

Ramachandran's failure to find rivalry for matched stimuli could be attributed to having a weak signal. Second, interpreting the findings for the MAE, particularly for dynamic and static test patterns, can be difficult. In fact, substantial evidence suggests that the two test patterns are tapping separate neural mechanisms (Culham et al., 1998). The matrix stimuli introduced in this study provide an opportunity to test if conflicting motion, in the absence of other conflicting signals between the two eyes, is sufficient to generate binocular rivalry.

Results and Discussion

Many properties associated with binocular rivalry can be measured experimentally, such as the mean dominance time, rate of perceptual switching, etc. Since the goal of the present study is to determine whether competing global information between the two eyes can generate binocular rivalry, the variable of interest is the proportion of the time that rivalry is experienced for various stimuli. This measure provides an index of the effectiveness of a stimulus to generate binocular rivalry. If the rivalry mechanism is sensitive to a conflict in the stimuli, then the rivalry mechanism will engage and binocular rivalry will be experienced. If the rivalry mechanism is not sensitive to a conflict, then subjects will not experience rivalry and some sort of integration will occur.

Global Form Conflict and Binocular Rivalry

First, using two uniform squares presented to the two eyes on dark background, we determined experimentally an interocular luminance range that was insufficient to generate

binocular rivalry. This range, however, was more than sufficient to generate a perceptually salient global pattern. The luminance of the elements that formed the letters was set to the maximum value of this range and the luminance of the remaining elements was set to the minimum value. As a control condition, the first pair of stimuli was an “X” and an “O” in their conventional form (figure 2A). Not surprisingly, this pair of stimuli was effective in generating binocular rivalry. Subjects reported seeing rivalry about 90% of the time.

Next, we constructed the same X and O patterns with locally matched elements (matrix condition). This manipulation effectively removed the local contours’ contribution to rivalry (Fry and Bartley, 1933; Levelt, 1965a). The result of this rather simple manipulation is a dramatic shift from rivalry to fusion (figures 2b and 3). Subjects now predominantly reported seeing fusion (figure 2). Apparently, the global X and O patterns in the two eyes were insufficient to generate binocular rivalry. Note, the differences between the images presented in the first experiment and the second experiment are very small (fig 2a and 2b, top), yet the perceptual consequences are striking (fig 2a and 2b, bottom). Figure 3 schematically shows the perceptual outcomes of the two stimulus conditions. Subjects perceived alternations of X and O or parts of the X and O in the conventional condition during most of the test period, but in the matrix condition they only occasionally saw indications of rivalry including mosaic rivalry. The results of these experiments indicate that conflicting global patterns are not capable of generating rivalry.

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---- Insert figure 3 here ----

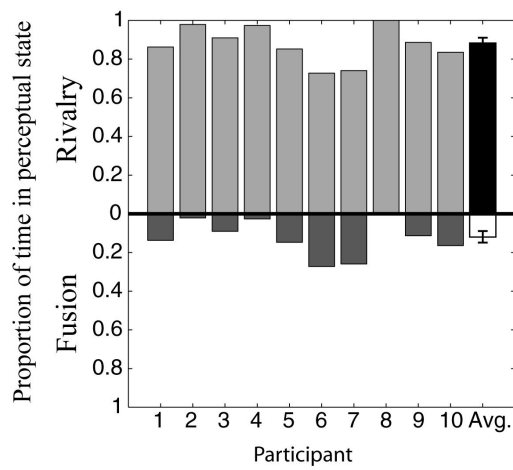
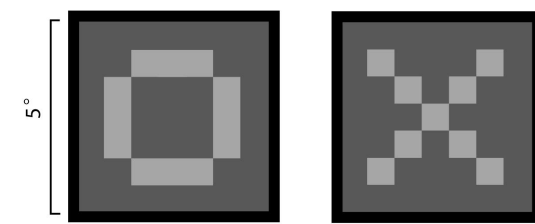
Introducing fusible contours to the two eyes' images has been shown to reduce the incidence of rivalry and promote fusion (Blake and Boothroyd, 1985; de Weert and Wade, 1988). Thus, one possible reason that little rivalry was perceived in the matrix condition was that the occluding lines provided a strong fusion cue that generally promoted fusion. This possibility was tested with a simple manipulation in which the occluding lines were shifted and misaligned with the boundaries of local square elements, thus revealing the competing local contours (Fig 2c top). With this manipulation, observers again perceived vigorous rivalry between the X and the O patterns (Fig 2c bottom). Clearly, simply having matched lines in the two stimuli that provide an additional fusion cue does not prevent observers from perceiving binocular rivalry, and it was not the reason that little rivalry was experienced in the condition shown in figure 2b.

Finally, to demonstrate the critical importance of the local image feature conflicts to rivalry, as well as to further demonstrate that having matched lines is not preventing global pattern rivalry, we performed an experiment in which the luminance of the occluding lines of the matrix was changed to an intermediate value (Fig 2d bottom). This manipulation maintained the fusible grid lines, but created competition between the local elements because the luminance of the local elements have the opposite polarity against the background, which would lead to rivalry between local elements. Not surprisingly, subjects again perceived vigorous rivalry between the "X" and "O" (Fig 2d bottom). In addition to demonstrating the critical role of local competition to rivalry, this result also provides additional evidence that the result shown in figure 2b was not merely due to the presence of fusible grid lines in the stimulus.

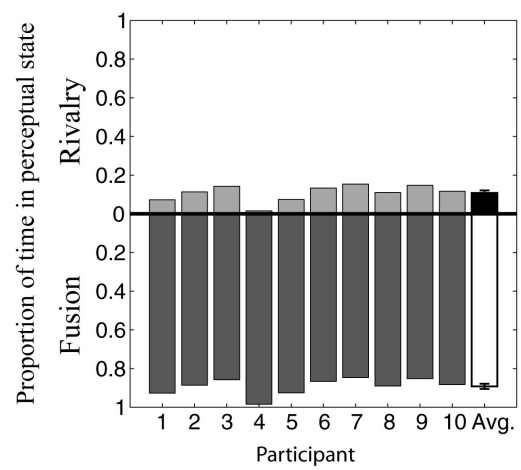
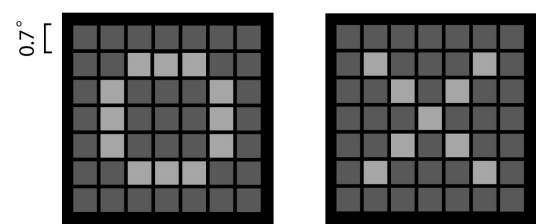
Global Motion and Binocular Rivalry

Figure 2

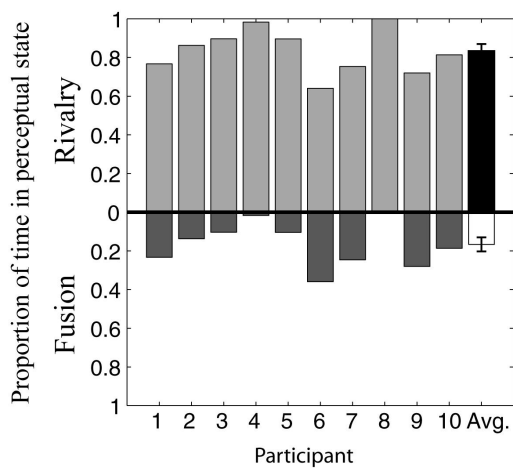
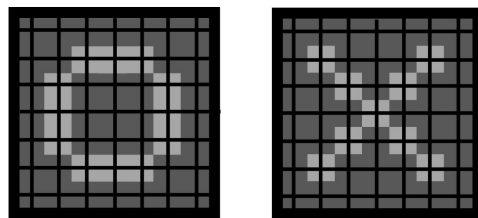
A. Conventional stimulus



B. Matrix stimulus



C. Matrix misaligned



D. Local polarity conflict

