NOTES AND DISCUSSION


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Stimulus exposure durations in visual laterality studies of normal people are typically shorter than the 150–200 msec it takes to initiate saccadic eye movements. This ensures that stimuli appear only in the visual half-field to which they are presented and project only to the contralateral hemisphere. In a number of reaction time experiments, however, stimuli were exposed for considerably longer than 150–200 msec (for references see Hardyck, Dronkers, Chiarello, & Simpson, 1985). Hardyck et al. noted that investigators justified their use of such long exposure durations as follows: (1) At onset the stimulus is initially, and appropriately, restricted to one half-field, and the information it conveys is projected to the contralateral hemisphere. Since RTs are measured from stimulus onset, it should not matter that the gaze may later shift and direct the stimulus bilaterally. The visual field differences obtained would still be due to differences in hemispheric specialization. (2) As proof of this, visual field differences reported in those studies are similar to those found in experiments that used shorter exposure duration.¹

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¹ There is a third justification that Hardyck et al. neglected to mention. Visual field differences are found to vary in hemispherically predictable ways among stimuli or cognitive manipulations, even when exposure duration is kept constant. Thus both a RVF or LVF advantage can be found with the same stimuli in different conditions (Klatzky & Atkinson, 1971; Moscovitch, Scullion, & Christie, 1976). The latter findings suggest that it is the hemisphere that is engaged in stimulus processing rather than nonhemispherically related...
In their recent study, Hardyck et al. claim to test whether these justifications are valid by monitoring eye movements in four conditions. In the baseline condition the stimulus appears once in the LVF or RVF for 25 msec. In the fixed condition, the stimulus appears twice in the same visual field for 25 msec, each presentation being separated by a 400-msec interval during which the subject maintains central fixation. The return condition is the same as the fixed condition, except that during the 400-msec interval the eyes are directed toward the location at which the stimulus initially appeared and then returned to the center before the second presentation. In all three conditions, the stimulus is restricted to a visual half-field. In the orienting condition, however, the stimulus is first lateraledized to one field, as in the previous conditions, but then appears a second time, after a 400-msec delay at central fixation, so that it is now directed to both hemispheres. According to Hardyck et al., it is performance in the orienting condition that provides a critical test of the hypothesis that central fixation of the stimulus does not alter perceptual asymmetries in a RT task if the initial presentation was restricted to only one hemisphere. The other conditions are only controls. In all cases, the stimulus is a string of letters and the subject's task is to decide whether the string forms a word.

Hardyck et al. reported that differences in accuracy favoring the RVF are found in all but the orienting conditions. Visual field differences in RT, however, were absent in all conditions. On the basis of these results they conclude "that visual field differences found with exposure times greater than 150 msec are due to the active cooperation of the subjects and not due to the justifications advanced by experimenters using long exposure times" (1985, p. 430).

There is no empirical basis for such a strong conclusion. The claims made by investigators using long exposure durations apply only to reaction time experiments, as Hardyck et al. acknowledge (p. 431). Nonetheless, the evidence on which Hardyck et al. base their conclusions rests primarily on accuracy data that failed to reveal a RVF advantage in the orienting condition, though it was found in the other conditions. Actually, simple post hoc tests showed that the RVF advantage was significant only in the fixed condition, a finding that should call their entire procedure into question. I return to this point later.

In the relevant reaction time analysis, no visual field difference was found in any condition, though interestingly the strongest tendency toward orienting or attentional factors that determine the differences observed. Though not mentioned by Hardyck et al., this justification is important since it argues against their claim that such differences as are found in RT studies with long exposures are due to a rightward response bias (p. 437). This claim is further nullified by the observation that the LVF is often favored in some of the studies that used long stimulus exposures.
a RVF advantage occurred in the orienting condition. As I note later, had Hardyck et al. used more than three subjects, this difference might have been significant. Under the circumstances, it is misleading to warn readers that "stimuli exposed for longer than the time taken for saccadic movements run the risk of either producing a response bias (but see Footnote 1) or losing potential visual field differences, unless eye movements are controlled." Based on their RT results, which are the only ones relevant to the hypothesis, Hardyck et al. may as well warn experimenters to stop conducting RT studies entirely, since their results indicate that no exposure duration, however brief, nor any amount of eye movement monitoring, however sophisticated, will produce significant visual field differences in RT. Such a warning is not likely to be heeded given the evidence from numerous RT studies, among them Hardyck's and Chiarello's, that report laterality differences.

Of course, one can draw other conclusions and learn other lessons from Hardyck et al.'s present study. The first is that they failed to test their hypothesis adequately. If they wished to determine the effects of eye movements on visual field differences in RT studies that used long exposure durations, they should have first replicated the conditions used in those studies, namely long uninterrupted exposure durations, rather than two 25-msec exposures separated by a 400-msec interval. Next, and equally important, they should have randomized presentations to each visual field, rather than blocking them so that the role of expectancies would be minimized. Having replicated the results of any one of the experiments whose validity they questioned, they should then have run a number of controls while monitoring eye movements. One control could be to tell the subjects to change their fixation from the center to the periphery as soon as the lateraled stimulus appears and to compare visual field differences in that condition with one in which the subjects maintain central fixation throughout. If Hardyck et al. are correct, only the latter condition would produce significant perceptual asymmetries in RT. An even better test would include conditions in which right or left hemispheric processes are recruited either by using different stimuli or different strategies. Contrary to Hardyck et al., different visual field asymmetries should then be obtained with the same exposure duration, as a number of authors have found (see Footnote 1 and Klatzky & Atkinson, 1971; Moscovitch, Scullion, & Christie, 1976).

Apart from choosing a less than ideal procedure, Hardyck et al. failed to test a sufficient number of subjects to instill confidence in the power of their statistical analysis. Three subjects, which is what Hardyck et al. included in each but the baseline conditions, is hardly enough when testing for differences in reaction time that are expected to be small and of relatively high variability. That three subjects were sufficient to produce a statistically significant visual field advantage in accuracy indicates only
that accuracy may be a more robust measure than RT. Even then, Hardyck et al. obtained a significant RVF advantage in only one condition.

Hardyck et al.'s. conclusions may yet prove to be correct and the justifications given by experimenters who use long stimulus exposures shown to be self-serving. I, for one, would welcome a proper study along the lines I have suggested. For the moment, however, Hardyck et al.'s. current findings, are too weak in themselves to be used as evidence that casts doubt on the adequacy of the procedure, the replicability of the findings, the validity of the justifications, or the interpretation of experiments that reported consistent laterality effects with stimulus exposures longer than 200 msec. Until the proper experiments are conducted, the results of the long-exposure experiments should be accepted at face value if they are consistent with other evidence.

REFERENCES


2 It may prove that long exposure durations do have an effect on laterality, but not for the reasons that Hardyck et al. assume. Sergent (1982) has suggested that differences in exposure duration below the 200-msec cutoff can alter visual field difference because it affects the quality of the information which each hemisphere receives and is specialized to process. Although this view is not universally accepted (Moscovitch, 1983), if it proves to be correct one can consider exposures longer than 200 msec to occupy the extreme end of Sergent's spectrum.