REPORT ORDER IN TACHISTOSCOPIC RECOGNITION

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Report order was investigated using tachistoscopically exposed random letter arrays. No significant interaction between report order and position of fixation point was found, despite significant main effects for both variables. For right-to-left report order, recognition was superior in the RVF under bilateral presentation, and in the LVF under unilateral presentation. Whereas "sequential scanning" could not account for the findings, a combination of cerebral dominance and forgetting during report did provide a satisfactory explanation of the data. Hence, considerable doubt was cast on Heron's (1957) directional "post-perceptual scanning" hypothesis.

Recent experiments by Merikle, Lowe and Coltheart (1971), and Merikle and Coltheart (1972) suggest that "scanning" may be from the outside toward the centre rather than from left-to-right. Similarly, Smith and Ramunas (1971) concluded that "scanning" is not necessarily from left-to-right for English letters. According to Scheerer (1972, p. 388), even when the report instructions arrive "after" the stimulus exposure, report order can "modify" the "scanning sequence" (cf. Freeburne & Goldman, 1969). The usual finding of a left-visual-hemifield (LVF) superiority of recognition, under bilateral presentation, probably reflects a left-to-right report bias (Coltheart & Coltheart, 1972). These findings are contrary to Heron's (1957) notion of a directional (left-to-right for English letters) "post-perceptual scanning" mechanism.

Even with bilaterally presented letter arrays a right-visual-hemifield (RVF) superiority may obtain (McKeever & Gill, 1972). For instance, Bryden (1966) found a RVF superiority using 20-30 msec exposures. Apparently, a cerebral-dominance explanation is more discernible when using brief exposures (Gill, 1973; McKeever, 1974). In the present study, report order is manipulated: (using full-report) by telling Ss "before" the stimulus onset in what order to report tachistoscopically exposed random letter arrays, so as to ascertain the relative merits of the "scanning" and "cerebral-dominance" hypotheses.

METHOD

Subjects
The 72 male and female Ss were all university students who could read English fluently.

Apparatus
The tachistoscope (like a camera-shutter) was attached to a Kodak Carousel slide projector. There were 5 practice slides and 20 experimental slides, each having 7 letters. Nonsense arrays minimized letter sequences inherent in English. Letters were 0.14 inches high and 0.11 inches wide. The letter array sub-
tended a visual angle of about 7º 8'.

**Design and procedure**

Two variables were manipulated. Report order was systematically varied, using left-to-right (LR), right-to-left (RL), and optional report order (RO). Fixation point was either in the middle (FP middle), to the left (FP left), or to the right (FP right) of the letter array. There were 9 groups of 8 Ss each (one group for each condition). The tachistoscope was operated via a microswitch held by E. The letter array was flashed horizontally onto a projection screen at 20 feet from the Ss, for 20 msec (thereby avoiding eye movements). Viewing was binocular. Ss were required to fixate a small cross after a pre-exposure "ready" signal, and to record the letters which they saw upon exposure.

**RESULTS**

Mean group recognition scores are shown in Table 1 for each condition.

**Table 1**

<table>
<thead>
<tr>
<th>Fixation Point</th>
<th>Report Order</th>
<th>Left</th>
<th>Middle</th>
<th>Right</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>RO</td>
<td></td>
<td>52·6</td>
<td>57·5</td>
<td>34·2</td>
<td>48·2</td>
</tr>
<tr>
<td>RL</td>
<td></td>
<td>44·3</td>
<td>51·6</td>
<td>49·6</td>
<td>45·5</td>
</tr>
<tr>
<td>LR</td>
<td></td>
<td>66·9</td>
<td>59·9</td>
<td>42·1</td>
<td>56·3</td>
</tr>
<tr>
<td>Column</td>
<td></td>
<td>54·6</td>
<td>56·3</td>
<td>39·1</td>
<td></td>
</tr>
</tbody>
</table>

A two-way analysis of variance yielded significant main effects for both variables. Report order was significant at the 5% level ($F=3·63$, $df=2,63$). LR differed significantly from RL ($F=6·71$, $df=1,63$; $p<0·05$). Position of fixation point was significant at the 1% level ($F=10·34$, $df=2,63$). FP left differed significantly from FP right ($F=11·39$, $df=1,63$; $p<0·01$). There was no significant interaction.

Since report order was significant, further analysis with respect to presentation condition and visual field was undertaken. Recognition scores for the LVF and the RVF under each presentation condition are shown in Table 2. For unilateral presentation, only the three letters closest to the fixation point are considered so that scores may be more comparable with those for the bilateral presentation.

**Table 2**

<table>
<thead>
<tr>
<th>Presentation and Visual Field (%) Correct</th>
<th>Report Order</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bilateral</td>
</tr>
<tr>
<td></td>
<td>LVF  RVF</td>
</tr>
<tr>
<td>RO</td>
<td>21·7</td>
</tr>
<tr>
<td>RL</td>
<td>16·7</td>
</tr>
<tr>
<td>LR</td>
<td>28·4</td>
</tr>
<tr>
<td>Column</td>
<td>66·8</td>
</tr>
</tbody>
</table>

Under bilateral presentation, recognition was superior in the RVF, particularly for RL. Under unilateral presentation, recognition was superior in the RVF except for RL.

**DISCUSSION**

In view of the large recognition superiority for RL in the RVF, under bilateral presentation, it appears that Ss long practised in LR assume RL equally efficiently and in a short time (cf. Freeburne & Goldman, 1969). Since "scanning" is presumed to proceed from left-to-right due to acquired reading habits (Heron, 1957), it cannot account for the above finding. The directional nature of Heron's (1957) "post-perceptual scanning" mechanism would necessitate a LVF...
superiority irrespective of which report order was used. This did not occur. In conjunction with the findings already mentioned (e.g. Merkle & Coltheart, 1972; Merkle et al., 1971; Smith & Ramunas, 1971), this strongly suggests that Heron's (1957) "sequential scanning" hypothesis is incorrect.

The usual LVF superiority, under bilateral presentation, implies that the right-hand letter in a tachistoscopically exposed letter array is poorly reported. Yet it is perceived clearly, since if it is post-exposureally cued it is well reported (Averbach & Coriell, 1961; Haber & Standing, 1969). Having been perceived and stored, it must be lost during report. Together with the left-hemisphere superiority at naming letters, this would account for the present findings. Under bilateral presentation with LR, the LVF is reported early whilst the RVF is "seen" by the left hemisphere. Hence there is no appreciable hemifield difference. With RL, the RVF is favoured by both of these, thereby accounting for the RVF superiority. Under unilateral presentation with RL, the three letters closest to the fixation point are reported early in the report sequence when the letter array is in the LVF, and late when it is in the RVF. Hence loss during report would account for the LVF superiority. With LR, a RVF superiority can be accounted for similarly. In summary, a combination of cerebral dominance and forgetting during report seems to provide a satisfactory explanation of the present findings.

REFERENCES


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