
300	150	450	190	490	215	515

Note—Duration, ISI, and SOA given in milliseconds.

argued the case for considering stimulus-onset-asynchrony (SOA) rather than ISI when one is considering temporal resolution in the visual system. If the data of Bowling and Lovegrove (1980) are considered in terms of SOA rather than ISI, then the pattern of results assumes a form rather different from that described by them. Table 1 presents the ISI values for each stimulus duration estimated from Figure 1 in their paper, together with the SOA values for each condition of their experiment. This way of presenting the data reveals that, for stimulus durations up to 100 msec, SOA is approximately constant, with the constant varying for different spatial frequencies. The fit is not perfect, but, given the range of experimental error alluded to by the authors in their paper, the relative constancy is quite surprising. Beyond 100 msec, the relationship breaks down, with SOA increasing as a linear function of stimulus duration.

Rather than implying decreasing persistence as a function of stimulus duration up to 100 msec, the present analysis implies a constancy in persistence for stimuli up to 100 msec in duration. This raises the important question as to which index of persistence is the most appropriate. Di Lollo (1980), using an integration paradigm, has argued the case for SOA, as has Boynton (1972). It should be noted that the substantive conclusion made by Bowling and Lovegrove (1980), that there are two types of persistence, is supported by the present analysis. Clearly, brief stimuli less than 100 msec in duration are processed differently from stimuli of greater duration.

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