THE EFFECT OF DIFFERENTIAL SOCIAL INFLUENCE UPON COLOR PERCEPTION

by

Charles Blake Keasey

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I. INTRODUCTION

One of the most significant elements of an individual's social environment is the existence of others. The significance of others derives from their capacity to both stimulate and react to behavior. Thus, the behavior of an individual, A, serves to stimulate a second individual, B. B reacts to the behavior of A and in so doing produces a reaction in A. This interplay between individuals, A and B, constitutes social interaction. Such interaction enables an individual to influence others and be influenced by them.

However, the operation of social influence is not limited to a two person or multiperson situation. It may operate through newspapers, magazines, radio, television, and other forms of mass media. Even an individual's memories may facilitate the operation of social influence.

Although an individual is usually aware of exerting social influence, he may also exert influence without being aware of it. Often a parent is not aware of the enormous influence he exerts upon his children by merely serving as a model they imitate. It is also common for an individual to be unaware that social influence is being directed at him and actually influencing his behavior. This has been dramatically demonstrated in a study by Greenspoon (1955). By a simple nod of the head, Greenspoon rewarded subjects for using plural nouns. The subjects were not aware that they were being rewarded, nor

that the number of plural nouns in their conversation was being greatly influenced.

The present study will investigate the effect of social influence upon an individual's perception and resulting behavior. (See Appendix A for a diagram of the conceptual framework of this study.) It has been suggested by Deutsch and Gerard (1955) that the social influences operating upon an individual's behavior are of two types, normative and informational. Normative social influence is in operation when the individual conforms to the many expectations that arise from the norms of various groups, other individuals, and one's own self. At other times informational social influence operates on the same individual when he accepts information from another as evidence about reality.

The general objective of this study will be to examine the effect of informational social influence (Deutsch and Gerard, 1955) upon an individual's perception and resulting behavior. This will be done by examining the differing amount of influence exerted by the same information when it comes from different sources. Five different information sources of varying credibility will be used.

The importance of this study lies in the data it will provide about the differential social influence exerted by various information sources. The use of such data would greatly aid in maximizing the probability that a particular individual or group would accept certain information. Such knowledge

would have wide application to the fields of education, health, safety, and all other areas in which attitude change is fundamental.

II. DEVELOPMENT OF THE PROBLEM

In order to obtain information about his world an individual must either engage in direct transactions with the objects of his world or turn to various information sources. These various information sources include other individuals, groups, written materials, and various types of mass media. Newcomb, Turner and Converse (1965) pointed out that there was a primary difference between information obtained by direct transaction with an object and that which comes from various information sources. The latter type of information is socially mediated rather than direct. Since a great deal of an individual's information about objects is socially mediated by various persons and groups, what Festinger (1950) called our "social reality" is largely influenced by such persons and groups. Even though various social influences have been operating upon man's perception and behavior for thousands of years, only recently have they been systematically investigated.

1. Reference group theory

One attempt to deal with social influences has been reference group theory, which asserts that a considerable number of any individual's attitudes are related to or anchored in one or more social groups. Either membership or nonmembership groups may serve as reference groups for an individual. It is

even possible for a single person (reference individual) to perform the functions of a reference group.

Kelley (1952) pointed out that the term "reference group" had been applied to two different relationships between an individual and a group. The first usage has been to denote a group in which an individual is motivated to gain and maintain acceptance. To gain this acceptance, he holds his attitudes in conformity with what he perceives to be the consensus of the group members. Implied in such a relationship is the notion that the reference group observes and evaluates the individual. The second usage has been to denote a group that an individual uses as a reference point in making evaluations about himself or other objects.

From this dual usage of the term, Kelley (1952) suggested that reference groups can play different functions in the determination of an individual's attitudes. One of these would be the establishment and enforcement of standards for an individual. Since such standards are usually termed group norms, Kelley (1952) labeled this the normative function of reference groups. He noted that a group can serve this function of norm setting and enforcement when it is in position to deliver rewards and punishments for conformity and nonconformity. Thus, a group functions as a normative reference group for an individual to the extent that it evaluates him relative to his conformity to certain standards of behavior and to the extent that the delivery of rewards and punishments is conditional

upon these evaluations.

A second function of a reference group is that of serving as or being a standard or comparison point against which an individual evaluates himself or other objects. Kelley (1952) referred to this as the comparison function of reference groups. A group functions as a comparison reference group for an individual to the extent that he uses the behavior, attitudes, or other characteristics of its members as standards or comparison points when he is making judgments and evaluations.

The above distinction is important in that it makes explicit the two main aspects of reference group theory; the motivational and the perceptual. Kelley (1952) suggested that the comparison functions of reference groups will become part of a general theory of perception and judgment, and their study will revolve around questions of perceptual and judgmental processes.

Kelley (1952) further observed that these two functions frequently are served by the same group. This is especially true of membership groups and nonmembership groups in which membership is desired.

Additional insight into the relationship of these two functions of reference groups was provided by Festinger's (1950) analysis of the emergence of group norms. He noted that group norms not only enable the group to maintain its identity and achieve its objectives, but they may provide for "social reality" for its members. Since some of the beliefs

of an individual can not be validated by either objective means or logical criteria, their truth is established by consensual validation. Thus, a belief may become a fact because other people hold a similar belief and this attests to its validity. In this way some group norms may actually serve as the fact that sustain the values and goals of a group.

2. Conformity studies

That group norms may emerge and function as facts is strongly supported by the now classic study carried out by Sherif (1935). The study dealt with the effects of group norms on immediate visual perception. He used the autokinetic phenomenon and instructed subjects to judge the extent of movement of the stimulus. For those subjects who first made their judgments in isolation from one another, there was a wide range of relatively stable individual differences. But when they made later judgments in the presence of another subject, there was convergence toward a "group norm". Those subjects who initially worked in groups stuck very closely to the norms established by the group when they later judged the stimulus in isolation from one another. This observation strongly suggests that the subjects' perceptual processes, and not merely their verbal responses, had actually been affected by their previous experiences in the group situation. The above interpretation is further supported by Sherif's (1935) finding that comparatively few subjects (about 25%) thought that they

had been influenced by the judgments of the others. Sherif (1935) noted that this was in line with the observation that individuals are often unaware that they are being influenced.

Since there was no direct interaction, nor any explicitly defined relationships among the subjects and they were not pursuing a common objective; it is not surprising that comparatively few subjects were aware of the exertion of group pressure. Because of the relative lack of group properties in this experimental situation it is questionable how much of the uniformity of response was a product of the operation of normative group pressures.

In another experimental situation, largely lacking group properties, Asch (1952) observed some sort of group influence operating upon the decisions and evaluations of individuals. He used groups of seven to nine college students, in which all but one were actually his confederates. Their task was to match accurately the length of a given line with one of three other lines. It was so arranged that the naive subject reported his judgment next to last, after the previous subjects had unanimously given the same wrong judgment. Thus, the naive subject was presented with a clear conflict between the evidence of his own senses and the responses of a group of his peers. Asch (1952) found that the naive subjects in the "group" situation made errors 36.8% of the time. This is highly significant, as there were virtually no errors (less than 1%) in

the control groups, in which the members recorded their estimates in writing. Asch (1952) obtained data on the conditions that determine the extent to which an individual, experiencing cognitive conflict, conforms to the position of the others. He found that an individual will conform more if he is faced with a unanimity of belief that disagrees with his own. But he will be less influenced if at least one other person agrees with him (errors dropped from 36.8% to 10.4%). It was also observed that conformity increased as the clarity of the judgmental situation decreased.

The subjects in both the experiments by Sherif (1935) and Asch (1952) were not group members in any obvious way. Thus, it is doubtful that direct normative group pressures could be solely responsible for the uniformity of response. But the fact remains that the uniformity of response occurred despite the relative lack of group properties.

Asch (1952) and Festinger (1954), because of their theoretical orientations, have suggested that this uniformity of response may have occurred because of an individual's needs for an accurate picture of his external world. Consequently, Asch (1952) suggested that when an individual experienced conflict between what he perceives or thinks and what is perceived or thought by others a "pull" toward the position of the group becomes understandable. Thus, it is the cognitive conflict experienced by an individual rather than any direct pressure brought to bear by the group that creates a "pull" toward the

group position.

It is upon this basis that Deutsch and Gerard (1955) made their distinction between normative social influence and informational social influence. They noted that these two types of influence are commonly found together. But it is possible to conform to the expectations of others and say things which one disbelieves but which agree with the beliefs of others. It is also possible that an individual will accept an opponent's beliefs as evidence about reality even though he has no motivation to agree with him.

Deutsch and Gerard's (1955) classification of types of social influence is very similar to Kelley's (1952) distinction between the functions of reference groups. It appears that the typology presented by Deutsch and Gerard (1955) is a more general classification of all social influence impinging upon an individual, whereas Kelley's (1952) refers only to social influence that is exerted by reference groups. Obviously, there is a great deal of overlap in the application of these two classifications. But the theoretical framework of Deutsch and Gerard (1955) will be used in this study rather than reference group theory, as it is more comprehensive and more fully developed.

Social mediation (Newcomb et al., 1965) can be differentiated into two types that closely resemble Deutsch and Gerard's (1955) classification of normative and informational social influence. If the social mediation operates as evidence about

reality coming from an information source other than one's own self, it would be informational social influence. Social mediation would be classified as normative social influence when it operated as a pressure to conform to the many expectations that arise from the norms of various groups, other individuals and one's own self.

Deutsch and Gerard (1955) suggested that in most investigations of the operation of social influences upon individual psychological processes, no distinction had been made among different kinds of social influences. Instead, the investigators had carelessly used the term "group" influence to characterize the impact of several different kinds of social factors. They further asserted that the subjects in these experiments (Sherif, 1935 and Asch, 1952) were not functioning as members of a group in any simple or obvious way. This assertion appears valid in that previous investigators (Sherif, 1935 and Asch, 1952) had not given the subjects any instructions to make them feel part of a group.

Deutsch and Gerard (1955) corrected for this absence of a group atmosphere when they designed a study to compare the relative effects of normative and informational social influence. With some modifications they duplicated the Asch situation: some subjects made their judgments in a face-to-face situation in the manner of Asch's subjects; others made their judgments without being seen by each other, and still others made their judgments privately but as members of a group pur-

suing a group goal. Generally their results confirmed and added to those of Asch (1952). They demonstrated the tendency of an individual to conform when he experienced cognitive conflict and that this conformity was greater when an individual made his judgments publically rather than privately. Furthermore, and perhaps of greater importance, they found greater conformity when an individual, experiencing cognitive conflict, was a member of a group. In such a situation an individual is subjected to much more normative social influence than in the experiments of Sherif (1935) and Asch (1952). They also found that the more uncertain an individual is about the correctness of his judgment, the more likely he is to be susceptible to both normative and informational social influence in making his judgment.

Their findings provided strong support for a number of hypotheses concerning the operation of normative social influence. However, they found little data relevant to the operation of informational social influence. That informational social influence was operating in the experiments by Sherif (1935), Asch (1952) and Deutsch and Gerard (1955) is indicated by the cognitive conflict experienced by the subjects. When Asch (1952) interviewed subjects after the experiment, he found that those who made errors had generally reacted in one of three ways. (1) A very few reported that they had actually begun to perceive the majority estimates as correct. In this category it would appear that the actual perception of sub-

jects had been affected. (2) A larger number of subjects reported that they had conformed because of an overwhelming need not to appear different from or inferior to the others. These subjects seemed to have suppressed the information of their own senses and conformed to the majority with the awareness of what they were doing. This situation clearly suggests the operation of normative social influence. (3) The majority of the subjects experienced a clear conflict of information from their own senses and from the unanimous judgment of the others. They resolved the conflict by concluding that the majority was correct and the information from their own senses was somehow inaccurate.

An individual may have resolved the conflict in the favor of the group for a number of reasons: 1) he may have concluded that the unanimous judgment of the others was more likely to be correct than his own judgment, (the relatively independent operation of informational social influence), or 2) he may have been additionally pushed toward accepting the group's judgment because of the minimal group pressures present (the interaction of normative and informational social influences). This second reason receives additional support from Deutsch and Gerard's (1955) finding that when a group situation is actually created the normative social influences increase and so does conformity to the group judgment. Thus, it would appear that little is actually known about the relatively independent operation of informational social influence.

3. Source credibility

A clue is provided when it is recalled that the information that an individual, experiencing conflict, receives from others is socially mediated. Newcomb et al. (1965) have pointed out that in the case of socially mediated information the individual evaluates not only the information transmitted by the source but also the source itself. Kelman and Hovland (1953) have demonstrated that the evaluation of the source affects the evaluation of the information transmitted by the source. Studies of the evaluation of information sources are generally lumped together under the term, source credibility. Hovland, Janis, and Kelley (1953) made a distinction between two components of credibility, expertness and trustworthiness. Expertness denotes the extent to which a communicator is perceived to be a source of truthful assertions. Trustworthiness denotes the degree of confidence in the communicator's intent to communicate assertions he considers true. They noted that an individual is likely to feel that persons with status, values, and needs similar to his own see things as he does and judge them from the same point of view. Because of this, their assertions about matters which the individual is ignorant will tend to carry special credibility. This notion is very similar to the comparative functions of membership reference groups.

Concerning the component of trustworthiness, it is hypothesized that when a person is perceived as having a definite intention to persuade others, the likelihood is increased that

he will be perceived as having something to gain and thus regarded as less worthy of trust. The symbols of an individual's social role serve as a set of specific cues that communicate his expertness and trustworthiness.

The research evidence (Ewing, 1942; Hovland and Weiss, 1951; and Kelman and Hovland, 1953) indicates that an individual's reactions to a communication are significantly affected by cues to the information source's expertness and trustworthiness. Hovland, Janis, and Kelley (1953) pointed out that the very same communication tends to be judged more favorably and hence exerts more influence when presented by an information source of high credibility than by one of low credibility.

4. Verbal mediation

An individual's perceptions and behavior are not only influenced by the communications of others, but also by the way his own mental processes are structured by the language he uses. A recent series of experiments (Thomas and Mitchell, 1962; Thomas and Bistey, 1966; Thomas and DeCapito, 1966; and Thomas, Hoving, and LaMonica, 1965) have demonstrated that the label a subject assigns to a color stimulus will affect his later perception of colors. This series of studies grew out of a serendipitous finding by Kalish (1958). Previous to the experiment in 1958, Kalish had successfully conditioned pigeons to discriminate between sets of very similar colors. The pigeons were conditioned to respond to a color of a particular wavelength and to ignore colors of very similar wavelengths.

The results of this procedure when represented graphically produced a distribution of responses resembling the normal curve. In most of the distributions the largest number of responses were made to the original color stimulus and progressively fewer responses were made to stimuli further removed from it. However, when Kalish (1958) used the above procedure on human subjects he did not get normal distributions about the stimulus values of 550 millimicrons (mu) and 560 mu. The distributions were asymmetrical rather than symmetrical, in that they had both shifted toward shorter wavelengths. Kalish (1958) attributed these unpredicted results to a decreased discrimination ability of subjects in the direction of shorter wavelengths.

Thomas and Mitchell (1962) employed the same basic procedure used by Kalish (1958) but came up with results that led them to reject Kalish's (1958) explanation for the shift in distributions. They found that during generalization testing the peak of the distribution of responses for 550 mu (a yellowish green) shifted toward shorter wavelengths (purer greens), but that the peak of responding following exposure to 510 mu (a bluish-green) shifted toward longer wavelengths (purer green). The peak of a wavelength between these first two, 525 mu (a pure green), showed no tendency to shift during the course of the testing. This led them to conclude that this displacement was a function of the label given to the color stimulus by the subject.

Thomas and Bistey (1966) found that the asymmetry of the

distribution of responses around a color stimulus of 550 mu (a yellowish green) varied directly with the number and range of similar colors presented in the situation. The greatest asymmetry occurred when they presented the subject with from 9 to 11 colors similar to a color stimulus of 550 mu. In this condition, there was an actual shift in the peak of responding from 550 mu to 540 mu. This finding led them to conclude that any condition which increases the difficulty of the subject's task will increase his reliance upon a label. This in turn increases the label's influence upon the individual's perception, as evidenced by the shift in his gradients. This finding is in agreement with the earlier finding (Asch, 1952 and Deutsch and Gerard, 1955) that as judgments become more difficult to make, an individual becomes more susceptible to both normative and informational social influence.

The results of the studies by Thomas and Mitchell (1962) and Thomas and Bistey (1966) strongly support the implicit assumption that the subject, when presented with a color stimulus, assigns the name of a color to it and from then on his perception is influenced by the label he assigned. The implication this assumption has for what Newcomb et al. (1965) called "direct information" is very important. It implies that the information an individual obtains through his senses, during direct transactions with the objects of his world, is not actually direct information. Even though it is not socially mediated by various information sources, as Newcomb et

al., (1965) pointed out, it is verbally mediated by the labels the individual has available.

To test the verbal mediation hypothesis, Thomas and DeCapito (1965) performed a study in which other interpretations seemed untenable. They used two color stimuli, 490 mu (a blue-green) and 584 mu (a yellowish-orange). Both of these were ambiguous with regard to color-naming categories and thus should have increased the subject's reliance upon labels. They predicted that if the subjects were required to label the color stimulus (single word designation only), then their subsequent generalization testing would indicate the influence of the label. They found that the subjects' distribution of responding shifted significantly in the direction corresponding to the label he chose. Thus, the distribution of responding for a subject who labeled the stimulus color, 490 mu, green rather than blue, would shift toward longer wavelengths (greener colors). Their findings clearly supported the verbal mediation hypothesis.

This experiment (Thomas and DeCapito, 1966) was repeated by Thomas, Hoving, and LaMonica (1966) with some important modifications. Rather than letting subjects chose their own label the experimenter assigned a label through their instructions to the subjects ("look at the green light"). In comparing the distributions they obtained with those obtained by Thomas and DeCapito (1966) they found similar results. This led them to conclude that a label imposed by the experimenter

had the same effect as one selected by the subject. The label selected by the subject and the one imposed by the experimenter had the same effect in that both exerted influence upon an individual's perception. But since the label came from different sources (one's own self and the experimenter) it should have exerted differing amounts of influence, which would be dependent upon the credibility of the two information sources.

It should be further noted that in the entire series of experiments upon the labeling effect only female subjects have been used. Both reference group theory and source credibility research suggest that an individual is more likely to be influenced by another individual of similar rather than dissimilar status, values and needs. This suggests that all else being equal, a male is likely to be more influenced by another male than by a female and vice versa.

They also found a high positive correlation between the subject's level of agreement with the assigned label and the extent to which the response distribution shifted in the direction suggested by the label. This finding suggests that the amount of influence exerted by an information source is dependent upon both its own credibility and the subject's extent of agreement or disagreement with the information source's judgment.

Thomas, Hoving, and LaMonica (1965) further noted that when the experimenter assigned the label, he was also exerting influence upon the subject, in that the subject was conforming

to a concept not of his own choosing. This observation and other findings suggest that the experimental procedure introduced by Kalish (1958) could be used to study conformity, with the shift in distributions serving as an index of conformity. They asserted that it had several advantages over previous procedures (Asch, 1952 and Crutchfield, 1955) used to investigate conformity. These advantages included the subjects' unawareness that his perception was being influenced by the stimulus label assigned by the experimenter and the absence of any tendency on the part of the subject to go along with anyone else's judgment.

They noted that the objective of their studies was to investigate the parameters of conformity in a situation which separated the perceptual and verbal components of conformity. It would appear that their procedure can minimize the operation of normative social influences and maximize the operation of informational social influence. If this is so it would be possible to examine the operation of informational social influence in a situation relatively independent of normative social influence. This could be done by varying the information sources to which the assigned label is attributed.

5. Objectives and predictions

This study was designed to investigate the effects of informational social influence upon an individual's perception and resulting behavior. The specific perceptual process stud-

ied in this investigation was that of color perception.

The first objective of this study was to examine the influence of verbal mediation upon an individual's perception of color and his resulting behavior. This was done by investigating the relationship between the label an individual assigned to a color and his subsequent perception of that and similar colors. It was predicted that:

1. The assignment of one label rather than another would cause an individual to respond differently than he would have had he assigned another label.

In addition to the influence of verbal mediation upon an individual's perception and resulting behavior it has been suggested by Newcomb et al. (1965) that perception and behavior are socially mediated. This suggests that it would make a difference as to who assigned the label to the original color stimulus. Rather than holding the information source (i.e., who assigned the label) constant and varying the label assigned, as was done to investigate the operation of verbal mediation (objective 1), the label could be held constant and the information sources varied. In this manner the influence of social mediation could be investigated. Thus, influence of both informational and normative social influence (types of social mediation) could be investigated by selecting appropriate information sources. Although this study was primarily concerned with the operation of informational social influence, normative social influence was also included because of the

close relationship between the two. The operation of both informational and normative social influence upon an individual's perception of color was manipulated by systematically varying the credibility of the label assigned to the original color stimulus. This was done by attributing the label to different information sources. It is possible that the credibility of any particular information source is partially dependent upon its sex composition. This question was dealt with in the second objective of this study.

The second objective of this study was to investigate the relationship between the sex composition of the information source and the amount of influence it exerted upon males and females. Reference group theory and source credibility research suggest that an individual is likely to be more influenced by someone of similar status, needs and values. Consequently, information sources composed exclusively of males should exert more influence upon males than females. Those information sources composed exclusively of females should exert more influence upon females than males. Males and females should be equally influenced by information sources consisting of about equal numbers of males and females. Thus, it was predicted that:

2. The information source of experimenter (a male graduate student) should exert more influence upon males than upon females.
3. The information source of cub scouts should exert

more influence upon males than upon females.

4. The information source of housewives should exert more influence upon females than upon males.
5. The information source of one's own self should exert equal influence upon males and females.
6. The information source of interior decorators should exert equal influence upon males and females.

The third objective of this study was to investigate the relationship between the extent to which individuals are influenced by information sources of varying credibility. To further examine the dependence of credibility of information sources upon their sex composition, credibility predictions were made with and without consideration of the sex composition of the information sources. Assuming that credibility operates independently of sex composition, it was predicted that:

7. Individuals should be most influenced by the first listed information source and less by each succeeding one: self, experimenter, interior decorators, housewives, and cub scouts.

The rationale for this prediction was based in part upon the findings of a pilot study designed to determine the relative credibility of ten groups. These findings provided evidence for assuming that interior decorators were seen as a more credibile information source than housewives and cub scouts less credibile than housewives. Since these sources

were providing information about reality they were exerting informational social influence upon the individuals. The remaining two information sources, self and experimenter, were exerting both informational and normative social influence. Since the combined operation of both types of social mediation tends to exert more influence than either alone (Deutsch and Gerard, 1955) the information sources of self and experimenter were placed above the other three (cub scouts, housewives, and interior decorators) that were only exerting informational social influence. The placement of the information source of self above that of experimenter was primarily based on the findings (Asch, 1952) that individuals are generally more influenced by their own expectations than by those of another, and also because of the fact that the information source of self is always of the same sex as the subject. Because of these two factors, the findings reported by Asch (1952) and the similar sex composition, the information source of one's own self was placed first in all three rank-order predictions.

Because of the sex differences suggested by reference group theory and source credibility research it is more meaningful to examine the extent to which males and females rather than individuals are likely to be influenced by various information sources. It was predicted that:

8. Males would be influenced most by the first listed information source and less by each succeeding one: self, experimenter, interior decorators, cub scouts, and

housewives.

The rationale for this prediction centered around anticipated sex differences suggested by reference group theory and source credibility research. Because the information source of experimenter was of the same sex as the male subjects it was placed second behind the information source of one's own self. The information source of interior decorators was placed third, above the remaining two sources because its credibility along the expertness dimension was much greater than theirs and its sex composition was equally male and female. Although the information source of housewives had greater credibility along the expertness dimension than the information source of cub scouts, it was anticipated that the similar sex composition of the information source of cub scouts and the male subjects would tend to counterbalance this credibility advantage. This advantage would be further reduced by the dissimilar sex composition of the information source of housewives and the male subjects. All of these factors when taken into account lead to the placement of the information source of housewives last, behind cub scouts.

9. Females would be influenced most by the first listed information source and less by each succeeding one: self, interior decorators, housewives, experimenter and cub scouts.

The rationale for this prediction also centered around anticipated sex differences. The information source of one's

own self still remained first, but it was no longer followed by the information source of experimenter. This source had been placed fourth in the rank-order because of the dissimilarity between its sex composition and that of the female subjects. The information source of interior decorators was placed second, above housewives because its credibility along the expertness dimension was much greater and its sex composition was equally male and female. The two information sources of experimenter and cub scouts were placed in the last two positions because of the dissimilarity between their sex composition and that of the female subjects. The information source of cub scouts was placed below that of experimenter because it had less credibility along the expertness dimension.

III. METHOD

1. Unit of analysis

The unit of analysis in this study was the individual. The sample of individuals used in this study consisted of 55 male and 55 female undergraduates, enrolled in introductory psychology courses at Iowa State University. These subjects were exposed to varying amounts of informational social influence in a color perception experiment. All subjects were presented with the same original "blue-green" color stimulus at the beginning of the experiment, and the label given to this original color stimulus was always "green".

2. Apparatus

The color stimulus chosen to serve as the original color stimulus had been selected because of its ambiguity with regard to color-naming categories. This had been determined in a pilot study, in which 81 college students had been asked to select the most appropriate name for the color, 489.5 mu (blue-green), from a list of six color names (red, orange, yellow, green, blue and violet). It was found that "blue" was selected by 42 students and "green" by 39 students.

The other eight colors used in the study were equal to the original color stimulus in lightness-darkness and saturation, but varied in hue (wavelength). The color stimuli used were all Munsell individual color papers with a matte finish. The

nominal Munsell notations were as follows: 7.5 G5/6, 10 G5/6, 2.5 BG5/6, 5 BG5/6, 7.5 BG5/6 (original color stimulus), 10 BG5/6, 2.5 B5/6, 5 B5/6, and 7.5 B5/6.

The color stimuli were presented to the subject through a 7/8 inch aperture that was located at the center of a 22 x 28 inch panel. The panel, which was constructed of black posterboard, faced the subject so that the aperture was at approximately eye level. The subject was seated in a chair at the end of the table on which the panel was mounted. To keep a constant distance of four feet between the color stimuli and the subjects, they were all told to move their chair up to the table. The color stimuli were mounted on circular discs 8 inches in diameter. On each disc the nine stimulus colors were arranged in different random orders.

3. Procedure

After each subject was seated, he was given the following instructions. "At the beginning of the experiment a specific color will be presented through the aperture in front of you. In a previous experiment it was judged green by a group of interior decorators (or housewives or cub scouts). Try to keep this color in mind because you will be asked to identify it later. After 30 seconds, this color will be removed from your vision. Okay, this is the color that was judged green by the interior decorators (or housewives or cub scouts). Try and keep it in mind because I will ask you to identify it

later." At this time the subject was exposed to the original color stimulus for 30 seconds and then given the following additional instructions. "From now on I will give the signal 'ready' and a few seconds later a color will be presented. You must decide whether this is the original color shown to you at the beginning of the experiment. If it is say 'yes', if not say 'no'. I shall continue to say 'ready' whenever I am about to present a color for you to judge. First, we are going to try some practice trials. They will be exactly the same as those in the real experiment. Do you have any questions at this time?" The subject's questions were answered if he had any and then he was given a practice trial with the fifth color disc. Each of the nine stimulus colors were presented to the subject for two seconds. There was an eight second interval between stimulus colors during which the subject saw only black. After the practice trial the subject was told, "Now we are going to begin the real experiment. Remember try to keep the original color in mind and respond as rapidly as you can, by saying either 'yes' or 'no'. Do not be disturbed, however, if you should make a mistake or two." After these instructions the subject was exposed to the five color discs in a standardized order. Thus, during the course of the experiment every subject was exposed to each of the nine color stimuli five times, for a total of forty-five presentations.

The above instructions were given to three groups, each containing 20 subjects (10 males and 10 females). For these

Table 1. Summary of group ratings on expertness in correctly labeling and distinguishing between colors

Group	Mean rating
Interior decorators	6.24
College art professors	6.16
Famous American artists	6.02
Housewives	4.49
Teenagers	4.21
College freshmen	4.01
Elementary school children	3.33
Businessmen	3.13
Cub scouts	2.87
Colorblind individuals	1.71

three groups the amount of influence exerted by the label assigned to the original color stimulus was varied by attributing the assigned label to different groups. The three groups which were used in this study were selected because of their relative degree of credibility. This was determined in a pilot study in which 25 college students were asked to rate ten groups (See Table 1) according to their expertness in correctly labeling and distinguishing between colors. On a seven point scale it was found that interior decorators were rated highest with a mean rating of 6.24 and cub scouts were rated next to lowest with a mean rating of 2.87. The lowest group, colorblind individuals, was not used because their ability to distinguish blue from green would not be impaired. A third group of moderate credibility was selected on the basis of lying midway between interior decorators and cub scouts. The group that

most closely satisfied this requirement was housewives, which had a mean rating of 4.49.

For the remaining two groups of subjects, the above instructions had to be slightly modified. One group was told "At the beginning of the experiment a green color will be presented through the aperture in front of you." These instructions were designed so that the Experimenter would be serving as the information source for the 10 males and 10 females in this fourth group. In the last group the subjects served as their own information source by choosing the most appropriate name for the original color stimulus from a list of six color names (red, orange, yellow, green, blue, and violet). No combination of labels (e.g. bluish-green) was permitted, instead the subject had to make a commitment to a single category name. Since the original color stimulus was blue-green, approximately half of the subjects in the last group labeled it "green" and the remaining half labeled it "blue".

After the subjects of the first four groups had been exposed to all five color discs they were asked to answer a few questions. Subjects of the first three groups (interior decorators, housewives, and cub scouts) were asked what group had participated in a previous experiment and what color they had judged the original color stimulus to be. These questions were designed to screen out those subjects who for one reason or another had not paid sufficient attention to the instructions. Only one subject was found who could not answer both of the

questions; consequently, his data were not used. The subjects were also asked to indicate their degree of agreement or disagreement with the group's judgment. A six point Likert type scale was used with no neutral scale position. Subjects in group four (experimenter as the information source) were asked what label had been assigned to the original color and their agreement or disagreement. Subjects in the last group were asked two questions immediately after they had been exposed to the original color stimulus for 30 seconds. First, they were asked to pick the most appropriate name for the color from a list of six (red, orange, yellow, green, blue, and violet). Then they were asked to indicate on a six point Likert scale how well they thought the label they picked described the original color stimulus.

4. Measure of influence

The nine color stimuli were assigned numbers from one to nine. The number one was assigned to the bluest color stimuli (7.5 B5/6) and the number nine to the greenest color stimuli (7.5 G5/6). The original color stimuli (7.5 BG5/6), being equally blue and green was assigned the number five.

During the experiment the experimenter recorded the number of times the subject gave the response "yes" to each of the nine color stimuli. Since each of the nine color stimuli appeared on each of the five color discs, there was a total of 45 presentations of color stimuli to every subject. To each of

these presentations the subject gave either a "yes" or a "no" response. It was on the basis of this resulting verbal behavior that inferences about the operation of influence were made. This was necessary because the internal process of perception could not be directly observed and thus an observable, such as resulting verbal behavior, had to be used. This record of each subject's "yes" responses constituted his response distribution. From each subject's response distribution a mean response was calculated (Appendix B).

If the label an individual assigned to the original color stimulus had no influence upon his perception and resulting behavior his response distribution should have fit one of two distributions, each with a mean response of five. Either he should have responded only to color stimulus number 5 (the original color stimulus) or his responses should have formed a normal distribution around color stimulus number 5. However, if the label an individual assigned to the original color stimulus influenced his perception and resulting behavior, the mean response of his distribution should differ from five. The extent of influence exerted by a label assigned to the original color stimulus would be indicated by the extent to which the mean of the resulting response distribution differed from five. The extent of influence exerted by the various information sources to which the same label was attributed would also be indicated by the extent to which the mean of the resulting response distribution differed from five.

IV. RESULTS

The null hypotheses generated from prediction 1 is as follows:

Null Hypothesis 1:

The mean response for individuals assigning the label "blue" should not differ from that of those who assigned the label "green". (The statistical hypothesis tested was $u_B = u_G$)

The analysis of variance presented in Table 2 indicates that the label-main effect was statistically significant ($p = .10$ or less) at the .01 level. The sex-main effect and sex-by-label interaction were both nonsignificant. Thus, there was evidence to reject null hypothesis u. The rejection of null hypothesis 1 confirms prediction 1.

The null hypotheses generated from prediction 2 through 6 are as follows:

Null Hypothesis 2:

The information source of experimenter (male graduate student) should exert equal influence upon males and females. (The statistical hypothesis tested was $u_{E(M)} = u_{E(F)}$)

Null Hypothesis 3:

The information source of cub scouts should exert equal influence upon males and females. (The statistical hypothesis tested was $u_{CS(M)} = u_{CS(F)}$)

Table 2. Summary of analysis of variance for main effects of labels and sexes

Source	Degrees of freedom	Sum of squares	Mean square	F
Sex-main effect	1	0.12	0.12	0.2934 n.s.
Label-main effect	1	3.94	3.94	9.6330 ***
Sex/label interaction	1	0.00	0.00	0.0000 n.s.
Within cell	16	6.54	0.409	

***Significant beyond the .01 level of probability.

Null Hypothesis 4:

The information source of housewives should exert <u>equal</u> influence upon males and females. (The statistical hypothesis tested was $u_{HW(M)} \neq u_{HW(F)}$)

Null Hypothesis 5:

The information source of one's own self should exert <u>unequal</u> influence upon males and females. (The statistical hypothesis tested was $u_{S(M)} \neq u_{S(F)}$)

Null Hypothesis 6:

The information source of interior decorators should exert <u>unequal</u> influence upon males and females. (The statistical hypothesis tested was $u_{ID(M)} = u_{ID(F)}$)

These null hypotheses were tested by a procedure set forth by Winer (1962). The analysis of variance of the main effects, presented in Table 3, indicates that the sex-main effect was statistically significant ($p = .10$ or less) at the .10 level.

Table 3. Summary of analysis of variance for main effects of information sources and sexes

Source	Degrees of freedom	Sum of squares	Mean square	F
Sex-main effect	1	1.61	1.61	2.7521 *
Source-main effect	4	2.02	0.505	0.8632 n.s.
Sex/source interaction	4	2.07	0.518	0.8855 n.s.
Within cell	90	52.66	0.585	
Total	99	58.36		

*Significant beyond the .1 level of probability.

The source-main effect and the sex-by-source interaction were not statistically significant.

Since a differential effect of a given information source upon males and females was predicted in only three of the five cases (prediction 2-experimenter, prediction 3-cub scouts, and prediction 4-housewives) a significant sex-by-source interaction was not necessarily expected. The test for the presence of interaction was equivalent to a test of the differences in the shapes of the profiles of the simple effects for information sources and for sexes. Geometrical representations of the profiles corresponding to the simple effects for the information sources and the simple effects for the sexes are presented in Figures 1 and 2, respectively.

Although the sex-by-source interaction was not statistically significant, the data presented in Figure 2 suggest

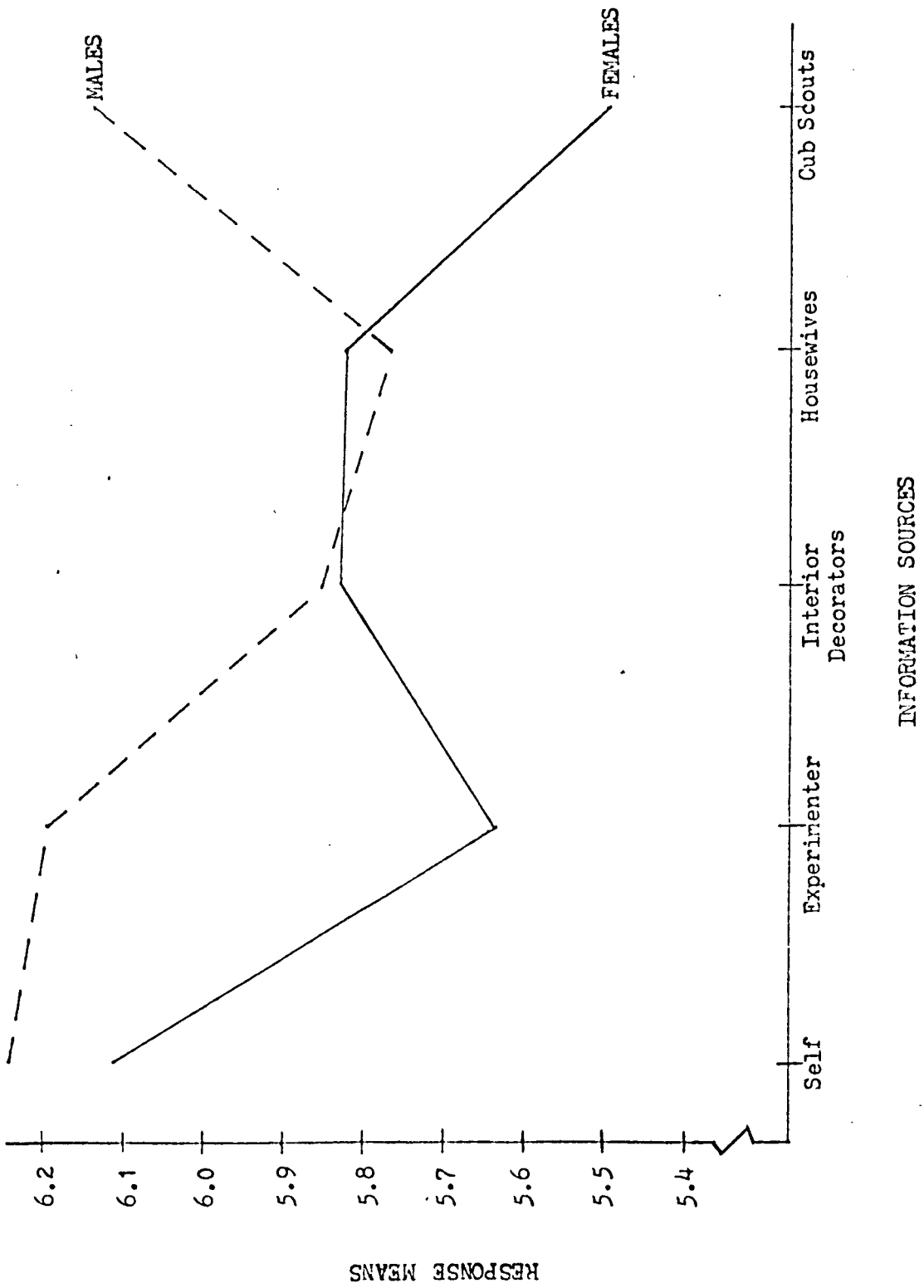

Figure 1. Profiles of simple effects for information sources

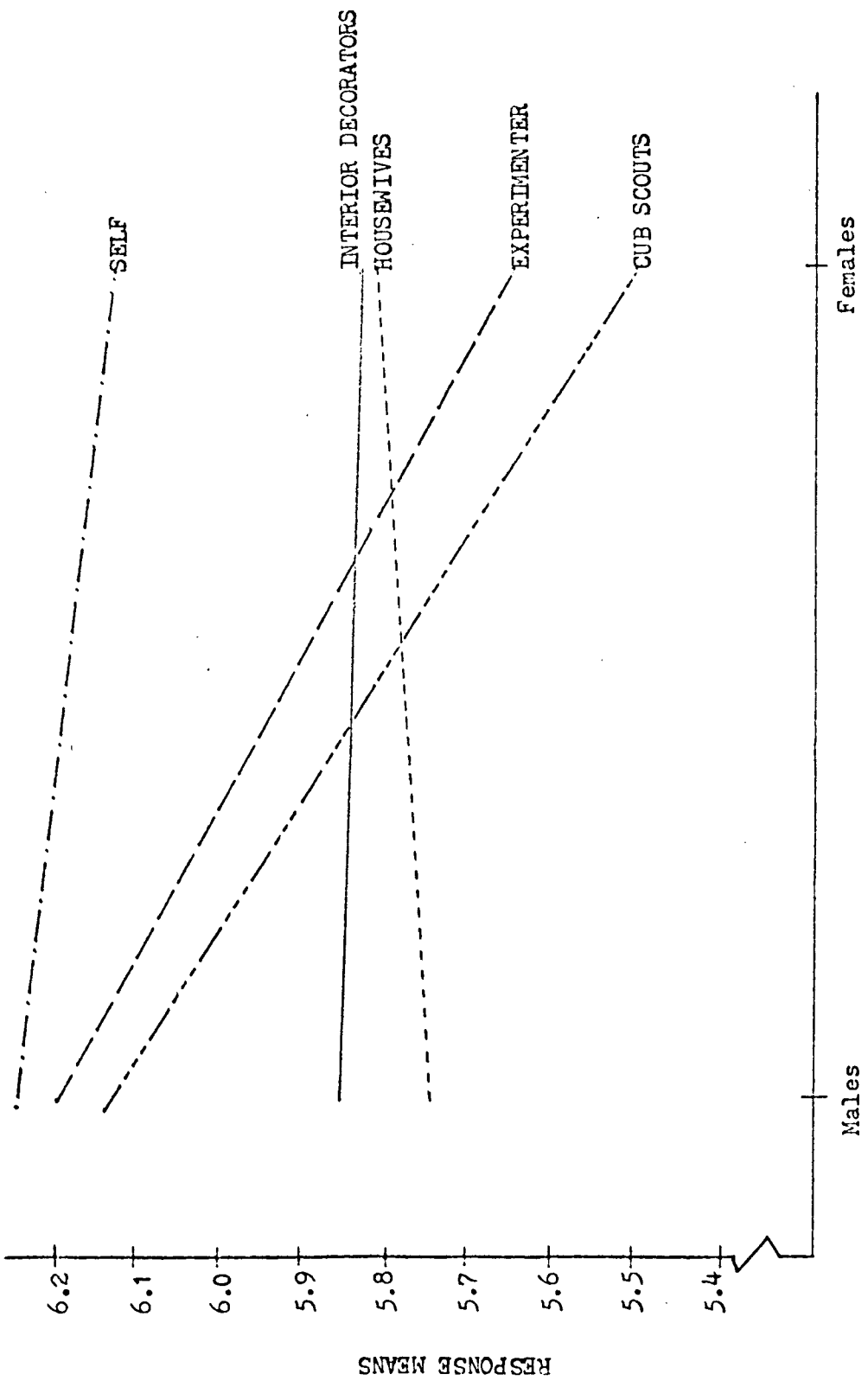

Figure 2. Profile of simple effects for sex of subjects

that the information sources of cub scouts and experimenter differentially affect males and females. Relevant to this possibility is the analysis of variance for the simple effects of the sexes for each information source, which is presented in Table 4. The experimental data indicate that there are differential effects upon the sexes for the information sources of cub scouts and experimenter, but that there are no

Table 4. Summary of analysis of variance for the simple effects of the sexes for each of the information sources

Source	Degrees of freedom	Sum of squares	Mean square	F	
Sexes for interior decorators	1	0.00	0.00	0.0000	n.s.
Sexes for housewives	1	0.03	0.03	0.0513	n.s.
Sexes for cub scouts	1	0.98	1.98	3.3850	***
Sexes for experimenter	1	1.58	1.58	2.7009	*
Sexes for one's own self	1	0.09	0.09	0.1530	n.s.
Within cell	90	52.66	.585		

***Significant beyond the .01 level of probability.
*Significant beyond the .1 level of probability.

differential effects upon the sexes for the information sources of interior decorators, housewives, or one's own self. Thus, there is evidence for the rejection of null hypotheses 2, 3, 5, and 6. The rejection of null hypotheses 2, 3, 5, and 6 confirms predictions 2, 3, 5, and 6 but not 4. Although the findings relevant to prediction 4 were not statistically sig-

Table 5. Summary of analysis of variance for the simple effects of the information sources for each of the sexes

Source	Degrees of freedom	Sum of squares	Mean square	F
Sources for males	4	1.92	.480	0.8905 n.s.
Sources for females	4	2.17	.543	0.9274 n.s.
Within cell	90	52.66	.585	

nificant, they were in the predicted direction.

Tests of differences between means within the same profile are given in tests on the simple effect of the information sources. The analysis of variance of the simple effects of the information sources for each of the sexes is presented in Table 5. The experimental data indicated that there are no differences between the information sources for males and females. Although the influence exerted by the different information sources upon males and females was not statistically significant, it was differently rank-ordered for males and females. This different rank-ordering was examined by testing the null hypotheses generated from predictions 7, 8, and 9.

The null hypotheses generated from predictions 7, 8, and 9 are as follows:

Null Hypothesis 7:

There is no correlation between the predicted rank-order of information sources for males and females

and that actually obtained from a group of males and females.

Null Hypothesis 8:

There is no correlation between the predicted rank-order of information sources for males and that actually obtained from a group of males.

Null Hypothesis 9:

There is no correlation between the predicted rank-order of information sources for females and that actually obtained from a group of females.

Null hypotheses 7, 8, and 9 were tested by calculating a Spearman rank-order correlation (r_s) between the predicted and obtained rank-orders for each of the three groups. The r_s between the predicted and actual rank-orders of information sources for males and females was .90, which was statistically significant ($p = .10$ or less) at the .04 level. This evidence leads to the rejection of null hypothesis 7 and the confirmation of prediction 7. An r_s of .90 was also obtained between the predicted and actual rank-orders of information source for males. This evidence leads to the rejection of null hypothesis 8 and the confirmation of prediction 8. The predicted and actual rank-orders of information sources for females were identical, which produced an r_s of 1.0 that was statistically significant ($p = .10$ or less) at the .02 level. This evidence leads to the rejection of null hypothesis 9 and the confirmation of prediction 9.

V. DISCUSSION AND CONCLUSIONS

1. Discussion

It was found that the label an individual gave to the original color stimulus when first exposed to it altered his subsequent perception of the original and similar stimulus colors. Thus, an individual who labeled the original color stimulus "green" tended to give the response "yes" more to the "green" stimulus colors so that his resulting response distribution shifted toward "greens" rather than "blues" and had a mean greater than five. However, an individual who labeled the original color stimulus "blue" gave more "yes" responses to "blue" stimulus colors so that his resulting response distribution shifted toward "blues" and had a mean slightly greater than five. Thus, it appears that verbal mediation does influence an individual's perception of colors and his resulting behavior. The findings of this part of the study are in agreement with previous research in this area (Thomas and Bistey, 1966; Thomas and DeCapito, 1966; Thomas, Hoving and LaMonica, 1965; and Thomas and Mitchell, 1962). The findings of all of these studies suggest that verbal mediation may influence much of human behavior by operating in many other areas of individual perception.

The primary concern of this study went beyond the operation of verbal mediation and dealt with the operation of social mediation. Social mediation was investigated by examining the

operation of information and normative social influence (Deutsch and Gerard, 1955) upon an individual's perception of colors. Differing amounts of informational and normative social influence were exerted by five information sources of varying credibility. It appears that credibility does not operate independently of the sex composition of the information sources. Instead, information sources that are composed of just one sex seem to exert more influence upon individuals of that sex than upon those of the other sex. Three of the five information sources were composed exclusively of one sex (cub scouts, experimenter, and housewives). The two information sources that were composed exclusively of males (cub scouts and experimenter) exerted significantly greater influence upon males than females. Although the information source (housewives) composed exclusively of females did not exert significantly more influence upon females than males, it did exert more influence upon females. It is possible that the amount of influence exerted upon college females by the information source of housewives was less than anticipated because it did not serve as a positive reference group for all of the college females. It is possible that for those college females who have a strong career orientation, housewives would serve as a negative reference group; whereas, housewives would serve as a positive reference group for those college females planning to be housewives. When the information source of housewives is seen as a negative reference group it would exert less influence than

when it is seen as a positive reference group. Although this line of reasoning was not directly tested in the study it is provided with some support. It was found that the variance of female response means was significantly greater than the variance of the male response means when the information source was housewives. Because of the differential influence exerted upon males and females by certain information sources (those composed of one sex) it seems more meaningful to speak of credibility in terms of males and females rather than individuals.

A statistically significant sex-main effect (see Table 3) was not anticipated. Males differed from females in that they gave 22% more "yes" responses (637 to 522) and had a higher overall mean response than females. The combination of the above three findings suggests that males were more subject to influence than females. But when an important variable, the sex of the experimenter, is taken into account it appears that the difference may have been due to the experimenter effect rather than greater susceptibility to influence on the part of males. This study was not designed to determine which of the above alternatives was responsible for the difference between males and females. But there is a growing body of literature that would support the operation of the experimenter effect as the main cause of such differences.

Although the source-main effect and the sex-by-source interaction were not statistically significant (see Table 3) different rank-orders of influence operated upon males and fe-

males. Predictions as to the rank-order positions of the information sources were made for males and females separately and together. Thus, three credibility estimates were made for each information source; one for males and females together, one for males only, and one for females only. In other words, the first credibility estimate for each information source was made without any consideration of possible sex differences, whereas the second and third sets of predictions took this possibility into account. Although the prediction of the rank-order of information sources for males and females together was confirmed, an inspection of the separate rank-orders for males and females suggests that differential influence was being exerted upon them by the information sources. The operation of differential influence is clearly indicated by the non-significant ($p = .34$) Spearman rank-order correlation of .5 between the separate rank-orders of information sources for males and females. Thus, it appears that the exertion of differential influence by the information sources is obscured when the data for both males and females are combined, but it becomes readily apparent when separate analyses are carried out.

2. Conclusions

From the findings of this study it may be concluded that a number of different types of social influence exert distorting pressures upon the process of color perception. These types of influence may be classified as verbal and social med-

iation.

Verbal mediation occurs when an individual finds it necessary to assign a label to something he perceives. From the findings of the present study it may be concluded that the label an individual assigned to a color influenced his later perception of that and similar colors.

Social mediation occurs as either informational or normative social influence. It may be concluded from the findings of this study that the amount of informational social influence exerted upon an individual by a particular information source was dependent upon two dimensions of credibility. One of these dimensions was that of expertness and the other was that of similarity or dissimilarity between the sex composition of the information source and the sex of the individual to whom the information was directed. Since the credibility of any information source was dependent upon these two factors, males and females were differentially influenced by some information sources (those composed exclusively of one sex), but not by others (those composed of a relatively equal number of males and females).

From the findings of this study which dealt with the comparative strengths of informational and normative social influence, it may be concluded that the later tends to exert more influence. The combined operation of both types tends to exert more influence than that produced by the relative operation of either one separately.

3. Research implications

The findings of the present study suggest that a number of variables need further investigation. One variable which was not controlled in the present study was the subject's degree of initial agreement-disagreement with the label assigned to the original color stimulus by various information sources. Since this variable has been found to effect the extent to which an individual is influenced by the assigned label (Thomas, Hoving, and LaMonica, 1965), it should be controlled. Although it is impossible to know in advance what a particular individual's degree of agreement-disagreement will be, it would be possible to wait and assign him to an experimental group after he had indicated his degree of agreement-disagreement.

Another variable which should be further investigated is the choice of labels the subject has available. Instead of offering him just green and blue, he should be given such intermediate labels as bluish-green, greenish-blue and equally blue and green. These labels, especially the latter one, should produce less distortion in the subject's perception than the labels blue and green. Thus, it would be anticipated that their response distributions would show little if any shift from the distribution that would be produced in the absence of influence.

The influence exerted by various information sources needs to be investigated in greater detail. It would be de-

sirable to use sets of information sources in which such factors as sex, age, education, etc. were systematically varied. Research such as this would help delimit the variables responsible for differing levels of credibility. There should also be an examination of the amount of influence exerted upon males and females by information sources composed of varying proportions of males and females. This is needed as the present research only indicated what happened when the information source is composed of all one sex or an equal number of each sex.

The influence exerted upon an individual by his own expectations should be examined. This could be done by modifying the credibility of the information an individual provides himself. After a subject was given a simple color discrimination test he would be informed that his color discrimination ability was excellent or poor. This in turn should increase or decrease the amount of influence his expectations should exert upon his perception of color.

Lastly this general experimental technique might be used to subtly measure prejudice. This could be done by attributing the label assigned to the original color stimulus to various majority and minority groups. A comparison of the amount of influence exerted by two groups that differed only as to various majority or minority group memberships might provide a measure of prejudice.

VI. SUMMARY

Because of the existence of other persons and one's interaction with them, an individual is exposed to various types of social influence. Kelley (1952) suggested that reference groups influenced individuals in various ways. Studies of conformity (Sherif, 1935 and Asch, 1952) have demonstrated that some form of group process operated to influence an individual's perception. Research (Ewing, 1942 and Hovland and Weiss, 1951) has demonstrated that the amount of influence exerted by the same information varies according to the credibility of the source providing the information. Deutsch and Gerard (1955) provided a useful distinction between the various types of social influence. Their term normative social influence encompassed the type of influence operating in the conformity studies. This was distinguished from informational social influence which operated in the research on source credibility. Even after making this distinction, Deutsch and Gerard (1955) provided little information as to the operation of informational social influence. Recent research (Thomas and DeCapito, 1966 and Thomas, Hoving, and LaMonica, 1965) had demonstrated that the very label an individual assigns to the things he perceives will exert influence upon his subsequent perception of these things.

The present study was designed primarily to provide fur-

ther information about the operation of informational social influence on perception. Secondary concerns were the operation of normative social influence on perception and the effects of assigning labels to the things one perceives (verbal mediation). The operation of these three processes was incorporated into an experiment on color perception. Verbal mediation was manipulated by assigning different labels to the same color. Informational and normative social influence were manipulated by attributing the assigned label to different information sources. Altogether five different information sources were used in the present study. Three of these sources (interior decorators, housewives, and cub scouts) exerted informational social influence and two of them (experimenter and one's own self) exerted primarily normative social influence. The unit of analysis in this study was the individual. A total of 110 subjects (55 males and 55 females) were exposed to varying amounts of social influence.

It was found that the operation of verbal mediation definitely exerted influence upon an individual's perception of color. It was also found that both normative and informational social influence exerted influence upon an individual's perception of color, with the former exerting the greater amount of influence. An important secondary finding of this study was that the credibility of the information sources did not operate independently of the sex composition of each source.

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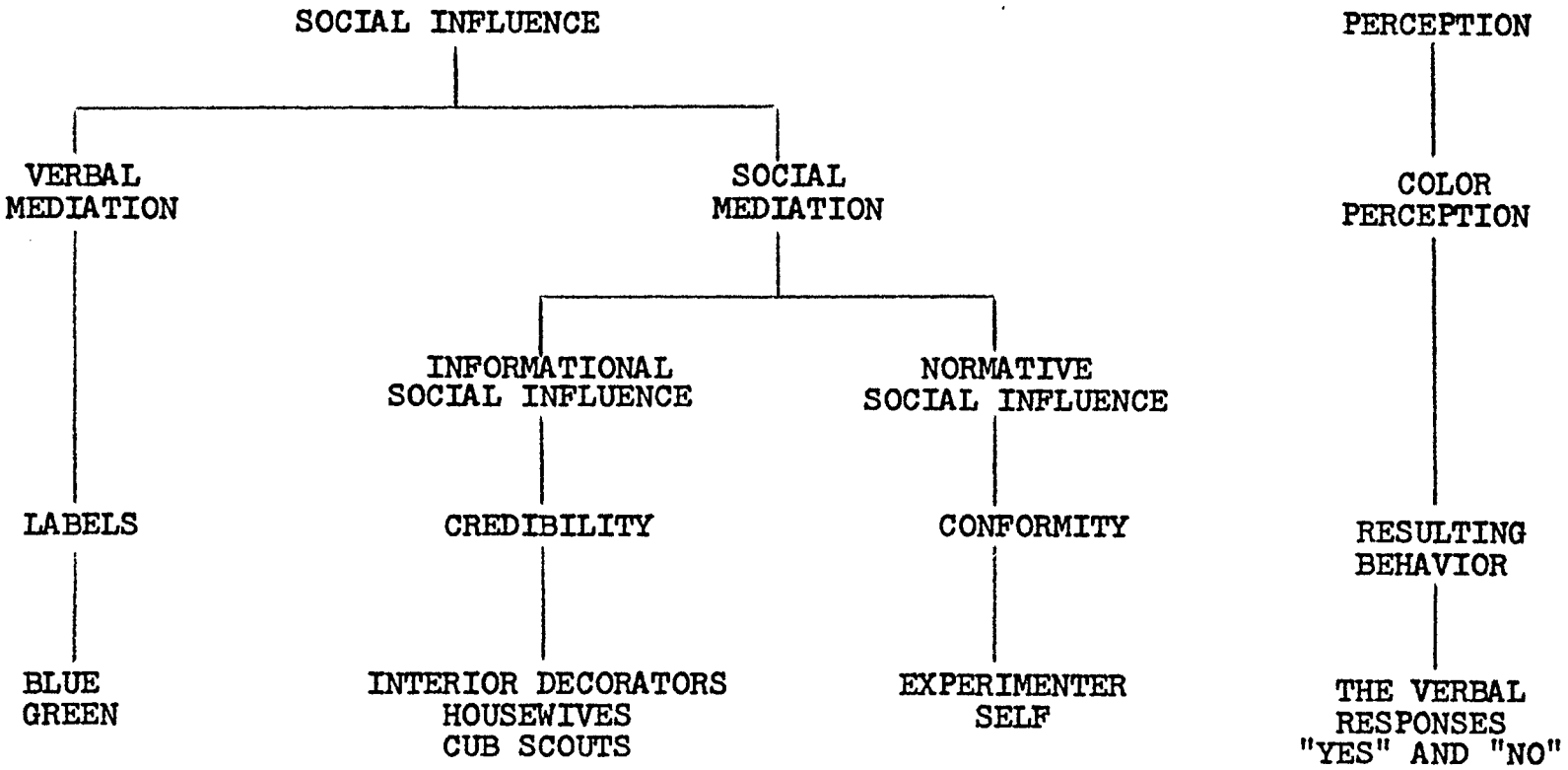
IX. APPENDIX A

DIAGRAM OF THE CONCEPTUAL FRAMEWORK



X. APPENDIX B

RESPONSE MEANS OF SUBJECTS

Information source	Interior decorators		Housewives		Cub scouts	
Assigned label	Green		Green		Green	
Sex	Males	Females	Males	Females	Males	Females
Response means	6.44	5.50	5.10	5.92	6.83	6.20
	5.31	6.25	6.25	4.00	7.18	5.69
	5.30	6.58	6.07	6.14	7.00	5.71
	5.45	5.50	5.50	5.91	6.13	4.57
	4.80	5.63	5.88	6.36	3.00	3.00
	6.38	6.25	6.00	6.18	5.80	5.33
	6.50	5.17	5.46	6.69	6.38	6.73
	6.17	5.90	5.00	5.22	6.31	6.22
	6.20	6.46	5.92	6.00	6.39	5.82
	6.00	5.08	6.27	5.82	6.22	5.67
Sex means	5.855	5.832	5.745	5.824	6.124	5.494
Information source means	5.8435		5.7845		5.8090	

Information source	Experimenter		Self			
Assigned label	Green		Green		Blue	
Sex	Males	Females	Males	Females	Males	Females
Response means	6.38 6.23 6.25 6.60 5.73 7.20 5.14 5.00 6.40 7.00	5.82 5.80 5.50 5.70 6.00 5.25 4.44 5.25 6.09 6.47	6.38 6.25 6.40 6.18 6.00 6.20 6.25 6.36 6.27 6.14	6.17 5.63 6.36 6.10 6.29 6.31 6.00 6.25 5.92 6.07	6.88 4.45 5.50 5.33 4.73	4.86 6.08 5.62 4.83 4.60
Sex means	6.193	5.632	6.243	6.110	5.378	5.198
Information source means	5.8435		5.7845		5.2980	