CHANGES OF APPRECIATION FOR COLOR COMBINATIONS

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The present experiment¹ was prompted by some cases that have come under my observation of evident change in the appreciative attitude of certain persons towards colors and color combinations. Artists who in the schools could admire only combinations of unsaturated colors, have so changed in their attitude that now they admire not only combinations of saturated colors but combinations of saturated colors at short intervals apart, combinations which they would have abhorred in their younger days. That changes in persons' appreciative attitude towards musical harmonies takes place is a well-established historical fact that has received experimental confirmation through the investigations of H. T. Moore.² I wished if possible to find experimental confirmation for the changes I had observed in persons' appreciative attitude towards color combinations. I resolved, therefore, to stimulate subjects repeatedly with combinations of colors in an attempt to produce experimentally such changes.

METHOD

The experiment was carried on in a dark room. The subject sat on a stool in the dark room facing a window which was covered with a black shutter. On the other side of the shutter, so arranged that it was the only object visible to the subject when the shutter was raised, was a light gray cardboard two feet square tipped at an angle of approximately 45° and illuminated by a daylight lamp swung overhead. In the middle of the cardboard an opening 3½ in. square was cut, behind which slides of colors could be slipped.

¹ Conducted in the Harvard Psychological Laboratory under the direction of Prof. H. S. Langfeld.

² Moore, Henry Thomas: 'The Genetic Aspects of Consonance and Dissonance,' *Psych. Monog.*, No. 73, Sept., 1914.

The Bradley colors were used in the saturated hues, violet, red-violet, violet-red, and red, with a tint and a shade of each hue—twelve colors in all. The choice of violets and reds was the result of a hasty preliminary examination of my subjects in all the hues, which seemed to indicate a greater dislike for combinations of reds and violets than for those of any other narrow range.

PART ONE

The first part of the experiment had for its purpose the determination of the subjects' average consistency in judgments of color appreciation, and the establishment of a basis for the choice of combinations to be used in the second portion of the experiment.

This double purpose was served by causing the subjects to give two judgments for each combination of colors within the range chosen. Since there were 66 possible combinations within the range selected, each subject gave 132 judgments in the first part of the experiment. Two slides were slipped behind the opening in the cardboard and placed side by side, so that half of each color showed, one to the right and one to the left. There was no interval between the slides; the edge of one slide abutted the edge of the other. To avoid the space error, the position of the colors in combination were exchanged when presented a second time. And by setting the colors side by side, not one above another, the effect of apparent weights of colors was minimized (though even as it was some subjects were disturbed by this factor).

After entering the dark room, the subject was allowed about five minutes to become dark adapted before the colors were shown; and then was given the following instructions: "Grade the combinations of colors you see in accordance with your liking of them, A+ being highest, E- lowest, and C neutral. Do not compare combinations with one another, and make your judgment of the *combination* of the colors, not of the colors separately." The last phrase was inserted to focus the attention on the combination. Frequently subjects found they could make two distinct judgments which would vary greatly, the one upon the general impression the colors

produced, the other on their suitability for combination. Since it was the combination we were interested in, the former type of judgment was systematically rejected.

After these instructions were given, the shutter was raised and the colors were exposed for five seconds. Then the shutter was lowered and the subject gave his judgment. When a minute had elapsed (affording time for after-images to lose their intensity), another combination was exposed. And so on at the rate of a little less than a combination a minute. As many judgments were recorded as could be made in the course of an hour. No regular method of determining the order of combinations to be exposed was observed. The combinations were selected at random, effort being made only to avoid showing the same combination twice in close succession.

When all the judgments had been made, the average consistency of each subject was estimated and may be seen in the third column of the table. In these averages a unit means a grade, or the difference between B- and B. The average consistency of the subject was estimated as follows: As stated, each subject gave two judgments on each of the 66 combinations. These pairs of judgments were compared and the amount of deviation between them set down. Thus if a subject's first judgment on a combination were D+ and his second C, there would be a deviation of two points. These deviations were all set down and then added up. The total sum of deviations was then divided by 66, the number of combinations observed, and this gave the average deviation for a combination, or the subject's average consistency.

Also the general average judgment for all the combinations was estimated and may be seen in the second column of the table. The general average of a subject was obtained by reducing the letters representing his judgments to figures. Thus $A+ = 1$, $A = 2$, $A- = 3$, $B+ = 4$, and so on. Each judgment would in this way be represented by a number. The numbers representing all the judgments of a subject were added together, and this sum divided by the total

number of judgments given. The number so obtained would be the number of the subject's average judgment. This number was interpreted into its corresponding letter (*e. g.*, if it were 4, it would be interpreted as B +) and this letter would be the average grade of the subject.

In all cases but one, namely subject No. 2, the subjects were kept in ignorance of the purpose of the experiment.

PART TWO

From all the combinations six were chosen for each subject to constitute the basis of experimentation in the second portion of the experiment. Whenever possible three of these combinations were D's, one an A, one an E, and one a B or a C. In all cases but one, three D's were obtainable, but in that one case (subject No. 1) there actually were no D judgments given. These selected combinations were then presented to the subject in the same manner as before. But the instructions were changed as follows: "Combinations of colors will be shown to you as before. But now as far as possible inhibit all judgments about them. Simply look at them as long as they are presented to the eye."

After four weeks the subjects' judgments on the combinations with which they had been stimulated were checked up. Since it was desirable the subject should not remember from time to time the judgments he had previously given on a combination, and also that he should make the judgments on the selected combinations as naturally as possible, the six selected combinations were distributed at random in a group of fifteen or twenty other combinations. All of these combinations were then exposed before the subject one after the other exactly as in the first part of the experiment. And the subject was given at the first of the hour the same instructions as in the first part of the experiment.

The new judgments for the selected combinations were recorded and compared with the old ones. In this manner the experiment was continued until the end of the year—four hours of exposure without judgment, then a checking up, again four hours of exposure, and again a checking up.

RESULTS

More than a third of the judgments showed a change of appreciation at the end of the experiment over the beginning exceeding the average consistency of the subject, this change on the whole being toward neutrality. The total number of points gained or lost for each grade was as follows: The total gain for E's was 9; loss 0; for D's 21, loss 9; for C's 1, loss 3; for B's 2, loss 20; for A's 0, loss 13. While there is some evidence of a change in individual æsthetic judgments, the results are not sufficient to warrant a definite conclusion or more detailed analysis.

The experiment, however, brought out some other results of a more definite character. Chief among these is a movement of the *average* of æsthetic judgments (in contrast with a movement of individual judgments). The evidence for this movement is based on a comparison of the average judgments of the subjects considered in relation to their individual experience in color observation. The subjects fell naturally into two classes on the basis of their color experience—an experienced class and an inexperienced. The experienced class comprised an artist (subject No. 1), an æsthetician (subject No. 2), and an experienced layman (subject No. 3) who had somewhat more than average interest and experience in colors. Of these the artist had most experience with colors, the æsthetician next, and the experienced layman next. The other four subjects comprised the group of inexperienced subjects and so far as could be ascertained at the beginning of the experiment they were of about an equal grade of inexperience. In view of these individual differences the average grades of the subjects for all the combinations used in the first part of the experiment are exceedingly illuminating. The average of all the combinations for the artist is B, for the æsthetician C, for the experienced layman C. For the rest of the subjects it ranged from C— to D (two C—'s, a D+ and a D). No inexperienced subject had a grade as high as an experienced subject, and among the experienced subjects the artist who was the most experienced received the highest grade. In other words, the greater the experience of a

subject in color combinations the higher the average grade of appreciation. Upon continued stimulation with color combinations, a person's average æsthetic judgment for all combinations tends to be higher than before.

The same tendency may be seen from another point of view by examining the number of E's in the experienced group compared with that in the inexperienced group. No. 1 had no E's; No. 2 had five; No. 3 had four. These made up the experienced group totalling, nine E's with an average of three apiece. In the inexperienced group, No. 4 had five E's; No. 5, thirty-four; No. 6, twenty; and No. 7, seventeen—a total of seventy-six E's with an average of nineteen per person. The E's are evidently much scarcer for the experienced subjects.

It is noteworthy too that all the E's tested in the experienced group were raised: an E+ to a D+ in subject No. 2, and E to a D— in subject No. 3, both raises being more than the average consistency of the subjects. On the other hand, in the inexperienced group out of four E's tested two remained unchanged, one was raised slightly but not above the average consistency of the subject, and only one showed an unmistakable raise. The E level was in unstable equilibrium for subjects No. 2 and No. 3, while it was still firmly established in subjects Nos. 4, 5, 6, and 7.

If these facts indicate a law, then with experience the average grade of a subject should tend to go above neutral C. If the æsthetician and experienced layman had had more experience with colors, there is every reason to believe they would have averaged higher than a C.

The fact that they averaged a C in the particular range of color combinations experimented upon is evidence that they would have averaged considerably above a C in their appreciation of all color combinations. For it must be borne in mind that the particular range of color combinations chosen was selected because in a rough preliminary investigation that range seemed to be the one in the whole gamut of colors most disliked. Hence, if the experienced subjects averaged a C in this narrow range of color combinations, they would

have averaged above a C for all color combinations. It is evident, therefore, that experience in colors not only tends to raise the average appreciation of a subject, but to raise it above neutral C.

To avoid misunderstanding it must be emphasized that repeated stimulation is not the only factor operative in determining judgments of appreciation. A person's character, state of health, or condition of rest or fatigue, all have their influence on the æsthetic judgment, but above all association. A color associated with a violently unpleasant experience will carry the shadow of that unpleasantness into every combination into which it enters. The same is true of associations with pleasant experiences. A certain combination used in the first part of the experiment happened to be the colors of one of the subject's college fraternity. It was quite impossible for him to take a disinterested attitude towards the colors, so that his judgment on that combination was valueless. The effect of association, however, seemed to be minimized in this experiment by the range of colors that was chosen. The violets and reds are not so common in nature, dress, and decoration as most other colors, and consequently the experiment was not so much disturbed by association as would have been expected. It also appeared that the experienced subjects were less disturbed by associations than the inexperienced, as might have been foreseen since experienced subjects have noticed colors so often that whatever associations might once have formed about them would afterwards become blurred and neutralized, while inexperienced subjects notice colors so rarely that when once a color is noticed the whole context in which it appeared is likely to be recalled when next the color is seen.

A subsidiary point of some interest brought out in the course of the experiment was that the greater the subject's experience with colors the higher was his average consistency or assurance of judgment. All in the experienced group had an average consistency of less than 2, and in about the order of their experience. Subject No. 1 who had the greatest experience had a higher consistency than No. 3 who was less

experienced. Though subject No. 2 was less experienced than No. 1, that subject's exceptionally high consistency may be attributed to long introspective training, since he was a trained psychologist. All the inexperienced subjects except No. 4 had an average consistency of 2 or more. No. 4's average consistency was 1.8, which though high was not so high as the lowest of the experienced subjects. No. 4, it may be recalled, is the subject who had the small number of E judgments among the inexperienced subjects.

SUMMARY OF RESULTS

- I. The average of æsthetic judgments of color combinations
 - (a) is higher for experienced than for inexperienced subjects,
 - (b) has a tendency to rise above neutral C.
- II. The influence of association on æsthetic judgments of color combinations is less prominent in experienced than in inexperienced subjects.
- III. The average consistency of æsthetic judgments of color combinations is higher in experienced than in inexperienced subjects.

TABLE

Subject	Average Grade	Average Consistency
No. 1	B	1.5
No. 2	C	1.2
No. 3	C	1.7
No. 4	D+	1.8
No. 5	D	2.0
No. 6	C-	2.6
No. 7	C-	2.6