

CAN EYE DOMINANCE BE TRAINED?¹

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If eye dominance is an acquired habit, one should be able to modify it through intensive training. This holds especially true if eye dominance is a dynamic relationship which undergoes adaptive changes over time. It should be possible to occasion short-term re-adjustments in this relationship by "training" a person to rely temporarily on one eye. The present study represents an attempt to do this.

The material used to "train" eye dominance was a set of 10 stereograms. Two of these were obtained from a series devised by Engel.² The other 8 were made up for the study. Each of the stereograms consisted of two dissimilar pictures. One of each pair of pictures was strongly "dominant" over the other. This means that a person presented with such a stereogram would tend to see only the "dominant" picture, at the expense of the other picture. With longer exposures, alternations or fusions would tend to take place, with the "dominant" picture over-represented in the product.

Pre-test to Establish Dominance

Table 1 lists the results for 28 Ss of a preliminary experiment which was

TABLE 1
DOMINANCE TEST RESULTS:
NUMBER OF TIMES EACH PHOTOGRAPH WAS PERCEIVED IN "TRAINING"
STEREGRAMS, IN 280 PRESENTATIONS ($N = 28$)

Content of "Dominant" Picture	Perceived	Content of "Recessive" Picture	Perceived	Fusions
Face of Ape	21	Portrait of Pres. Eisenhower	3	4
"Pin up" Girl (Color)	26	Buddhist Monk (Color)	1	1
Portrait of Little Girl	26	Japanese Woman's Portrait	0	2
Mexican Woman	28	Face of Bull (Color)	0	0
Madonna & Child	25	Statue of Nude Girl	0	3
Portrait of Girl (Color)	27	Portrait of Girl (Color)	0	1
Portrait of Pres. Lincoln	27	Face of Old Lady	0	1
Face of Bear (Color)	27	Human Breast	0	1
Statue (Face Portion)	24	Statue (Pubic Portion)	0	4
Flower Patch (Colored)	27	Skin and Hair Patch	0	1
Total Dominant	268	Total Recessive	4	Fused 18

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²Engel, E. *Meaningful content in the study of rivalry and fusion*. Mimeographed Report, Princeton University, Perception Research Center, March, 1955.

designed to check whether the "dominant" pictures in our stereograms were indeed "dominant."

Procedure.—Our 28 Ss were shown each of the 10 stereograms for half a second. Half the group ($N = 14$) were presented with the "dominant" picture to the left eye; the other 14 Ss viewed it with the right eye. The stereoscope used was a modified model (enclosed, with facilities for variable illumination) devised by Engel (1956).

Results.—As may be noted in Table 1, "dominant" pictures were exclusively perceived in 268 out of 280 trials. Only 4 instances of perception of the other picture were recorded; 3 of these occurred in the pair presented first, and 1 in the pair presented second; all 4 occurred in the group who saw the non-dominant picture with the right eye. Ss who had the dominant picture presented to their right eye saw only dominant pictures, except for five fusions. It may be recalled that the right eye is the dominant eye in most people.

The experiment appeared to show that each of our stereograms contained a picture which effectively "dominated" its companion.

The "Training" Experiment

Procedure.—A group of 16 Ss were submitted to eye dominance "training." Each viewed the 10 experimental slides in succession, with the "dominant" picture always to the left eye. Every slide was viewed for a full minute. The total "training" period thus consisted of 10 min. of viewing time.

A control group of 18 Ss went through a similar procedure, with 10 stereograms which yielded "fused" or composite images. This series (comprising human portraits) was developed by Engel (1958).³

Both "training" and control Ss were simply instructed to report what they saw. All slides were illuminated with 12 candles/sq. ft. The training periods and control sessions were preceded and followed by a test for eye dominance. This measure of eye dominance was based on an ingenious stereogram developed by Breese (1899). On this slide a red surface covered with oblique lines is paired with a green surface on which oblique lines run in the opposite direction. This stereogram results in the perception of alternating red and green. If no eye dominance intervenes, the red and green are each perceived 50% of the time. The color presented to the dominant eye would predominate to the extent of the eye's dominance. Success of "training" of eye dominance could be gauged as an increment in duration of perception of the color exposed to the "trained" eye, i.e., in our study, green. If we succeeded in modifying dominance, green should be seen for longer times in the test following training than in the pre-test. Such an increase should not be found in the control group.

The Breese stereogram was presented for a full minute. Illumination was

³The perceived face does not derive its features equally from the two component faces. But chance presentation to the two eyes makes a systematic error extremely unlikely.

kept at .018 candles/sq. ft., to reduce speed of alternation. Ss were instructed as follows:

As soon as the light comes on, tell me the color you see. As you keep looking at the square it may suddenly change from one color to another color. After a while it may change back again. If you notice such a change and *as soon as you do*, please let me know *at once*. If the square becomes red, say 'red', if the square becomes green, say 'green'. Be sure you let me know right away if the square changes.

All reported color changes were timed with a stop watch.

Results.—Table 2 summarizes the results. A tendency toward right-eye dominance was present in the pre-tests for both groups. This tendency disap-

TABLE 2
MEAN NUMBER OF SECONDS RED AND GREEN WERE SEEN DURING TWO TEST PERIODS BY EXPERIMENTAL AND CONTROL GROUPS

Group	Pre-test		Post-test	
	Red (Right Eye)	Green (Left Eye)	Red (Right Eye)	Green (Left Eye)
Experimental ($N = 16$)	34.4*	25.6	29.8	30.2
Control ($N = 18$)	36.3	23.7	31.3	28.7

*Number of seconds out of 60.

peared in the tests which followed the training or control sessions. There are no differences whatsoever in the measures obtained from the experimental and control groups.

Is eye dominance neutralized by prolonged viewing of stereograms, irrespective of the stereograms used? Our results are merely suggestive of this tendency.⁴ A sign test applied to the number of increases in perception of green from pre-test to post-test ($n = 23$) as against the number of increases in red-perception ($n = 10$) shows that the difference did not reach significance at the .5 level.

DISCUSSION

The present study does not provide an answer to the question posed. If eye dominance can be modified, the task is more complex and difficult than we envisaged. It could be argued that our failure was inevitable, because dominance develops cummulativey over a lifetime. One can hardly expect to offset this experience (even temporarily) in 10 min. Much longer retraining of the eyes would be required.

⁴Similar suggestive findings were obtained with a Necker Cube divided up so that the top half was presented to one eye and the bottom half to the other. First presentations yielded "bottom forward" perceptions 65% of the time. A second presentation (after a series of unrelated stereograms) yielded "bottom forward" perceptions precisely 50% of the time.

This argument becomes less impressive if eye dominance is viewed, not as a *fixed habit*, but as a complex functional relationship within the optical system, which is subject to continuous variation and adjustment. If such is the case, more prolonged training should not increase the likelihood of success.

Eye dominance as an adaptive process may be too efficient for *any* training. The flexibility of the visual system may be such, that adjustments and readjustments can occur in considerably less time than it takes the average *E* to secure his favorite measure of eye dominance.

SUMMARY

An attempt was made to temporarily modify eye dominance through training. A series of 10 stereograms was developed in which one of the two monocular fields strongly predominated over the other. Training consisted of consecutive stereoscopic presentations of these slides, with the dominant field always to the left eye. Total viewing time was 10 min. A control group was presented with stereograms which produced composite images. Eye dominance was measured before and after viewing in both groups. The pre-tests showed a tendency toward right eye dominance. This tendency was not present in the post-tests, but neither was there a detectable difference between the two groups. The negative finding was discussed in terms of two alternative explanations, related to premises concerning the nature of eye dominance.

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