Muscle Strength as a Function of Exposure to Hue Differences in Visual Stimuli: An Experimental Test of the Kinesoid Hypothesis

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Abstract

The study was conducted to test experimentally the kinesoid hypothesis that visual stimuli of different hues may differentially affect muscle strength. Thus, the maximum squeeze strength of N = 72 subjects (36 males, 36 females) was measured using a hand dynomometer, as Ss stared at blue or pink cardboard plate. The results of 2(Sex) x 2(Plate Color) mixed design factorial ANOVA indicated significantly higher squeeze strength scores: (a) for males than for females; and (b) in response to the blue as compared with the pink plate. In view of the limited magnitude of the plate color effect, however, the results were interpreted as providing only partial support for the kinesoid hypothesis.

Interest in the psychological significance of color is by no means new (Birren, 1961, 1969). But recent developments in photobiology have generated some particularly provocative possibilities, notable among which is Otfs discussion of the role of the visual system in regulating a wide variety of psychophysiological functions (Ott, 1979). Otfs arguments are based largely on research indicating that the sensory processing of light stimuli may, through complex biochemical mediating mechanisms, have important collateral effects, neurologically and endocrin-ologically (e.g. Hague, 1964; Kerenyi, 1977; Krieg, 1932; Salterelli and Coppola, 1979; Shipley, 1964; Wurtman and Axelrod, 1966; Wurtman, 1975).

The present study focuses on Ott's suggestion that exposure to visual stimuli differing in their electromagnetic properties may affect muscle strength throughout the body. With regard to particular colors, Ott's assumption is that *pink or orange cause greater loss of strength and blue the least (Ott*, 7979, p. *9).* This idea has become the object of considerable attention in recent months, following anecdotal observations in correctional facilities as to the apparent reduction in incidence of aggressive and violent behaviors and inmates confined in holding cells painted pink (Schauss, 1979, 1980).

Evidence as to the effects of color on muscle strength, however, has been derived almost completely from the outcome of demonstrations using what has come to be referred to as the "kinesoid" test, wherein the subject holds his arm out straight in front

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of him, parallel to the floor and at a 90° angle to his own body. The subject's task is to resist as vigorously as possible the demonstrator's efforts to push the arm down toward the floor. Following establishment of a "baseline" level of strength by means of this procedure, a significant loss of strength has been observed when the test is then conducted immediately thereafter while a piece of pink construction paper is held about 15 inches in front of the subject's eyes, with an apparent return in the subject's resistance strength when a piece of blue construction papNer is similarly placed in front of his eyes (Schauss, 1979,1980).

Compelling as this demonstration may be, inferences based upon its outcome are dubiously valid in view of sources of potential methodological confounding in the procedure such as those due to: (a) the subjectivity of the criterion dependent measure of strength, based entirely upon the demonstrator's impressions or perceptions of subject's resistance; (b) related to the first point, the questionable uniformity in kinesiological pressure applied by the demonstrator on each trial; (c) related to both (a) and (b) above, "experimenter" bias on the part of the demonstrator in judging outcomes on this test as congruent with hypothesized predictions (Rosenthal, 1966); and (d) demand characteristics (Orne, 1966) operating through implicit in situ communication to subjects concerning the "expected" outcome of the demonstration, or pre-established in them through prior exposure and possibly even commitment to the validity of the hypothesized effect.

The present study was thus designed to provide a systematically controlled experimental test of the kinesoid hypothesis, under laboratory conditions.

METHOD

Subjects

Subjects in the experiment were 72 right-handed undergraduates, 36 males and 36 females, all of whom were students in General Psychology classes, participating in partial fulfillment of a course research requirement.

Materials

A Lafayette Dynomometer, Brenet stopwatch, and two 18 inch by 24 inch cardboard plates — one pink, and one blue, were the only special materials used in the study. The plates were the same ones used in the kinesoid demonstrations referred to above.

Procedure

Upon arriving at the sound-proof laboratory room, soft-lighted only by a 150 watt incandescent bulb in an enclosed ceiling fixture, the S was seated as close as possible to the front of a table in the middle of which was mounted a wooden platform upon which £ could place either of the cardboard plates directly in front of the *S's* field of vision, about 10 inches to 16 inches from his/her eyes. The hand dynomometer was in *S's* plain sight, to the right of the platform on the table.

After 5 had been seated, £ set one of the plates on the platform at *S's* eye-level as described above and said, "Please look at a place right in the middle of the card, and stare at it until I tell you to stop." The plates were kept concealed until presented in this way. After 5 had stared for exactly 60 seconds (stopwatch-timed), £ picked up the dynomometer and rested it on the table in a position so that 5 could grasp it easily and correctly with his/her preferred (i.e. right) hand. S was then instructed as follows: "Keep on staring at the card. But as you continue to stare, reach over now, get a good grip on this handle, and squeeze it as hard as you possibly can." So as to have a uniform criterion of "maximum squeeze" pressure for all *Ss*, £ allowed each 5 to continue to squeeze on each test trial until the bi-directional gauge indicator on the dynomometer began to move back toward zero. £ then said, "O.K. I'll take the handle now, and you can rest for a moment." £ recorded to the nearest .5 kilogram the maximum tension level indicated on the unidirectional gauge, put the dynomometer back in the same position it was when S entered the room, and repeated this procedure with the other plate. So as to control for order effects, half of the subjects of each sex got the pink card first and the blue one second, and vice versa for the remaining half.

At the end of the session, which required about six minutes from start to finish, *Ss* were asked to refrain from talking about the experiment so as to avoid possible biasing of students who had not yet participated. All *Ss* were told that their instructor would discuss the experiment in class and answer questions about it at that time. Finally they were thanked for their time, credited with partial fulfillment of their experimental participation requirement, and dismissed.

RESULTS

The "maximum squeeze" scores for all Ss in the experiment (see Table 1) were analyzed by means of a 2(Sex) x 2(Plate Color) mixed design factorial analysis of variance, with Sex as the between-and Plate Color the within-subjects factor (Myers, 1966). This ANOVA, summarized in Table 2, revealed statistically significant main effects on both the Sex factor, reflecting the greater squeeze strength of the male subjects over the two Plate Color conditions combined, and on the Plate Color variable, reflecting the higher squeeze scores in the Blue condition over male and female *Ss* combined. The interaction was not significant.

The higher squeeze strength of the male subjects is not surprising, nor is it of interest here. But in view of the power of the statistical test used, and the small difference obtained between Plate Color conditions, a magnitude of effect estimate (Hays, 1963; Keppel, 1973; Lindman 1974; Vaughan and Corballis, 1969) was calculated for the repeated measure. This procedure yielded an est. a>2 = .05, indicating that although significant at the $p<.05$ level ($F = 4.88$, $df = 1/70$), the Plate Color effect accounted for only about 5 percent of the variance on the dependent measure.

TABLE 1
Summary of Maximum Squeeze Scores
(in Kilograms)

Sex		PLATE COLOR: BLUE	PLATE COLOR: PINK	
	Males	M = 46.71 SD = 8.64 n = 36	M = 45.27 SD = 7.72 n = 36	M = 45.99 SD = 8.17 n = 72
	Females	M = 27.76 SD = 5.40 n = 36	M = 26.68 SD = 5.88 n = 36	M = 27.22 SD = 5.63 n = 72
	Both Sexes	M = 37.24 SD = 11.92 n = 72	M = 35.98 SD = 11.58 n = 72	

TABLE 2
Summary of ANOVA of Maximum Squeeze Scores

Source	df	MS	FS	p
Total	143			
Between Ss	71			
A (sex)	1	12,684.39	145.14	< .001
S/A	70	87.39		
Within Ss	72			
B (Plate Color)	1	56.88	4.88	< .05
A x B	1	1.09	.01	
SB/A	70	11.65		

DISCUSSION

The results of the study thus provided only partial support for the hypothesis that exposure to visual stimuli differing in hue can differentially affect muscle strength, measured here by voluntary maximum contraction of the preferred hand. That is, although the somewhat greater strength response to the blue than to the pink stimulus was found to constitute a statistically significant difference, the absolute behavioral magnitude value of this color effect was quite small.

The puzzling question arises as to why the apparent effect is so much more dramatic in the "push-down" test used in the kinesoid demonstration described above. One possibility which deserves consideration in this regard is that exposure to stimuli differing in their electromagnetic properties has differential effects on different muscle groups and organ systems in the body. This matter, along with questions as to individual differences between people in response to such stimulus differences, are among those we are currently investigating. In the meantime, the results reported here suggest that judgment on the strength-color hypothesis by suspended, contingent upon clearer empirical bases for inference.

In short, it remains to be established unambiguously whether the previously observed (Schauss, 1979) "kinesoid effect" of color is more than procedural artifact. Nonetheless, from the standpoint of the conventional model of inference, the statistically significant color effect in **this** experiment cannot be totally dismissed. Nor can we totally disregard the fact that the color difference obtained did account for **some** of the variance on the dependent measure of strength. More thorough resolution and clarification of this issue await the outcome of subsequent inquiry along these lines.

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Nutritional Quality Index of Foods R.G. Hansen, B.W. Wyse and A.W. Sorenson $15.00 AVI Publishing Co., Inc. Westport, Conn. 1979

We should all be concerned about the quality of the food we eat. Quality refers to the ability of the food to provide optimum nourishment for us to grow and live, not to its color or appearance although these are important in enhancing enjoyment of the meal. Most people are not aware that the foods they buy in stores are not nutritionally equivalent in quality although by now they have heard about a simple classification of foods into junk foods and other food. The quality of anything is measured relative to something else; in a nation of people who are five feet tall a six footer is considered tall, while in a population of seven footers the six footer would be considered short. Thus there must be some standard against which to compare foods.

One way is to measure the ability of food to maintain normal growth and health in animals and in man. This is very difficult for the large variety of foods and food mixtures which are available, and probably is impractical. This is the most accurate way. One could compare populations which are healthy with populations less healthy with respect to their food consumption. These studies are very useful but do not give us information about individual foods. Another way I have suggested is to show on the label of any food the proportion of the whole food present in the final preparation. Thus white bread could be labelled to show it contained 60 percent of the whole wheat and failed to contain bran and wheat germ and only contained a portion of other essential nutrients. This is based upon the conclusion that any whole food is nutritionally superior when compared to any food which contains only a portion of it.

In this book Hansen, Wyse and Sorenson describe another way using Index of Nutritional Quality (INQ). The INQ of any food or food combination is determined by comparing the quantity of any nutrient it contains against the recommended dietary allowance, (RDA). RDA's are those quantities of nutrients considered necessary for any average population. They are, of course, of little value for any individual; there is no real average person. The RDA is given for 1000 calories, thus it recommends 23 grams of protein,21.4 milligrams of Vitamin C and 357 milligrams of calcium per 1000 calories of food. These authors use a term "nutrient density." A substance like sugar which has no nutrients such as protein, fat, vitamins and minerals, is a substance with a low nutrient density. It is rich in calories. A food which contains the RDA of any nutrient per

1000 calories has a nutrient density ratio of 1.0; desirable foods have ratios greater than 1.0, i.e. they contain more nutrients per 1000 calories than foods which have a ratio of less than 1.0. Using these nutrient density ratios it is possible to prepare profiles. At a glance one can determine for any food which nutrients are present in ratios greater than one. Foods in the range under 1.0 are generally inferior. When the many tables are examined it is apparent that whole foods in general have high ratios, are good foods compared to most processed foods.

The book should be very valuable to people who want to know why certain foods or mixtures are preferable, to nutritionists who must plan diets in institutions, and for individuals. But they must remember that a substantial proportion of any population have extraordinary needs for some nutrients which can not be met by any combination of foods; only supplements will correct this problem.

The food profiles are given from pages 177 to 623, they cover milk and milk products, eggs, fish, meats, beans, peas, nuts, vegetables, fruits, grain and bakery products, fats and oils, sugars and sweets and miscellaneous substances.

The Index of Nutritional Quality (INQ) can be used as an aid in teaching nutrition, in planning meals, and in labelling. These are discussed by the authors in the early sections of the book.

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CANCER AND VITAMIN C

A discussion of the nature, causes, prevention and treatment of cancer, with special reference to the value of Vitamin C.

Ewan Cameron and Linus Pauling.
The Linus Pauling Institute of Science and Medicine,
Menlo Park, Ca. 94025
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New York, 1979.

Few families have been free of the ravages of cancer which has become one of the major epidemics of our times, along with cardio and cerebrovascular disease and a variety of psychiatric disorders.Society, especially the USA, has rallied against cancer, spending about ten billion dollars over the past twenty-five years in the USA. Tragically we have little to show for this. Surely this result should raise serious questions about the direction this research has taken. One would think that scientists directing this massive attack on cancer would be delighted to hear of other ideas. Their enthusiasm has been very restrained while the critical attacks by their leaders have been loud, continuous, and widespread. This is why we must all learn as much as we can about the disease. We need public information. We have to accept that people are able to learn about cancer, are able to analyze the evidence about treatment and its results and must make a decision. No physician can force a patient to accept a treatment, nor do they wish to, but organizations who have invested their time and interest in cancer have tried to prevent people from making an informed decision. This they have done by boycotting physicians who provide alternative choices and by suppressing, where possible, information which is essential for patients who wish to make a decision which will best serve their specific needs.

This book by Dr. Ewan Cameron, a surgeon expert in the treatment of cancer, and Dr. Linus Pauling provides people this balance of information I consider so essential. It contains a discussion of the causes of cancer, which in most cases turn out to be a result of man's abuse of the environment, but even background radiation, over which we have almost no control, may cause 9 percent of all cancer. The common cancers are discussed simply and adequately. The common treatments: surgery, radiation and chemotherapy, and the use of hormones, are described fairly. Immunotherapy, which is gaining increasing importance, appears here. Unorthodox treatments also are analyzed, but much more space is given to Vitamin C.

Drs: Cameron and Pauling's research has created a major controversy among physicians. Their conclusions are that optimum doses of Vitamin C are important in treating cancer and may be one of the most hopeful ways of preventing cancer. They believe "that the main objective of cancer treatment should be to give the patient a long, useful, comfortable, contented, productive and satisfying life." In line with this philosophy one should use a program of treatment which combines the best of available treatment. This includes surgery, radiation if necessary as well as some chemotherapy, but with major emphasis on Orthomolecular nutrition supplemented with Vitamin C in doses of ten to one hundred grams per day plus other vitamins and essential minerals. This program may also be preventive.

Cameron and Pauling's evidence is powerful and convincing. Lest anyone think it is only Cameron's charisma or placebo effect which is effective I will refer to three patients I have seen recover with Vitamin C. They also were receiving niacin, but I know of no study which shows niacin has any effect. My first case was an elderly scientist who suffered from an inoperable bronchio-genic cancer diagnosed by x-ray, visual examination and biopsy, and a psychosis. When I first saw him he was considered terminal by the cancer clinic. On Vitamin C and niacin 3 grams per day he was mentally normal in three days and he died 28 months later of coronary disease. The last few x-ray examinations showed no tumor mass. He had also received one series of radiation using the cobalt bomb.

My second case was a 15 year-old girl with osteogenic sarcoma of her arm. Biopsy revealed a highly malignant cancer and amputation was recommended. Her mother, a patient of mine with depression, resisted giving consent. Her daughter was started on Vitamin C plus other vitamins. She has been well over ten years. My third case was a woman with inoperable pancreatic cancer which had obstructed her duct and caused jaundice. She started herself on Vitamin C 10 grams per day. Her physician referred her to me. I increased it to 40 grams per day plus a few other nutrients and a junk-free diet. She has been normal for over one year. Her last CAT scan showed no evidence of any tumor.

But I have also seen several failures; we must find out why some do not respond. In the meantime there is almost no harm in using Vitamin C, which is probably safer than many junk foods.

The Cameron-Pauling thesis is being examined, but it will be examined much more seriously if the public demands that those charged with research into cancer proceed to do so. For each individual, arm yourself with information such as is presented in this book and search out physicians also willing to read and study it. If you cannot find such a physician there is nothing safer than to combine the methods described with any treatment you agree to accept.

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