AN ABSTRACT OF THE THESIS OF

SUSAN GRAY CARTER for the degree MASTER OF SCIENCE
(Name) (Degree)

in Clothing, Textiles and Related Arts presented on August 9, 1974
(Major Department) (Date)

Title: CONSUMER PERCEPTION AND ACCEPTANCE OF COLOR CHANGE

Abstract approved: Redacted for Privacy
Ruth E. Gates

The purpose of this study was to determine consumer perception and acceptance of color change in textile fabrics, and the relation of acceptance to age, sex, and socio-economic level. Eighteen null hypotheses were drawn to investigate if relationships existed between: (1) the degree of color change perceived and found acceptable and: uniformity of the color change within the clothing item, cost of the clothing item, and whether the clothing item was to be worn in public or at home; and (2) perception and acceptance of color change and: age, sex, and socio-economic level of the consumer.

The sample of male and female subjects 25-34, 45-54, and 65-74 was randomly selected from the Corvallis voter's registration files. In the study there were 10 to 15 members in each age-sex group with a total of 86 consumers being interviewed. The consumer was presented 36 pairs of fabric samples consisting of an original and a test fabric representing pastel and intense yellow, red, and

blue. For each color six pairs of fabric samples at the five levels of fading plus a control level were presented. Six questions on perception of color difference and acceptance of the color change were posed.

Major conclusions of the study were:

None of the 18 posed null hypotheses was rejected. In analyzing the age and sex variables no consistent relationships were found between perception and acceptance of color change in textile fabrics and these two variables. Problems in the size of the socio-economic classes in the study resulted in the decision not to analyze this variable statistically.

In cases where significant relationships were found they showed a tendency for males to be more accepting of color change than females and in a few cases, for acceptance of color change to increase with increasing age. Accuracy of perception of color change tended to decline with increasing age. Also, for all colors at all color levels, it was indicated that uniform color change was more acceptable than non-uniform color change, that color change was more acceptable in clothing to be worn at home than in clothing to be worn in public, and that color change was more acceptable in inexpensive clothing than in expensive clothing. Acceptability of color change decreased when the amount of color change increased.

Consumer Perception and Acceptance of Color Change

by

Susan Gray Carter

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

June 1975

APPROVED:

Redacted for Privacy

Associate Professor of Clothing, Textiles and Related Arts
in charge of major

Redacted for Privacy

Head of Department of Clothing, Textiles and Related Arts

Redacted for Privacy

Dean of Graduate School

Date thesis is presented August 9, 1974

Typed by Clover Redfern for Susan Gray Carter

ACKNOWLEDGMENTS

The writer wishes to express sincere appreciation to all those who assisted her with this thesis and her graduate program. Special thanks are extended to Dr. Ruth Gates, her major professor, for her interest, encouragement, scholarly advice, and professional guidance throughout the study.

Appreciation is also expressed to Dr. Florence Petzel, Head of the Clothing, Textiles, and Related Arts Department and to other faculty members in the department for their assistance during the graduate program; to Miss Elaine Carlson for her special interest, counsel, and friendship and to Mrs. Connie Plants for her interest and concern; to Dr. R. E. Rowe for his assistance with the statistical analyses; and to the many individuals who participated in evaluating the test samples and thus made the study possible.

Special appreciation is expressed to the writer's parents for their sincere interest and concern. Their constant inspiration, encouragement, and strong support has meant a great deal. Deepest thanks are given to the author's husband, Mike, for his patience, interest, understanding and unselfish attitude throughout the graduate program, and for his special way of making even difficult times bearable.

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Statement of the Problem	3
Hypotheses of the Study	4
Assumptions	6
Limitations of the Study	7
BACKGROUND AND REVIEW OF LITERATURE	8
Perception	8
Color Perception	9
Theories on Color Perception	13
The Trichromatic Theory or Young-Helmholtz Theory	14
The Opponent Color Theory	14
The Zone Theory	15
Deficiencies in Color Perception	15
Factors Related to Color Perception	20
Age	20
Sex and Eye Color	22
Training	22
Social Influences	23
Measurement of Color	23
AATCC Test Methods	26
Perception and Acceptance of Color Change	27
PROCEDURE	29
Collection of Data	29
Selection of Site	29
Selection of Sample	30
Collection Procedure	31
Instruments Used	32
Viewing Area	33
Viewing Instrument	34
Fabrics Used	35
Specific Method	36
Measures	38
Social Status	38
Statistical Analyses	39
FINDINGS	41
Description of Sample	41
Statistical Analyses	42

Page

Perception and Acceptance of Color Change in Pastel Yellow 46
Perception 46
Acceptance 46
Perception and Acceptance of Color Change in Pastel Red 51
Perception 51
Acceptance 51
Perception and Acceptance of Color Change in Pastel Blue 54
Perception 54
Acceptance 58
Perception and Acceptance of Color Change in Yellow 61
Perception 61
Acceptance 61
Perception and Acceptance of Color Change in Red 66
Perception 66
Acceptance 66
Perception and Acceptance of Color Change in Blue 70
Perception 70
Acceptance 74
Summary of Color Perception and Acceptance 77
Perception 77
Acceptance 77

CONCLUSIONS AND DISCUSSION 78
Null Hypotheses 78
Summary 86

RECOMMENDATIONS 88
Uses of the Present Study 88
Recommendations for Improvement of the Present Study 89
Recommendations for Further Research 90

SUMMARY 92
Statement of the Problem 92
Purpose of the Study 92
Procedure 93
Findings and Conclusions 94
Recommendations 95

BIBLIOGRAPHY 97

LIST OF TABLES

Table		Page
1	Coding of fabric samples.	36
2	Population distribution by socio-economic level, age, and sex.	41
3	Population distribution by socio-economic level, marital status, age, and sex.	43
4	Pastel yellow -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	47
5	Pastel yellow -- chi-square values for uniformity of change, end use, and cost for six color levels.	50
6	Pastel yellow -- percentages of yes responses to questions Q1 through Q6 by color level.	50
7	Pastel red -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	52
8	Pastel red -- chi-square values for uniformity of change, end use, and cost for six color levels.	55
9	Pastel red -- percentages of yes responses to questions Q1 through Q6 by color level.	55
10	Pastel blue -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	56
11	Pastel blue -- chi-square values for uniformity of change, end use, and cost for six color levels.	60
12	Pastel blue -- percentages of yes responses to questions Q1 through Q6 by color level.	60
13	Yellow -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	62

Table		Page
14	Yellow -- chi-square values for uniformity of change, end use, and cost for six color levels.	65
15	Yellow -- percentages of yes responses to questions Q1 through Q6 by color level.	65
16	Red -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	67
17	Red -- chi-square values of uniformity of change, end use, and cost for six color levels.	71
18	Red -- percentages of yes responses to questions Q1 through Q6 by color level.	71
19	Blue -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.	72
20	Blue -- chi-square values for uniformity of change, end use, and cost for six color levels.	76
21	Blue -- percentages of yes responses to questions Q1 through Q6 by color level.	76

CONSUMER PERCEPTION AND ACCEPTANCE OF COLOR CHANGE

INTRODUCTION

Color performance is one of the more important factors affecting consumer satisfaction with textile products (Steiniger and Dardis, 1971). This fact has become even more prominent in the last few years when the use of color in all types of textile products has advanced considerably. Especially in fashion and home furnishing products the intensity of colors used has noticeably increased. These changes in fashion have also made more apparent the male consumer's concern over color performance in textiles.

The greatest value in attaining a higher degree of knowledge and understanding of the expectations or requirements of consumers in regard to color performance in textiles would be the aid this would give to the industry and to government in developing more accurate performance standards and labeling laws for textile products. Present standards for color performance in textiles vary considerably. In many instances these standards are below consumer requirements, and it is estimated that in other instances the standards set higher qualifications of performance than are actually necessary for the consumer's intended end use of the textile product. The correction or at least improvement of such standards would be very beneficial

to the consumer as well as to the industry.

Color is usually the first attribute noticed in a textile product and is very influential on the consumer's decision to purchase (Stearns, 1974). As a result color performance of the textile product is of major importance to the average consumer. Color performance failure in textile products made up 30 percent of the registered consumer complaints to the National Institute of Drycleaning in 1970 (NID Bulletin, 1971). There are various factors that contribute to poor color performance, but the most important seem to be poor resistance to light and failure to withstand care procedures (WRCC-9 Proposal, 1973). New regulations on care labeling should help to reduce color loss due to care procedures. However, it is still essential to determine the degree of color loss that can take place and still result in a textile product that the consumer perceives as being acceptable or satisfactory for use.

Certain consumer variables may be associated with perception, and with acceptance, of color change in textiles. It must be considered that the observer's perception and acceptance of color change are affected not only by the actual stimuli but also by forces within the individual. Therefore to explain more adequately consumer reaction to color performance in textiles, investigation should present information on how the consumer reacts to color change and also give some insight into why he reacts as he does. This combination of

information gives a more complete picture and would be more useful in ultimately predicting textile color performance requirements of all consumers.

The topic of this study is associated with a research project of the Western Regional Coordinating Committee (WRCC-9) and findings will contribute to the same.

Statement of the Problem

Research in the fiber and textile industries has done much to improve color performance in textiles. Various performance standards have been set by the industry in attempting to provide higher quality products and thus more satisfied consumers. Although it appears that the consumer is being given much attention, in reality very little research has been done that takes into consideration consumer reaction to existing color performance in textiles and the consumer's actual requirements for color performance in textiles. The purpose of this study was to assess consumer perception and acceptance of color change in textiles and to investigate possible related consumer variables which may be associated with his reactions. The objectives were to research possible relationships between: (1) the degree of color change perceived and found acceptable and: uniformity of the color change within the clothing item, cost of the clothing item, and whether the clothing item was to be

worn in public or at home; (2) perception and acceptance of color change and: age, sex, and socio-economic level of the consumer.

Hypotheses of the Study

The following null hypotheses were posed:

Hypothesis I. Perception of color change in fabrics is not significantly different for consumers of different socio-economic levels.

Hypothesis II. Perception of color change in fabrics is not significantly different for consumers of different sex.

Hypothesis III. Perception of color change in fabrics is not significantly different for consumers of different ages.

Hypothesis IV. Acceptance of color change for clothing items worn at home is not significantly different for consumers of different socio-economic levels.

Hypothesis V. Acceptance of color change for clothing items worn at home is not significantly different for consumers of different sex.

Hypothesis VI. Acceptance of color change for clothing items worn at home is not significantly different for consumers of different ages.

Hypothesis VII. Acceptance of color change for clothing items worn in public is not significantly different for consumers of different

socio-economic levels.

Hypothesis VIII. Acceptance of color change for clothing items worn in public is not significantly different for consumers of different sex.

Hypothesis IX. Acceptance of color change for clothing items worn in public is not significantly different for consumers of different ages.

Hypothesis X. Acceptance of color change for expensive clothing items is not significantly different for consumers of different socio-economic levels.

Hypothesis XI. Acceptance of color change for expensive clothing items is not significantly different for consumers of different sex.

Hypothesis XII. Acceptance of color change for expensive clothing items is not significantly different for consumers of different ages.

Hypothesis XIII. Acceptance of color change for inexpensive clothing items is not significantly different for consumers of different socio-economic levels.

Hypothesis XIV. Acceptance of color change for inexpensive clothing items is not significantly different for consumers of different sex.

Hypotheses XV. Acceptance of color change for inexpensive clothing items is not significantly different for consumers of different ages.

Hypothesis XVI. Acceptance of color change in fabrics is not significantly related to uniformity of color change in the clothing item.

Hypothesis XVII. Acceptance of color change in fabrics is not significantly related to the end use of the clothing item.

Hypothesis XVIII. Acceptance of color change in fabrics is not significantly related to cost of the clothing item.

Assumptions

The following assumptions were made concerning the study:

The consumers answered the questions pertaining to the fabric samples truthfully.

The consumers' reactions to color change in the fabric samples were representative of the way they would react to color change in their own clothing.

The methods and instruments used to test the variables were valid and reliable.

The sample was normally distributed.

The participants were representative of the broad classification of "consumers".

Limitations of the Study

The following factors may have limited the validity or the interpretation of the study:

The small sample size of 10 to 15 consumers in each age group.

The use of only three colors, yellow, red, and blue in pastel and intense concentrations. This was due to the regional study specifications.

The tendency of the consumers to answer questions about the fabrics consistently.

The dimensions of the fabric samples visible in the viewing instrument.

The proximity of the fabric samples in the viewing instrument.

The size of the viewing area.

The use of participants broadly classified as consumers. Individuals with expertise in assessing color were neither sought nor excluded. The intent of the study was to use individuals who are involved in the day-to-day purchase and use of textile products, as consumers.

BACKGROUND AND REVIEW OF LITERATURE

Perception

Perception is defined by Webster's New World Dictionary as "a mental grasp of objects, qualities, etc. by means of the senses" (Webster, 1970, p. 1054). The American College Dictionary goes further to say that perception is "a single unified meaning obtained from sensory processes while a stimulus is present" (ACD, 1962, p. 899). Both of these definitions suggest that a sensation must precede perception, and in general propose that perception is sensation plus meaning. Bartley (1970) states that the defining of perception in these terms was established during the early days of the study of psychology. At this time the term perception was sometimes used to deal with responses, but more often to deal with thinking or any behavior that was associated with knowing and understanding something. He notes that these early definitions represent a limited, somewhat nebulous understanding of perception. To better define the term Bartley suggests that the word perception should be used

> to label the over-all immediate response to stimulation of sense organs, that is, a label for the reaction that expresses the organism's relation to the environment, regardless of whether this expression is conscious or simply a gesture or other motor act that is discriminative. This over-all label is perception (Bartley, 1970, p. 262).

Whether or not one agrees with Bartley, a general concept of the term perception may be formed from any one or a combination of the above definitions. The perceptual system of the body that this particular study is concerned with is the visual system. In the visual process the retina and optic pathway enable normal human beings to perceive objects, colors, visual movement, and light and dark in their environment. Perception is the response to these external conditions (Bartley, 1970).

Color Perception

How we see is a complex process. The eye might be likened to a camera with the pupil representing the adjustable light opening, the lens of the eye representing the various camera lenses used for close up and distance focusing, and the retina representing the film. In viewing black and white the retina receptor cells called rods pick up the light. Inside the rods a chemical called rhodopsin undergoes a chemical change or bleaching from pink to white when it is exposed to light. What started as light then becomes a "picture painted on the retina in bleached rhodopsin" (Rushton, 1969, p. 47). Rods and rhodopsin then have nothing to do with color vision (Rushton, 1969).

Other retinal receptor cells called cones aid us in viewing color. There are three types of cones in the retina, "one sensitive to red, one to green, and one to blue. Each cone contains a single type

of photosensitive pigment" (Rushton, 1969, p. 53). The red sensitive pigment is erythrolabe, the green sensitive pigment is chlorolabe, and the blue sensitive pigment is cyanolabe. A few years ago was the first time it had been possible to measure these pigments reliably (Rushton, 1965). Color is typically seen when a stimulus such as light acts on these three cones, and they in turn activate the nervous system which ends in a color response (Rushton, 1969; Burnham, Hanes, and Bartleson, 1963).

Light is an important form of energy especially in color perception. Light is part of a great energy spectrum called the electromagnetic spectrum. Light is the form of radiant energy that is visible and which comprises a narrow band on the electromagnetic spectrum between 380 and 760 nanometers (Cruz-Coke, 1970; Stearns, 1974, Part I). Light can vary in many ways, but the most important variation in terms of color perception is wavelength. Stearns (1974) notes that:

> we can see light of 555 nm most easily; that is, it appears brightest. At shorter or longer wavelengths it is less bright, and when the wavelength is slightly below 400 or slightly above 700 nm, the eye sees nothing. In the range of visible wavelengths, the eye can distinguish about 125 different hues, but these are usually put into groups which are commonly called violet, blue, green, yellow, orange, and red. The short invisible wavelengths below the violet are called ultraviolet, and the invisible wavelengths longer than the red are called infrared (Stearns, 1974, Part I, p. 39).

Vision cannot occur in the infrared or in the ultraviolet ranges because these radiations do not have the energy necessary to stimulate the function of vision (Cruz-Coke, 1970).

Light sources also have an effect on color. Daylight varies widely from morning to evening light, north sky to direct sunlight, and on cloudy or clear days. Incandescent lights also vary due to voltage and wattage. Fluorescent lights also vary but are most commonly used in stores and industry because they give off more lumens per watt than incandescent lamps and more nearly approach daylight (Stearns, 1974, Part I).

> In visual comparisons of textiles, north sky daylight is often used because of all types of daylight, it tends to vary least. Banks of fluorescent lamps are quite commonly used. One of the light sources is the Macbeth lamp which closely approximates natural daylight if one switch is thrown, and incandescent light with another switch (Stearns, 1974, Part I, p. 40).

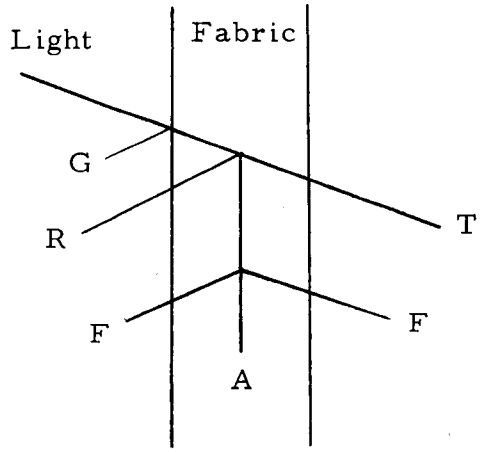
The AATCC recommends a light level of 50 foot candles or more for the evaluation of color in fabrics (Stearns, 1974, Part I).

The sketch below shows what happens when light strikes a fabric. Some of the light is reflected from the surface of the fabric as luster and is labelled G. The part of the light that is transmitted through the fabric is labelled T. Part T can be reduced to zero if more dye or some other means of making the fabric thick is used. The fabric is then termed opaque. Some of the light that enters the fabric is reflected as R after being influenced by the dyes present in

the fabric. If more white pigment is added to the fibers or the amount of dye is reduced the amount of light reflected, part R, increases. Some of the light is absorbed by the fabric and is labelled A. The light absorbed can be increased by adding dye or reducing the white pigment.

> The light which is absorbed is ordinarily re-emitted by the fabric as infrared energy which is invisible. In some cases the absorbed energy is re-emitted in the visual range and may be seen. Such light is known as fluorescent light, and the fabric sample is said to be fluorescent (Stearns, 1974, Part II, p. 46).

The fluorescent light is shown in the figure below as part F. Color appearance in textiles is dependent upon the light reflected and the fluorescent light which combine and enter the eye of the observer (Stearns, 1974, Part I).



(Stearns, 1974, Part I, p. 40).

The background against which a fabric is viewed may also influence the color perceived.

> The light which passes through the fabric may strike a white background and be given a chance to return and join the reflected light, or it may strike a black background and be absorbed. The background will therefore affect the color seen (Stearns, 1974, Part I, p. 40).

Other characteristics of a textile fabric also have a bearing on the color perceived. Texture affects color by giving various illuminated and shadowed areas on the surface of the fabric. Gloss affects color because it gives a different reflection at the surface of the fabric than from within the fabric. Transparency affects color because again the background comes into play in that it has a definite effect on the color appearance of any translucent fabric (Stearns, 1974, Part I).

Theories on Color Perception

In exploring the area of color one will find various proposed explanations to account for experimental findings on how we see color. As mentioned earlier, color vision results not only from light stimulation of the cone receptor cells, but also depends on further interaction with the nervous system. Experiments sustain different theories, however, this review will briefly describe only

> the trichromatic theory [which] may well account for the receptor stage of color vision; [and the] opponent and zone theories [which] consider neural interaction effects which occur at higher levels (Cruz-Coke, 1970, p. 35).

The Trichromatic Theory or Young-Helmholtz Theory. In 1802 a young physician, Thomas Young, proposed that color vision was dependent on stimulation of three independent mechanisms in the retina. He felt that these mechanisms were associated with the nervous system and upon being stimulated gave a color sensation of red, green, or violet which provide the basis for all other colors. This theory was not well received until about 50 years later when Helmholtz tested it extensively and added to it that "there are three qualitative spectral sensitivity curves for the three receptors, and that nerve impulses convey the impression of color to the higher nervous centers" (Cruz-Coke, 1970, p. 36).

This theory is highly accepted. The most important criticism of the theory is that yellow is a true color not a reddish-green and that white is not a reddish-greenish-blue. This major complaint that "yellow and white are unitary sensations and not color blends" (Cruz-Coke, 1970, p. 37) was posed by Hering.

The Opponent Color Theory. This theory was proposed by Ewald Hering in 1872.

> The theory of Hering maintained that there are six primary sensations, which fall naturally into three pairs of polar opposites: red-green, yellow-blue, and white-black. No specific receptors for color or brightness were considered. Hering supposed the existence of only two opponent retinal processes, "breakdown" and "resynthesis." Each of these processes operating on a color pair gives different sensations. Breakdown of the red-green pair produces a sensation of red, and resynthesis, a green sensation (Cruz-Coke, 1970, p. 38).

There is some support to Hering's theory beyond the receptor level, but he does not seem to explain adequately the receptor level of color vision.

The Zone Theory. This theory considers simultaneously hue, saturation, and brightness of light combined with the ideas of Young and Hering. At the receptor level the retina contains three types of cones: red, green, and blue as presented in the Young theory. The brightness signal of each cone is in a channel all its own where it is unaffected by hue or saturation. These brightness signals flow to the luminosity center and are then sent to higher nerve centers. The chromatic (hue and saturation) signals of each cone travel to adaption and addition centers and then are sent either to the red-green color center or the yellow-blue color center. Finally from the two color centers signals are conveyed to higher nerve centers (Cruz-Coke, 1970). "Abnormal color vision has been fundamental in the development of this theory" (Cruz-Coke, 1970, p. 40).

Deficiencies in Color Perception

Not all people see colors equally well. People who do not view color the same as color normal people are referred to as color defective or color deficient. The two major types of color deficient individuals are deuteranopes (insensitive to green) and protanopes (insensitive to red). It has been found that people with this defective

red-green color perception are lacking a cone pigment sensitive to red (erythrolabe) or to green (chlorolabe). The protanope's pigment cannot absorb red light, but absorbs best in green light. The deuteranope's pigment absorbs red light well, but does not absorb green. These color deficients do detect brightness, but they do not see different colors in the red-green range. A less prevalent type of color deficient individual is the tritanope who lacks the blue pigment (cyanolabe) (Rushton, 1965, 1969; Cruz-Coke, 1970; Hurvich, 1971). It has been found that the visual acuity of these color deficients increases when there is a definite brightness contrast between stimuli (Chen, 1971).

Color normal individuals are referred to as trichromats. Trichromats use three primaries, red, green, and blue to obtain a color mixture that matches a given sample. Deuteranopes and protanopes use only two primaries in obtaining what they feel are color matches. The deuteranopes use red and blue and no green, and the protanopes use blue and green and no red. Deuteranopes and protanopes would then be termed dichromatic (Chen, 1971). There are also people who match color samples by using only one primary color. They see everything as a variation of one color and are termed monochromatic. Sometimes in these individuals there is a complete lack of functioning of the cone mechanism. Monochromatism is also referred to as total color blindness. This is obviously the worst of

the deficiencies (Burnham et al., 1963).

How prevalent are color deficiencies? Various sources quote different figures, but in essence they are quite similar. Rushton (1969) says that one man in twelve suffers from some form of defective color vision, but that in many cases it is not a conspicuous handicap. This would be approximately 8.3 percent of the male population. Stearns (1974) says that 8 percent of the male population and .4 percent of the female population have some color deficiency. Red-green deficiencies are said to run from 6 to 10 percent among American whites (Wardell, 1969). Chen (1971) says that the "incidence of deuteranopes is about 1.5 and protanopes about 1.1 percent among Caucasian populations" (Chen, 1971, p. 418). It is estimated that only three out of every four males or 75 percent have really good red-green color vision. There is an intermediate group that is termed color weak, and then those who are definitely color deficient (Wardell, 1969).

Color vision defects vary widely among ethnic and regional groups. Some feel that the longer a race has been exposed to civilization, the higher the incidence of color defectiveness. For American Indian males the figure falls to 1 to 2 percent (Wardell, 1969). Burnham (1963) states,

> The incidence of color-vision defects apparently varies widely with various ethnic and regional groups. Very low rates or incidence of color vision defects in males have

> been found, for example, among Fijis (0.8%), Navajo Indians (1.1%), and Belgian Congo Negroes (1.7%), while high rates of incidence in males have been found among Canadians (11.2%), Poles (10.7%), Czechoslovakians (10.5%), and Norwegians (10.1%) (Burnham et al., 1963, p. 103).

Color deficiencies usually are an inherited, congenital abnormality; but sometimes they can result from disease. The gene for color blindness is carried on the X chromosome and is transmitted in an X-linked pattern. Acquired color deficiency resulting from disease differs from inherited color deficiency in various ways (Cruz-Coke, 1970).

The detection of color vision deficiency is a difficult task. If one were truly objective it would be best to somehow measure the pigments in the cones of the retina. Since this is not possible in general testing more subjective means have to be used.

Confusion tests or charts are the most frequently used.

> The confusion charts are constructed with various patterns of colored dots, which are of different colors. . . Only subjects with normal color vision can read the figures drawn with these colors which are confused by color-blind individuals. The colors are carefully chosen to fall within the areas where color defectives are most likely to differ from normal (Cruz-Coke, 1970, p. 59).

Ishihara's Test for Color Blindness is one of the best known. Another well known test that is similar to the Ishihara test is the Dvorine Pseudo-Isochromatic Plates. The Dvorine test consists of a demonstration plate and 14 test plates. They are very similar to the

confusion charts described above in that the numbers formed by the dots on each plate should be invisible to color deficient individuals. This test has two plates that are designed to distinguish protanopes from deuteranopes. These two plates show a 95 and a 26. As Paulson (1971) explains it,

> In these plates the double-digit number is composed of gray circles, with the first digit appearing on a pink background and the second digit appearing on a red purple background. Because gray and pink look alike to them, protans should see only the second digit, whereas deutans, to whom gray and red purple are indistinguishable, should see only the first digit (Paulson, 1971, p. 37).

Various other tests are used to evaluate whether the individual can discriminate among hues and can match colors satisfactorily.

The best way to evaluate color test results is to say that they give a good, rough estimate of the individual's color vision but are not entirely reliable. It is quite unlikely that the results of one test could adequately indicate the type or extent of color deficiency. A battery of tests is most helpful in giving the best evaluation of an individual's color vision. The strength, type, and angle of the illuminant used during the testing may also affect the results (Wardell, 1969).

In so many aspects of our everyday life such as signs, maps, illustrations, etc. color increases the ease of perception and understanding. To help color deficients increase their color perception the amount of hue contrast between symbols and backgrounds and the brightness contrast between symbols and backgrounds should be

increased considerably (Chen, 1971). Although high levels of color discrimination are required in only a small proportion of occupations, it is often very important where it is required. People should be aware of any color limitations before training for certain jobs. Only 2 percent of an estimated 4,000 jobs require above average color discrimination, and only 1 percent require the highest level of color perception. Over 57 percent require only the very lowest level of color perception (Barker, 1971).

Factors Related to Color Perception

Age

It has become apparent through various research that age affects what colors people actually see or perceive. When there are large age differences among observers matching color swatches significant differences often occur. In most cases the fact that older people perceive colors differently is related to the idea that as a person becomes older he experiences increased

> yellowing of the macula area of the retina and the crystalline lens of the eye. Because of the degree of yellowing of the lens of the eye, violets would probably look redder to a person 50 years old than to someone 25 years old (Vogel, Stanziola, Auman, Lobb, and Tausendfreund, 1972, p. 31).

Stearns (1974) compares this to constantly looking through a yellow filter. He says that an older person sees a color in daylight approximately as

it would appear to a younger person under incandescent light.

In a study by Vogel et al. (1972) it was found that in color matching of samples a definite change begins in the forties. In ages 20 to 40 viewing is fairly consistent. Percentages of the study show that:

> 51% of the children (10-14) saw the same match point as the arithmetic average of their group. 64% of the people in their twenties and thirties saw the same match point as the average of their age group. Only 41% of the people in the 40-44 year old group agreed with the arithmetic average, while 39% of the observers in the 50-54 year group agreed with the average of their group (Vogel et al., 1972, p. 33).

Smith (1943) also noted that the peak age of accurate color matching is approximately 25 years. He found that in old age (beyond age 64) a definite drop in color matching ability occurs. It is then interesting to note that at least 50 percent of the consumers in the U.S. are not in the best color matching age group of 20 to 30 (Wardell, 1969).

The color preference of the geriatric population (65 and over) which would probably be related to their perception of color shows that both males and females prefer blue most and yellow is the least preferred. Males prefer red over green and females slightly prefer green over red. The stronger preference for red over green in the male group is a reversal of the trend that from childhood there is a decreasing preference for red with age and a stronger preference for more subtle colors with age (Mather, Stare, Breinin, 1971). "A possible interpretation of these results is that the popularity of the

more striking colors increases because of the over-all decline in sensitivity to color in the aged" (Mather et al., 1971, p. 313). The average color preference order for the younger population is blue, red, green, violet, orange, and yellow. Based on combined results of several investigations the correlation between the order of color preference for men and women is 0.95 and between Negroes and whites is 0.96 (Burnham et al., 1963).

Sex and Eye Color

Neither sex nor eye color showed a significant effect on the color matching attempts of any of the observers (Vogel et al., 1972).

Training

The study by Vogel et al. (1972) pointed out that experienced colorists as a group were no more consistent in their color evaluations than others in the same age group. Coates and Rigg (1968) also pointed out that trained colorists' ability to describe color difference improves with experience, but their ability to detect color difference does not and is similar to that of any consumer. Smith (1943) on the other hand reported that those subjects employed in color work were superior to any other group and were consistently better than the average for their age. Smith (1943) also suggested that higher intelligence is related to better color perception and discrimination.

Wardell (1969) stated that "research indicates color matching ability is favorably affected by intelligence, learning ability, and zest for work connected with color" (Wardell, 1969, p. 21).

Social Influences

In the research done by Keasey, Blake, Walsh, and Moran (1969) it is pointed out that often individuals will respond in the manner their peers or other influential sources respond rather than depending only on their own perception. Subjects are usually more influenced by information sources of their own sex. Also it was stated that how a subject initially perceives a color highly influences his later color discrimination perceptions.

Measurement of Color

Colorimetry is the science which deals with the measurement of color. It is composed of many aspects and cannot be labelled as really fitting into any single scientific field but instead draws attributes from several disciplines (Cruz-Coke, 1970). In the textile industry one of the greatest concerns and topics of controversy is how best to measure color and color difference. Color control is greatly needed in mass production, both in developing new shades and in matching repeat dyeings (Norwick, 1969).

Until fairly recently the only accepted and fairly effective method of determining color difference in textiles was by using visual assessment of various professional dyers or colorists. Since judgement of color difference between a standard and a sample is very critical, one can easily see that the use of only one colorist would not be an accurate method, although it would be inexpensive and rapid. Accuracy actually does not improve significantly even when several colorists are used, for there is always disagreement in the various observers' assessments. In terms of cost it is expensive in dollars, time, and effort to collect several observers' opinions and then average them. Another drawback of using visual assessment of color differences is that it can vary extensively depending on the viewing conditions (Coates and Rigg, 1968).

It is not the purpose of this review to fully discuss the development of color difference equations, tristimulus values, and instrumental measurement; however, in order to compare instrumental and visual assessment of color difference these areas may be briefly mentioned. In considering instrumental measurement of color the difference between a sample and a standard is determined by assessing the X, Y, and Z parameters (tristimulus values) that are used to define a color. The usual method of instrumental measure of color difference is by using a colorimeter or spectrophotometer. A spectrophotometer is the most accurate instrument to use in textile

color measurement. If two samples have identical spectrophotometric curves then the colors of the two sample fabrics are identical (Stearns, 1974, Part I). This is very useful in predicting dyebaths so that dyeings will give a certain color. However, the spectrophotometric curves can only be duplicated exactly by using the same dyes, so this eliminates the possibility of obtaining a good match by using different dyes which might be required for different fibers (Coates and Warburton, 1968; Stearns, 1974, Part I).

In general instrumental measurement of color is as good as that of observers and could be improved if more attention were paid to standardization of method of use and of mounting samples. There is some disagreement between different instruments and even between particular instruments of a given type, but in many cases instrumental measurement gives superior results. The correlation between visual and instrumental assessments is not satisfactory (Coates and Warburton, 1968; Stearns, 1974, Part I). Since the end use of any textile product depends on visual satisfaction with the color or color match there is much to be solved before measurement by instruments is perfected. In some cases instruments may be giving finer matches than are required by the consumer and in other cases the reverse is true. Norwick (1969) feels that there need to be studies that would correlate "consumer color complaints with test scores of instruments and people passing judgement [colourists]" (Norwick, 1969, p. 35).

No matter what an instrument or colourist may report, if the color or color match is not acceptable to the buyer further work is needed (Norwick, 1969). Because of the existing controversy the findings of the present study could ultimately be of use in that they show the average consumer's perception of color difference and his level of acceptance of the same.

AATCC Test Methods

The AATCC is mainly concerned in their testing with what will happen to textiles in use. They have over 30 test methods that require evaluation of color difference. The AATCC does not recommend instrumental evaluation of color difference as they feel visual evaluation is simpler, quicker, does not require expensive equipment, and that "various specimens of different hues, values, and chromas that show changes of equal visual importance vary considerably in the numerical value as determined by a color difference formula" (Stearns, 1974, Part II, p. 49).

The AATCC recommends the use of a Gray Scale in evaluating color difference.

> One Gray Scale is called the Gray Scale for Color Change and consists of nine pairs of gray chips. One specimen in each pair is a standard medium gray. The second specimen in each pair varies, becoming lighter, and presents a series of contrasts with the fixed specimen. The various contrasts are given numerical fastness ratings. The first full step is 1.5 Color Difference units as measured with the

> Adams chromatic value formula. The Gray Scale itself is standardized with instrumental evaluation (Stearns, 1974, Part II, p. 49).

To use the Gray Scale it is:

> held near the specimens of interest with all conditions of illumination and viewing as much alike as possible. The observer looks back and forth from the pair of specimens to the Gray Scale and decides which Gray Scale contrast is most like the specimen pair contrast. In effect, the observer "calibrates" his eye with the Gray Scale (Stearns, 1974, Part II, p. 49).

For illustrations of the Gray Scale please see the Technical Manual of the AATCC, 1972, p. 93.

Perception and Acceptance of Color Change

Actually there seems to have been little or no research yet performed which involves perception and acceptance of color change in fabrics. Coates and Rigg (1968) state that most equations that have been devised to estimate color difference only attempt to measure perceptibility of a color difference and what is really required in terms of ultimate use is a measure of acceptability. However, some studies on perception of color difference in color matching have presented factors which may be closely related to the present study. A study on color scaling techniques by Burnham, Onley, and Witzel (1970) showed that as different color samples were pushed closer together subjects found the contrast effect to be greater and the color difference between the two samples appeared to be larger. They also

stated that in their research subjects tended to rate large color differences smaller than predicted and small color differences larger. These results may be because of the viewing instrument used. Coates and Rigg (1968) state that difference in color can be more easily discerned when the samples are in contact with no intervening color. Also they found larger samples aided in color difference discrimination. Background colors were found to be important as they influence the adaption of the eye, but when the samples are large enough to fill the whole visual field of view background becomes less important. Another very important difference was the placement of the samples in respect to the light source and the observer.

Burnham, Onley, and Witzel (1971) also suggested that the subject's reaction to color difference is affected by interactions among hue, saturation, and lightness. Coates and Rigg (1968) also state this and feel that it is simpler to consider differences in lightness and chromaticity separately. They propose that for textile materials a close match to hue is usually imperative, but larger tolerances may be allowed for variations in lightness and saturation.

PROCEDURE

Collection of Data

Selection of Site

The city selected for this research was the university community of Corvallis, Oregon. The fact that individuals would have to come to the university in order to participate made it necessary to restrict the sample to those living within the urban area.

The most current estimate lists the population of Corvallis as being 39,750 (estimate by Portland State University, July 1, 1973). The 1970 census listed the population of Corvallis as 35,153 (Corvallis Area Chamber of Commerce, 1970, p. 1). The median income per family in 1970 was $9,542, with mean income of $11,362, and 23.1 percent of the families having incomes of $15,000 or more. Approximately 64.3 percent of the population are employed in white collar occupations. Of the approximately 14,000 males and females 25 years old or over 5,338 have completed four years of college or more, and over 80 percent have completed high school (Corvallis Area Chamber of Commerce, 1970, p. 3, 4, 9). The males and females in the labor force are as follows:

75.3 percent of males 25-34 years old
91.6 percent of males 45-64 years old
27.5 percent of males 65 years and over
50.4 percent of females 25-34 years old
52.8 percent of females 45-64 years old
12.8 percent of females 65 years and over

(Corvallis Area Chamber of Commerce, 1970, p. 6).

Selection of Sample

The sample was stratified into six groups of 10 to 15 members each classified by age and sex. The groups were as follows: females ages 25-34, 45-54, and 65-74, and males ages 25-34, 45-54, and 65-74. The sample size was determined by the number of subjects required for the regional study.

A random selection of the subjects was made from the Corvallis voter's registration files. The researcher chose to use the voter's registration files instead of the telephone directory because it was necessary to know the age of the subject. These files are kept as current as possible and contain cards for 34,000 registered voters. The registration cards are filed in 23 drawers with approximately 1478 cards per drawer. Subjects were selected from each drawer. A random table was used to determine at which point (front, middle, or back) each drawer was entered (Appendix A). It was decided to select 276 names with 45-47 names in each age-sex group. This was approximately three times the required sample size. Twelve names

were selected from each drawer with two names fitting the requirements of each of the six groups. Thus, four cards were pulled toward the front of the file drawer, four toward the middle, and four toward the back. The first cards in the drawer that fit in the required age groups and were listed in the Corvallis telephone directory were selected to make up the sample. Age groups for males and females were 25-34 with birthdates of 1939-1948, 45-54 with birthdates of 1919-1928, and 65-74 with birthdates of 1899-1908.

Collection Procedure

The 45-47 prospective subjects in each age group were randomly numbered by the use of a random number table. The prospective subjects who were assigned numbers 1 through 15 were then sent postcards explaining briefly about the study and signed by the researcher and her major professor (Appendix B). After two to three days these subjects were telephoned, asked if they were willing to participate in the study, and an appointment time was set. The subjects were asked to come to the second floor of the Home Economics Building to be tested and interviewed because of the special viewing area that was used (Appendix C). Subsequent mailing and telephoning was done until appointments were set for 10 to 15 subjects in each age group. Because of the difficulty in getting men age 65 to 74 to participate the researcher also visited the Senior Citizens' Club and

personally asked men at the club if they would be willing to participate.

Two hundred and thirty-six prospective subjects were contacted from February 20, 1974 to April 6, 1974. During this same time period 89 interviews were conducted, a 38 percent response. Three interviews were not analyzed because the subjects were color blind and had not stated this in the telephone conversation; thus, data on 86 subjects were analyzed. The number of persons contacted in each age group and reasons for not participating in the study are listed in Appendix D, p. 107 and 108.

All data were collected in a 30 to 45 minute personal interview in which the questionnaire shown in Appendix E and data collection sheet shown in Appendix F were used. Before the interview each subject was informed of the general nature of the study and assured that the interview was of a confidential nature (Appendix G). Before the testing the Dvorine Test of Color Blindness was administered to eliminate any functionally color defective subjects. The demographic data were collected midway through the testing with the questionnaire shown in Appendix H and were recorded on the reverse side of the data collection sheet shown in Appendix F, p. 114.

Instruments Used

In order to meet the specifications of the regional study, the viewing area, the viewing instrument, the questionnaires, and the

methods used in conducting the research corresponded to the standard conditions stated in the committee proposal. In the cases where additional testing or questioning that related only to the researcher's study took place, it was always done at the completion of collecting the data that would be used for the regional project. The following descriptions of viewing area, viewing instruments, and method are based on the committee proposal (WRCC-9, 1973).

Viewing Area

The durable press viewing set-up, AATCC Test Method 124-1969, was used (Technical Manual of the AATCC, 1972, p. 169). A table measuring 30 inches from the floor was placed directly under the fluorescent light and in the center of the durable press viewing area board. The consumer was seated directly under the light with the gray wall and durable press viewing board to his or her right. The interviewer sat directly across the table from the consumer (Appendix I). The wall behind the interviewer was painted black and the area to the left of the consumer was covered with black draperies. The chairs used measured 18-1/2 inches from the floor, and the consumer was seated a comfortable distance from the table edge (approximately 4-5 inches). The light source was about 60 inches from the table top. The table was covered with feather gray mat board. When the consumer was determining color difference, the viewing instrument was

kept lying flat on the table and was placed parallel to the edge of the table. During the interview, both the interviewer and the consumer being interviewed wore white laboratory coats (WRCC-9 proposal, 1973).

Viewing Instrument

The instrument used in viewing the color difference was constructed of feather gray mat board. The viewing instrument measured 10 by 13 inches; viewing window measured 4-3/4 by 7-3/4 inches. The two parts of the instrument frame were joined by masking tape with allowance made for the sample insert. The fabric samples were premounted side by side on feather gray mat board which measured 9-3/4 by 12-3/4 inches. The fabric edges were carefully trimmed on the lengthwise grain and met at the center of the viewing area. These mounted samples were then inserted in the instrument for viewing (Appendix J). All fabric samples measured approximately 5 by 8 inches. The viewing window of the instrument exposed the control sample and the test specimen; the left side of the window was marked "1" in black ink and the right side was marked "2" in black ink. The control sample was always placed on the left hand side or "1" position of the viewing window with the lengthwise grain running in the vertical position. The test specimen was placed on the right hand side or "2" position of the viewing window with the

lengthwise grain running in the vertical position.

Fabrics Used

The fabrics used in the study were 100 percent cotton, a 50/50 blend of the lowest and highest micronaire grown in West Texas. The fabrics were specially dyed at Texas Research Center for the regional study. The fabrics represented pastel and intense yellow, red, and blue. See Appendix K for more specifications on dyeing procedures.

The fabrics were faded under laboratory conditions with the Gray Scale (see Technical Manual of AATCC, 1972, p. 93) being used as a basis of reference. The yellow fabrics were faded at Colorado State University, the red fabrics at University of Alberta, and the blue fabrics at University of California. Further information on approximate hours exposed in the Fade-Ometer are found in Appendix K.

Each university participating in the regional study received two complete sets of fabric samples. The best samples of the two sets were chosen for mounting; thus, in the coding it will be noticed that the set number varies. The coding used for the fabric samples is shown in Table 1. These codes were labelled on the lower right hand corner of the specimens and were not visible to the consumer. The codes were also noted on Consumer Response Data Sheets, Appendix F. Samples of the fabrics used may be found in Appendix L.

Table 1. Coding of fabric samples.

Color	State	Set No.	Color Change Gray Scale Level
PY Pastel yellow	1 Arizona	I	5 Control
PR Pastel red	2 California	II	4-5 Gray scale 4-5
PB Pastel blue	3 Canada		4 Gray scale 4
Y Intense yellow	4 Colorado		3-4 Gray scale 3-4
R Intense red	5 Hawaii		3 Gray scale 3
B Intense blue	6 Oregon		2 Gray scale 2
	7 Texas		
	8 Utah		
	9 Washington		

(WRCC-9 Proposal, 1973, p. 4).

Specific Method

After completing the Dvorine Color Blindness Test the consumer was given a brief introduction to the study and a trial set of questions and fabric samples (Appendix G). If there were no questions the interviewing was begun. The fabric samples were inserted in the viewing instrument and then the instrument was moved across the table and placed in front of the consumer. The interviewer then asked the first question and if the response was affirmative continued to ask the remainder of the questions (questions #2 through #6). In asking the last 5 questions the interviewer sometimes pointed to fabric sample "2" in order to improve the consumer's understanding of the question. The consumer was given approximately 10 seconds to respond to each question. The consumer's reactions to the questions

were recorded on the Consumer Response Data Sheet. On the data sheet the consumer was identified only by a number, and he was assured that his responses would be kept confidential (see Appendix F).

The consumer was first presented the pastel colors, then given a 10 minute break, and finally viewed the intense colors. During the break the demographic data questionnaire (Appendix H) information was collected. This information was recorded by the interviewer on the reverse side of the Consumer Response Data Sheet. At this time the consumer was offered refreshment and told that he could walk around or leave the viewing area if he desired.

Eighteen pairs of control pastel samples and test specimens were presented to the consumer. After each pair had been shown, the interviewer removed the viewing instrument from the table. The next test pair was inserted in the viewing instrument while the instrument was in the lap of the interviewer and below the consumer's level of vision. Therefore, the consumer never saw the test specimen until the viewing instrument was placed directly in front of him. The eighteen pairs of control intense samples and test specimens were presented in the same manner. The order of the samples presented to each individual consumer was randomized by using a table of random numbers, and this order was noted on each data collection sheet. The order of the samples within the pastel and intense groups was also random and again was shown on each data collection sheet.

The samples were arranged according to specified random order before the consumer entered the viewing area in order to facilitate a more continuous presentation of the samples.

Measures

Social Status

The McGuire-White Index (Appendix M) was used as a measure of social status. The short form of the index was used and the three characteristics assessed were weighted as follows:

Occupation 5

Source of Income 4

Education 3 (McGuire and White, 1955, p. 2).

This short form was used since it was not possible to assess dwelling area and house type of the consumer.

Occupational listings by McGuire and White (1955) were used whenever possible to assign the status rating to the occupation the consumer gave during the interview. In cases where exact occupations were not included in McGuire and White's Table of Occupations, (McGuire and White, 1955, p. 7) the researcher attempted to assess its prestige and assign it an appropriate rating. Married women even though employed were given the status of their husband's occupation. Single, widowed, or divorced women were assigned the values of their own occupations.

Source of income and level of education were supplied by the consumers when the demographic data were collected. The corresponding values were selected by the researcher from the McGuire and White Tables of Source of Income and Educational Attainment (McGuire and White, 1955, p. 8).

After the numerical values were assigned for each characteristic, the total score was computed by multiplying the weight by the value and totaling the three characteristics to get the total score. McGuire and White's General Conversion Table for Status Indices (McGuire and White, 1955, p. 4) was then used to assign social class level according to the individual's index score. In using the McGuire-White Index scores vary from 12 (high) to 84 (low).

Statistical Analyses

Chi-square distributions were used to determine if perception and acceptance of color change were different on: uniformity of color change, varying end use of the clothing item, and varying cost of the clothing item, for consumers of different ages and sex. Yes and no responses to each question were analyzed for age-sex groups, age groups, and sex groups by using contingency tables. The significance level of .05 was selected.

Chi-square was also used to compare overall yes and no responses on questions 2 through 6 to determine relationship between

acceptance of non-uniform and uniform color change; acceptance of color change in clothing to be worn in public and at home; and acceptance of color change in expensive and inexpensive clothing items. In these analyses 2-by-2 contingency tables were used. Again the significance level of .05 was selected. Comparison of the percentages of overall yes responses to questions 2 through 6 was also used to assess differences.

FINDINGS

Description of Sample

The sample consisted of 86 males and females distributed into age groups of 25-34, 45-54, and 65-74. The sample was randomly selected from the current Corvallis, Oregon voter's registration files. The number of participants in each age-sex group is shown in Table 2.

Table 2. Population distribution by socio-economic level, age, and sex.

	Upper Class	Upper Middle Class	Lower Middle Class	Upper Lower Class	Total
Males 25-34	2	12	1	0	15
Females 25-34	0	14	2	0	16
Males 45-54	0	8	5	0	13
Females 45-54	0	11	6	0	17
Males 65-74	4	3	2	1	10
Females 65-74	4	5	5	1	15
Total	10	53	21	2	86

Socio-economic class levels were assigned on the basis of weighted total scores for three status characteristics: occupation, education, and main source of income. For female participants the status characteristics of their husbands were used except in cases in which the participants were single, divorced, or widowed. Participants were grouped into four categories of socio-economic level on

the basis of the following scores: upper class -- 12-22, upper middle class -- 23-37, lower middle class -- 38-51, and upper lower class -- 52-66 (Appendix M). The number of participants in each socio-economic level is shown in Table 2. The population distribution by socio economic level and marital status is shown in Table 3.

It was not possible to analyze the data in terms of socio-economic level for two main reasons: (1) the extremely small number of participants in the upper class and upper lower class groups, and (2) the uncertainty in determining whether results obtained from the upper class and upper lower class groups were dependent on only socio-economic level or if age was an influential factor. Thus descriptive information on the percentage of yes responses to each question by socio-economic level is found in Appendix N, and further discussion of this factor will not be contained in the text.

Statistical Analyses

Chi-square distributions were used to determine if perception and acceptance of color change were different on: uniformity of color change, varying end use of the clothing item, and varying cost of the clothing item, for consumers of different ages and sex. Yes and no responses to each question were analyzed for age-sex groups, age groups, and sex groups, and for age and sex interaction. In these analyses 2-by-2 contingency tables were used in dealing with the sex

Table 3. Population distribution by socio-economic level, marital status, age, and sex.

		Upper Class	Upper Middle Class	Lower Middle Class	Upper Lower Class	Total
Males 25-34	M	1	9	1	0	11
	S	1	3	0	0	4
	D	0	0	0	0	0
	W	0	0	0	0	0
Females 25-34	M	0	14	2	0	16
	S	0	0	0	0	0
	D	0	0	0	0	0
	W	0	0	0	0	0
Males 45-54	M	0	8	5	0	13
	S	0	0	0	0	0
	D	0	0	0	0	0
	W	0	0	0	0	0
Females 45-54	M	0	9	5	0	14
	S	0	1	0	0	1
	D	0	0	1	0	1
	W	0	1	0	0	1
Males 65-74	M	4	2	2	1	9
	S	0	1	0	0	1
	D	0	0	0	0	0
	W	0	0	0	0	0
Females 65-74	M	3	3	1	0	7
	S	1	0	0	0	1
	D	0	0	0	0	0
	W	0	2	4	1	7
Total		10	53	21	2	86

M = Married
S = Single
D = Divorced
W = Widowed

Total married = 70
Total single = 7
Total divorced = 1
Total widowed = 8

variable, 3-by-2 contingency tables were used in dealing with the age variable, and 6-by-2 contingency tables were used in dealing with the age-sex variable. Chi-square was also used to compare overall yes and no responses on questions 2 through 6 to determine whether there was a difference in the yes/no pattern of responses on: acceptance of non-uniform and uniform color change; acceptance of color change in clothing to be worn in public and at home; and acceptance of color change in expensive and inexpensive clothing items. In these analyses 2-by-2 contingency tables were used.

When using contingency tables the number of degrees of freedom is given by the number of rows minus 1 times the number of columns minus 1. In cases where there are zero responses in a row or column, the degrees of freedom equal zero, thus making the chi-square value equal to zero. This occurs in the present study when responses are either all yes or all no. The significance level of .05 was selected. The age-sex variable had 5 degrees of freedom and to be significant at the .05 level required chi-square values of 11.07 or larger and at the .01 level, values of 15.09 or larger. The age variable had 2 degrees of freedom and to be significant at the .05 level required chi-square values of 5.99 or larger and at the .01 level, values of 9.21 or larger. The sex variable and the comparisons between questions 2, 3; 3, 4; and 5, 6 all had 1 degree of freedom and to be significant at the .05 level required chi-square values of 3.84 or larger and at the .01

level, values of 6.63 or larger.

The chi-square test requires that expected frequencies in each cell should not be too small or the test loses meaning (Siegel, 1956). Evaluation of the chi-square tests of significance was made on the basis of the following rules:

1. If there are 2 or more degrees of freedom and the expectation in each cell is more than 5, the chi-square table assures a good approximation to the exact probabilities.

2. If there are 2 or more degrees of freedom, and roughly approximate probabilities are acceptable for the test of significance, an expectation of only 2 in a cell is sufficient.

3. If there are more than 2 degrees of freedom and the expectation in all the cells but one is 5 or more then an expectation of only 1 in the remaining cell is sufficient to provide a fair approximation to the exact probability. (Walker and Lev, 1956, p.)

In cases where there was one degree of freedom the expectation of 5 or more in each cell was considered as a good approximation and the expectation of 3 or more in each cell was sufficient to roughly approxmate the probabilities.

In using the chi-square test if the difference between the observed and expected frequencies is large the chi-square value will also be large and will signify that the probability that the observed difference is due to chance is small. If the differences between the observed and expected frequencies are small they may be attributable only to chance (Parl, 1967).

In addition to the chi-square distributions percentages of individual and overall yes responses to all questions were calculated for purposes of description.

Perception and Acceptance of Color Change in Pastel Yellow

For the following discussions please refer to Table 4 and Appendix N, p. 135 and 136.

Perception

There was no level of color for which perception of color change differed significantly for age or sex, or age-sex groups, or for age and sex interaction. However, at the control level (PY-5) where no color change was present, four consumers in the 65-74 age group reported a color difference in the fabric samples.

Acceptance

Acceptance of non-uniform color change (Q2) was significantly different for consumers of various age-sex groups at color level 4. At the same color level an age-sex interaction was evident. Older females were found to be more accepting of non-uniform color change at this level than were younger or middle age females. Older males were less accepting of non-uniform color change than were younger or middle age males. In terms of the age variable alone, no significant differences were found. In terms of the sex variable at color level 3, males were significantly more accepting of non-uniform color change than were females.

Table 4. Pastel yellow -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
PY-2	X	NS	NS	NS	NS	NS	86
PY-3	NS	NS	NS	NS	NS	NS	85
PY-3-4	NS	NS	NS	NS	NS	NS	85
PY-4	NS	12.627*	NS	X	NS	NS	79
PY-4-5	NS	NS	X	X	NS	X	36
PY-5	+	-	-	-	-	-	4
Age -- df = 2							
PY-2	X	NS	NS	NS	NS	NS	86
PY-3	NS	NS	NS	NS	NS	NS	85
PY-3-4	NS	NS	NS	NS	NS	NS	85
PY-4	NS	NS	NS	X	NS	NS	79
PY-4-5	NS	NS	X	X	NS	X	36
PY-5	+	-	-	-	-	-	4

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X DF = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 4. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
PY-2	X	NS	NS	NS	NS	NS	86
PY-3	NS	7.776**	NS	NS	NS	NS	85
PY-3-4	NS	NS	NS	NS	NS	NS	85
PY-4	NS	NS	NS	X	NS	NS	79
PY-4-5	NS	NS	X	X	NS	X	36
PY-5	NS	-	-	-	-	-	4
Age and sex interaction -- df = 2							
PY-2	X	NS	8.038*	NS	NS	NS	86
PY-3	NS	NS	6.950*	NS	NS	NS	85
PY-3-4	NS	NS	NS	NS	NS	NS	85
PY-4	NS	8.567*	NS	X	NS	NS	79
PY-4-5	NS	NS	X	X	NS	X	36
PY-5	NS	-	-	-	-	-	4

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant

\+ Small expected values and thus chi-square test is inappropriate.
X DF = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Acceptance of color change in clothing to be worn in public (Q3) resulted in significant age-sex interactions at color levels 2 and 3. At color levels 2 and 3 the younger and middle age groups expressed similar acceptance. Older females were found to be more accepting of color change in clothing to be worn in public than were younger and middle age females, and older males were less accepting than younger and middle age males. Older males were less accepting than any other age-sex group at color level 2. In terms of general age-sex groups, age, and sex no significant differences were found.

No significant differences in acceptance of color change in clothing to be worn at home (Q4), acceptance of color change in an expensive garment (Q5), or acceptance of color change in an inexpensive garment (Q6) were found for age or sex at any color level.

Chi-square tests (see Table 5) show no significant difference between acceptance of non-uniform and uniform color change, or acceptance of color change in garments to be worn in public and at home at any color level. A significant difference was found in acceptance of color change in expensive and inexpensive clothing at color level 3-4. Although not interpreted as significant, the percentages in Table 6 show that at all color levels uniform color change is more acceptable than non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, color change is more acceptable in inexpensive than in expensive garments. In all cases acceptibility of color change declines as the amount of color change increases.

Table 5. Pastel yellow -- chi-square values for uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	NS	+	+	86
3	+	+	+	85
3-4	+	+	6.81**	85
4	NS	X	NS	79
4-5	X	X	X	36
5	X	X	X	4

** Significant at .01 level (6.63).

X Degrees of freedom = 0, thus chi-square value = 0.

\+ Small expected values and thus chi-square test is inappropriate.

a N equals those perceiving color change (yes to Q1).

Table 6. Pastel yellow -- percentages of yes responses to questions Q1 through Q6 by color level.

Color Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	- % -						
2	100	4	62	85	17	69	86
3	99	17	79	97	37	88	85
3-4	99	26	88	97	44	91	85
4	92	53	98	100	77	99	79
4-5	42	62	100	100	86	100	36
5	5	100	100	100	100	100	4

a Number answering yes to question 1.

Perception and Acceptance of Color Change in Pastel Red

For the following discussions please refer to Table 7 and Appendix N, p. 137 and 138.

Perception

There was no level of color for which perception of color change differed significantly for age or sex, or age-sex groups, or for age and sex interaction. However, at the color control level (PR-5) where no color was present, four consumers perceived a color difference in the fabric samples.

Acceptance

Acceptance of non-uniform color change (Q2) was not significantly different for consumers in terms of the age-sex groups or the age variable, nor were any significant age and sex interactions found. In terms of the sex variable at color levels 4 and 4-5 males were significantly more accepting of non-uniform color change than were females.

Acceptance of color change in clothing to be worn in public (Q3) was not significantly different for consumers of varying age or sex at any color level.

Acceptance of color change in clothing to be worn at home (Q4) was not significantly different for consumers in terms of the age-sex groups or the age variable, nor were any age and sex interactions found. In terms of the sex variable at color level 2 males were more accepting of color change in clothing to be worn at home than were

Table 7. Pastel Red -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
PR-2	X	NS	NS	NS	NS	NS	86
PR-3	X	NS	NS	NS	NS	NS	86
PR-3-4	X	NS	NS	NS	NS	NS	86
PR-4	X	NS	NS	NS	NS	NS	86
PR-4-5	NS	NS	NS	X	NS	NS	83
PR-5	NS	-	-	-	-	-	4
Age -- df = 2							
PR-2	X	NS	NS	NS	NS	NS	86
PR-3	X	NS	NS	NS	NS	NS	86
PR-3-4	X	NS	NS	NS	NS	NS	86
PR-4	X	NS	NS	NS	NS	NS	86
PR-4-5	NS	NS	NS	X	NS	NS	83
PR-5	NS	-	-	-	-	-	4

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 7. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
PR-2	X	NS	NS	10.098**	NS	NS	86
PR-3	X	+	NS	NS	NS	NS	86
PR-3-4	X	NS	NS	NS	NS	NS	86
PR-4	X	4.599*	NS	NS	NS	NS	86
PR-4-5	NS	5.287*	NS	X	NS	NS	83
PR-5	NS	-	-	-	-	-	4
Age and sex interaction -- df = 2							
PR-2	X	NS	NS	NS	NS	NS	86
PR-3	X	NS	NS	NS	NS	NS	86
PR-3-4	X	NS	NS	NS	NS	NS	86
PR-4	X	NS	NS	NS	NS	NS	86
PR-4-5	NS	NS	NS	X	NS	NS	83
PR-5	NS	-	-	-	-	-	4

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze
a N equals those perceiving color change (yes to Q1).

females.

Acceptance of color change in expensive garments (Q5) and inexpensive garments (Q6) was not significantly different for consumers of varying age and sex at any color level.

Chi-square tests (see Table 8) show no significant difference between acceptance of non-uniform and uniform color change, or acceptance of color change in garments to be worn in public and at home at any color level. A significant difference was found in acceptance of color change in expensive and inexpensive garments at color level 2. Although not interpreted as significant the percentages in Table 9 show that at all color levels uniform color change is more acceptable than non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in inexpensive than in expensive garments. In all cases acceptability of color change declines as the amount of color change increases.

Perception and Acceptance of Color Change in Pastel Blue

For the following discussion please refer to Table 10 and Appendix N, p. 139 and 140.

Perception

Perception was found to be significantly different for age-sex groups and for age groups at color control level (PB-5). At this level (PB-5) no color change was present, yet 21 consumers reported a color difference. Generally, the number of consumers perceiving a

Table 8. Pastel red -- chi-square values for uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	NS	+	7.67**	86
3	NS	+	+	86
3-4	NS	+	+	86
4	NS	+	+	86
4-5	NS	X	NS	83
5	X	X	X	4

** Significant at .01 level (6.63).

X Degrees of freedom = 0, thus chi-square = 0.

\+ Small expected values and thus chi-square test is inappropriate.

a N equals those perceiving color change (yes to Q1).

Table 9. Pastel red -- percentages of yes responses to questions Q1 through Q6 by color level.

Color Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	- % -						
2	100	2	44	79	9	54	86
3	100	7	71	91	20	73	86
3-4	100	7	74	92	23	78	86
4	100	11	81	95	29	87	86
4-5	97	36	96	100	65	99	83
5	5	100	100	100	100	100	4

a Number answering yes to question 1.

Table 10. Pastel Blue -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
PB-2	X	NS	15.853**	NS	NS	NS	86
PB-3	X	NS	NS	NS	NS	NS	86
PB-3-4	X	NS	NS	NS	NS	NS	86
PB-4	X	NS	NS	NS	NS	NS	86
PB-4-5	NS	13.147**	NS	NS	NS	NS	85
PB-5	15.519**	-	-	-	-	-	21
Age -- df = 2							
PB-2	X	NS	NS	NS	NS	NS	86
PB-3	X	NS	NS	NS	NS	NS	86
PB-3-4	X	NS	NS	NS	NS	NS	86
PB-4	X	NS	NS	NS	NS	NS	86
PB-4-5	NS	NS	NS	NS	NS	NS	85
PB-5	7.021*	-	-	-	-	-	21

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.
\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 10. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
PB-2	X	+	14.624**	9.140**	4.599*	NS	86
PB-3	X	+	5.734*	NS	NS	NS	86
PB-3-4	X	NS	NS	NS	NS	NS	86
PB-4	X	8.145*	NS	NS	NS	NS	86
PB-4-5	NS	9.042**	NS	NS	7.168**	NS	85
PB-5	NS	-	-	-	-	-	21
Age and sex interaction -- df = 2							
PB-2	X	NS	NS	NS	NS	NS	86
PB-3	X	NS	NS	NS	NS	NS	86
PB-3-4	X	NS	NS	NS	NS	NS	86
PB-4	X	NS	NS	NS	NS	NS	86
PB-4-5	NS	NS	NS	NS	NS	NS	85
PB-5	6.607*	-	-	-	-	-	21

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

color difference increased with age.

A significant age and sex interaction was also evident at the color control level (PB-5). Looking at the data in terms of this interaction, older males again perceived color change at the control level more than any other group; however, in females the middle age group had the highest percentage perceiving a color difference rather than the older age group.

Acceptance

Acceptance of non-uniform color change (Q2) was significantly different for consumers of various age-sex groups at color level 4-5. Younger males were found to be more accepting of non-uniform color change than any other group and middle age females were the least accepting of non-uniform color change. In terms of the age variable alone no significant differences were found. In terms of the sex variable at both color levels 4 and 4-5 males were significantly more accepting of non-uniform color change than were females.

Acceptance of color change in clothing to be worn in public (Q3) was significantly different for consumers of various age-sex groups at color level 2. Younger males were found to be more accepting than any other group and older females were the least accepting. In terms of the age variable alone no significant differences were found. In terms of the sex variable at both color levels 2 and 3 males were more

accepting of color change in clothing to be worn in public than were females.

Acceptance of color change in clothing to be worn at home (Q4) was not significantly different for consumers of various age-sex groups or in terms of the age variable. In terms of the sex variable at color level 2 males were more accepting of color change in clothing to be worn at home than were females.

Acceptance of color change in an expensive garment (Q5) was not significantly different for consumers of various age-sex groups or in terms of the age variable. In terms of the sex variable at color levels 2 and 4-5 males were more accepting of color change in expensive garments than were females.

Acceptance of color change in inexpensive garments (Q6) was not significantly different for consumers of varying age and sex at any color level.

Chi-square tests (see Table 11) show no significant difference between acceptance of non-uniform and uniform color change. A significant difference was found in acceptance of color change in clothing to be worn in public and at home at color level 4-5 and in acceptance of color change in expensive and inexpensive garments at color level 2. Although not interpreted as significant the percentages in Table 12 show that at all color levels uniform color change is more acceptable than non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in inexpensive than in expensive garments. In all cases acceptability declines as the amount of color change increases.

Table 11. Pastel blue -- chi-square values for uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	NS	+	8.74**	86
3	NS	+	+	86
3-4	NS	+	+	86
4	NS	+	+	86
4-5	NS	16.19**	+	85
5	X	X	X	21

** Significant at .01 level (6.63).

X Degrees of freedom = 0, thus chi-square value = 0.

\+ Small expected values and thus chi-square test is inappropriate.

a N equals those perceiving color change (yes to Q1).

Table 12. Pastel blue -- Percentages of yes responses to questions Q1 through Q6 by color level.

Color Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	- % -						
2	100	4	45	73	11	54	86
3	100	6	65	83	16	69	86
3-4	100	6	71	91	22	81	86
4	100	11	77	93	35	83	86
4-5	99	41	94	99	62	95	85
5	24	71	100	100	81	100	21

a Number answering yes to question 1.

Perception and Acceptance of Color Change in Yellow

For the following discussion please refer to Table 13 and Appendix N, p. 141 and 142.

Perception

Perception was found to be significantly different for consumers of various age-sex groups and also in terms of the age variable at color level 4-5. At this level the older age group perceived the color difference much less frequently and middle age consumers were most frequent in perceiving the color difference in both males and females. Overall, middle age males were most perceptive of color difference at this level. At the color control level (Y-5) where no color difference was actually present, one older female perceived a color difference in the fabric samples.

Acceptance

Acceptance of non-uniform color change (Q2) was significantly different for consumers of various age-sex groups at color level 4. At this level younger and middle age males were much more accepting of non-uniform color change than were females of the same ages. In the older age group females were slightly more accepting of non-uniform color change than were males. In terms of the age variable alone no significant differences were found. In terms of only the sex variable at color levels 3-4 and 4 males were found to be generally more accepting of non-uniform color change than were females.

Table 13. Yellow -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
Y-2	X	NS	NS	NS	NS	NS	86
Y-3	X	NS	NS	NS	NS	NS	86
Y-3-4	X	NS	NS	NS	NS	NS	86
Y-4	NS	11.124*	NS	NS	NS	NS	85
Y-4-5	13.522**	NS	X	X	NS	X	54
Y-5	NS	-	-	-	-	-	1
Age -- df = 2							
Y-2	X	NS	NS	NS	NS	NS	86
Y-3	X	NS	NS	NS	NS	NS	86
Y-3-4	X	NS	6.064*	NS	NS	NS	86
Y-4	NS	NS	NS	NS	NS	NS	85
Y-4-5	13.138**	NS	X	X	NS	X	54
Y-5	NS	-	-	-	-	-	1

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.
\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 13. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
Y-2	X	+	NS	NS	NS	NS	86
Y-3	X	+	NS	NS	NS	NS	86
Y-3-4	X	9.630**	NS	NS	NS	NS	86
Y-4	NS	6.618*	NS	NS	NS	NS	85
Y-4-5	NS	NS	X	X	NS	X	54
Y-5	NS	-	-	-	-	-	1
Age and sex interaction -- df = 2							
Y-2	X	NS	6.135*	NS	NS	NS	86
Y-3	X	NS	6.407*	NS	NS	NS	86
Y-3-4	X	NS	NS	NS	NS	NS	86
Y-4	NS	NS	NS	+	NS	NS	85
Y-4-5	NS	NS	X	X	NS	X	54
Y-5	X	-	-	-	-	-	1

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Acceptance of color change in clothing to be worn in public resulted in significant age and sex interactions at color levels 2 and 3. At both levels younger males were more accepting of color change in clothing to be worn in public than were middle age and older males. Older females were more accepting than were young and middle age females. At both levels younger females were less accepting of color change in clothing to be worn in public than any other group. At both levels older females were more accepting of color change in clothing to be worn in public than any other group. In terms of only the age variable at color level 3-4 older consumers were found to be more accepting of color change in clothing to be worn in public than were younger people.

No significant differences in acceptance of color change in clothing to be worn at home (Q4), acceptance of color change in an expensive garment (Q5), or acceptance of color change in an inexpensive garment (Q6) were found for age or sex at any color level.

Chi-square tests (see Table 14) show a significant difference between acceptance of non-uniform and uniform color change at color level 3-4. No significant difference was found in the acceptance of color change in clothing to be worn in public and at home at any color level. A significant difference was found at color level 2 in acceptance of color change in expensive and inexpensive garments. Although not interpreted as significant the percentages in Table 15 show that at all color levels uniform color change is more acceptable than non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in inexpensive

Table 14. Yellow -- chi-square values for uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	+	+	12.85**	86
3	+	+	+	86
3-4	7.40**	+	+	86
4	+	+	+	85
4-5	X	X	X	54
5	X	X	X	1

** Significant at .01 level (6.63).

X Degrees of freedom = 0, thus chi-square value = 0.

\+ Small expected values and thus chi-square test is inappropriate.

a N equals those perceiving color change (yes to Q1.)

Table 15. Yellow -- percentages of yes responses to questions Q1 through Q6 by color level.

Color Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	- % -						
2	100	4	31	59	9	41	86
3	100	6	50	71	22	59	86
3-4	100	12	61	77	22	72	86
4	99	26	88	97	58	93	85
4-5	63	63	100	100	87	100	54
5	1	100	100	100	100	100	1

a Number answering yes to question 1.

than in expensive garments. In all cases acceptability of color change declines as the amount of color change increases.

Perception and Acceptance of Color Change in Red

For the following discussions please refer to Table 16 and Appendix N, p. 143 and 144.

Perception

There was no level of color for which perception of color change differed significantly for age or sex, or age-sex groups, or for age and sex interaction. However, at the color control level (R-5) where no color change was present, three consumers in the older age group reported a color difference in the fabric samples.

Acceptance

Acceptance of non-uniform color change (Q2) was significantly different for consumers of various age-sex groups at color levels 4 and 4-5. At both color levels younger males were more accepting of non-uniform color change than any other group and in males acceptance declined with increasing age. Middle age females were less accepting of non-uniform color change than any other group and in female consumers the older group had more acceptance. In terms of the age variable alone no significant differences were found. In terms of the sex variable at color levels 3, 3-4, 4, and 4-5 males were significantly more accepting of non-uniform color change than were females.

Table 16. Red -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
R-2	X	NS	11.918*	12.827*	NS	NS	86
R-3	X	+	NS	NS	NS	NS	86
R-3-4	X	+	NS	NS	NS	NS	86
R-4	NS	15.777**	NS	NS	NS	NS	83
R-4-5	NS	15.643**	NS	NS	NS	NS	78
R-5	NS	-	-	-	-	-	3
Age -- df = 2							
R-2	X	NS	NS	NS	NS	NS	86
R-3	X	NS	NS	NS	NS	NS	86
R-3-4	X	NS	NS	NS	NS	NS	86
R-4	NS	NS	NS	NS	NS	NS	83
R-4-5	NS	NS	NS	NS	NS	NS	78
R-5	+	-	-	-	-	-	3

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 16. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
R-2	X	+	NS	8.123**	NS	NS	86
R-3	X	12.697**	6.197*	NS	4.550*	NS	86
R-3-4	X	11.142**	NS	NS	NS	NS	86
R-4	NS	12.299**	NS	NS	NS	NS	83
R-4-5	NS	11.098**	NS	NS	NS	NS	78
R-5	NS	-	-	-	-	-	3
Age and sex interaction -- df = 2							
R-2	X	NS	8.472*	NS	NS	NS	86
R-3	X	NS	NS	NS	NS	NS	86
R-3-4	X	NS	NS	NS	NS	NS	86
R-4	NS	NS	NS	NS	NS	NS	83
R-4-5	NS	NS	NS	NS	NS	NS	78
R-5	NS	-	-	-	-	-	3

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Acceptance of color change in clothing to be worn in public (Q3) was significantly different for various age-sex groups at color level 2 and there was also a significant age and sex interaction at this level. It was found at this color level that acceptance increased with increasing age in females and decreased with increasing age in males. Younger males were more accepting of color change in clothing to be worn in public than any other group and younger females were less accepting than any other group. In terms of the age variable alone no significant differences were found. In terms of the sex variable at color level 3 males were significantly more accepting of color change in clothing to be worn in public than were females.

Acceptance of color change in clothing to be worn at home (Q4) was significantly different for consumers of various age-sex groups at color level 2. At this level younger males were more accepting of color change than any other group and younger females were less accepting of color change than any other group. The middle age males and females were less accepting of color change in clothing to be worn at home than were the older consumers. In terms of the age variable alone no significant differences were found. In terms of the sex variable at color level 2 males were more accepting of color change in clothing to be worn at home than were females.

Acceptance of color change in an expensive garment (Q5) was not significantly different for various age-sex groups or in terms of only the age variable. In terms of the sex variable at color level 3 males were more accepting of color change in an expensive garment than were females.

Acceptance of color change in an inexpensive garment (Q6) was not significantly different for consumers of varying age and sex at any color level.

Chi-square tests (see Table 17) show a significant difference between acceptance of non-uniform and uniform color change at color level 4, in acceptance of color change in clothing to be worn in public and at home at color level 4, and in acceptance of color change in an expensive and an inexpensive garment at color level 2. Although not interpreted as significant the percentages in Table 18 show that at all color levels uniform color change is more acceptable than non uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in an inexpensive than in an expensive garment. In all cases acceptability declines as the amount of color change increases.

Perception and Acceptance of Color Change in Blue

For the following discussions please refer to Table 19 and Appendix N, p. 145 and 146.

Perception

There was no level of color for which perception of color change differed significantly for age or sex, or age-sex groups, or for age and sex interaction. However, at the control level (B-5) where no color change was present, one female in the older age group perceived a color difference in the fabric samples.

Table 17. Red -- chi-square values of uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	+	+	12.42**	86
3	+	+	+	86
3-4	NS	+	+	86
4	7.36**	34.55**	+	83
4-5	+	+	+	78
5	X	X	X	3

** Significant at .01 level (6.63)

X Degrees of freedom = 0, thus chi-square value = 0.

\+ Small expected values and thus chi-square is inappropriate.

a N equals those perceiving color change (yes to Q1).

Table 18. Red -- percentages of yes responses to questions Q1 through Q6 by color level.

Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	- % -						
2	100	4	42	65	12	48	86
3	100	11	67	83	31	80	86
3-4	100	9	76	91	34	85	86
4	97	42	89	95	70	95	83
4-5	91	56	94	97	80	97	78
5	4	100	100	100	100	100	3

a Number answering yes to question 1.

Table 19. Blue -- chi-square values for perception and acceptance of color change for individuals of varying age and sex.

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Age-sex group -- df = 5							
B-2	X	NS	NS	NS	NS	NS	86
B-3	X	NS	NS	NS	NS	NS	86
B-3-4	X	NS	12.573*	+	NS	NS	86
B-4	X	+	NS	NS	NS	NS	86
B-4-5	NS	13.773*	NS	NS	NS	NS	84
B-5	NS	-	-	-	-	-	1
Age -- df = 2							
B-2	X	NS	NS	NS	NS	NS	86
B-3	X	NS	NS	NS	NS	NS	86
B-3-4	X	NS	NS	7.310*	NS	NS	86
B-4	X	NS	NS	NS	NS	NS	86
B-4-5	NS	NS	6.763*	NS	NS	NS	84
B-5	NS	-	-	-	-	-	1

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Table 19. (Continued)

Classifying variables and color change levels	Questions						
	Q1-perceive color change (N = 86)	Q2-accept if two colors in one garment	Q3-accept if uniform for wear in public	Q4-accept if uniform for wear at home	Q5-accept if uniform in expensive garment	Q6-accept if uniform in inexpensive garment	N[a] (Q2-Q6)
Sex -- df = 1							
B-2	X	NS	5.750*	5.330*	+	NS	86
B-3	X	9.626*	NS	NS	NS	NS	86
B-3-4	X	6.710**	NS	NS	NS	NS	86
B-4	X	10.150**	NS	NS	NS	NS	86
B-4-5	NS	11.407**	NS	NS	NS	NS	84
B-5	NS	-	-	-	-	-	1
Age and sex interaction -- df = 2							
B-2	X	NS	NS	NS	NS	NS	86
B-3	X	NS	7.174*	NS	NS	6.321*	86
B-3-4	X	NS	NS	NS	NS	NS	86
B-4	X	NS	7.106*	NS	NS	NS	86
B-4-5	NS	NS	NS	NS	NS	NS	84
B-5	NS	-	-	-	-	-	1

* Significant at .05 level (df 1 = 3.84; df 2 = 5.99; df 5 = 11.07).
** Significant at .01 level (df 1 = 6.63; df 2 = 9.21; df 5 = 15.09).
NS Not significant.

\+ Small expected values and thus chi-square test is inappropriate.
X Df = 0, thus chi-square value = 0.
\- N too small to analyze.
a N equals those perceiving color change (yes to Q1).

Acceptance

Acceptance of non-uniform color change (Q2) was significantly different for consumers of various age-sex groups at color level 4-5. At this level for both males and females acceptance decreased with increasing age. None of the older females accepted non-uniform color change at this level. In terms of the age variable alone no significant differences were found. In terms of the sex variable at color levels 3, 3-4, 4, and 4-5 males were more accepting of non-uniform color change than were females.

Acceptance of color change in clothing to be worn in public (Q3) was significantly different for various age-sex groups at level 3-4. At this color level all middle age females accepted the color change in clothing to be worn in public. Older females were less accepting than any other group, and all males were similar in their acceptance. In terms of the age variable at color level 4-5 acceptance of color change in clothing to be worn in public decreased with increasing age. In terms of the sex variable at color level 2 males were more accepting of color change in clothing to be worn in public than were females. At color levels 3 and 4 significant age and sex interactions were found. At both color levels younger females were less accepting of color change in clothing to be worn in public than any other group, and middle age females were more accepting than any other group.

Acceptance of color change in clothing to be worn at home (Q4) was not significantly different for consumers of various sex-age groups. In terms of only the age variable at color level 3-4 the

younger and middle age groups were similar in their acceptance of color change in clothing to be worn at home and consumers in the older age group (especially women) were much less accepting. In terms of the sex variable at color level 2, males were more accepting of color change in clothing to be worn at home than were females.

Acceptance of color change in an expensive garment (Q5) was not significantly different for consumers of varying age and sex at any color level.

Acceptance of color change in an inexpensive garment (Q6) was not significantly different in terms of the age-sex groups or the age or sex variables, but a significant age and sex interaction was found at color level 3. Older males were more accepting of color change in inexpensive garments than any other group. Older and younger females and middle age males were similar in their lesser degree of acceptance.

Chi-square tests (see Table 20) show no significant difference between acceptance of non-uniform and uniform color change or acceptance of color change in clothing to be worn in public and at home at any color level. A significant difference was found in acceptance of color change in expensive and inexpensive garments at color level 4. Although not interpreted as significant the percentages in Table 21 show that at all color levels uniform color change is more acceptable than non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in an inexpensive than in an expensive garment. In all cases acceptability declines as the amount of color change increases.

Table 20. Blue -- chi-square values for uniformity of change, end use, and cost for six color levels (df = 1).

Color Levels	Acceptance of color change: Non-uniform and uniform color change Q2, Q3	Wear in public and at home Q3, Q4	Expensive and inexpensive garments Q5, Q6	N[a]
2	NS	+	+	86
3	+	+	+	86
3-4	NS	+	+	86
4	+	+	6.98**	86
4-5	NS	+	+	84
5	X	X	X	1

** Significant at .01 level (6.63)

X Degrees of freedom = 0, thus chi-square value = 0.

\+ Small expected values and thus chi-square test is inappropriate.

a N equals those perceiving color change (yes to Q1)

Table 21. Blue -- percentage of yes responses to questions Q1 through Q6 by color level.

Color Level	Questions: Q1 Perception	Q2 Non-uniform	Q3 Public	Q4 Home	Q5 Expensive	Q6 Inexpensive	N[a]
	%						
2	100	1	36	63	7	49	86
3	100	8	65	84	21	73	86
3-4	100	9	74	87	35	81	86
4	100	15	79	94	44	91	86
4-5	98	21	89	98	60	96	84
5	1	100	100	100	100	100	1

a Number answering yes to question 1.

Summary of Color Perception and Acceptance

It is evident from the previous discussions and tables that few relationships met the test of significance. Those mentioned may indicate further investigation, although their significance could easily be a result of chance alone.

Perception

An overall look at perception at all color levels seems to indicate that it is not dependent on age or sex. In instances where the age variable was important it was indicated that perception declines with increasing age. This is also evidenced in the fact that in the majority of instances where a color difference was perceived at the color control level (when such a difference does not actually exist), it was perceived as different by consumers in the older age group.

Acceptance

The major tendencies observed in overall acceptance of color change were that when sex was a significant variable males were more accepting of color change than were females. When age was a significant variable acceptance of color change sometimes increased with increasing age, although this was not consistently found to be true. When age and sex interactions were found to be significant no consistent pattern emerged and responses seemed dependent on the individual color and color level. In all colors and at all color levels it was consistently found that uniform color change is more acceptable than

non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in an inexpensive than in an expensive garment. Also as previously mentioned acceptability declined as the amount of color change increased.

CONCLUSIONS AND DISCUSSION

In drawing the following conclusions concerning the null hypotheses posed earlier in the study, 36 tests of each null hypothesis were considered. In order to reject any of the null hypotheses, all of the 36 tests of each null hypothesis would have to be significant. As mentioned earlier in the study it was decided after collection of the data not to analyze statistically socio-economic level because of the small size of the upper class and the upper lower class groups; also because of the way in which these two groups were stratified it was not possible to determine whether responses were dependent on socio-economic level only or if age was also a factor. Because of this decision only descriptive data on percentage of yes responses to the questions posed by socio-economic level are included in the appendix (N) of the study, and conclusions were not drawn for null hypotheses I, IV, VII, X, and XIII.

Null Hypotheses

Hypothesis II. Perception of color change in fabrics is not significantly different for consumers of different ~~age~~ sex.

Chi-square values did not show perception of color change to be significantly different for consumers of different sex in any of the tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Since significant differences were not shown, neither males nor females can be designated as more likely to perceive color difference in fabrics.

Hypothesis III. Perception of color change in fabrics is not significantly different for consumers of different ages.

Chi-square values showed perception of color change to be significantly different for consumers of different ages in only 2 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

The chi-square values that were significant were for pastel blue at color control level 5 and intense yellow at color level 4-5. In the pastel blue fabrics at color control level 5 (where color difference was actually not present) perception of color difference tended to increase with increasing age. Perception of color difference at the control level was also true for other colors but was not found to be significant (Appendix N). In the yellow fabrics at color level 4-5 the highest percentage of middle age consumers perceived the color difference, and the older group was the least perceptive of any group.

In looking at the age and sex interaction that was significant at color level 5 of pastel blue it was found that older males perceived color change more than any other group; however, in females the middle age group perceived color difference more than the older age group.

It was expected that age would be more important in perception of color change since other researchers have found that age affects the way that people see color. The yellowing of the macula area of the retina with increasing age is proposed to have a definite effect on color

vision (Vogel, 1972; Stearns, 1974). Possibly the proximity of the control and test fabric samples in the testing helped consumers to detect color change more easily. It is also interesting to observe the attempt that older consumers made to perceive a color difference in all instances and thus often responded that a color difference was evident at the control level. These responses might be interpreted as possible evidence of their trying to please the researcher or always give a "correct" response.

Hypothesis V. Acceptance of color change for clothing items worn at home is not significantly different for consumers of different sex.

Chi-square values showed acceptance of color change in clothing worn at home to be significantly different for consumers of different sex in only 4 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for pastel red, pastel blue, intense red, and intense blue at all color level 2. In all instances males were more accepting of color change in clothing items to be worn at home than were females. Although no explanation of this has been found in related readings, a plausable explanation might be that males do have a stronger color preference for blue and red than they do for yellow, and thus they may accept them even when the color has changed extensively. Also the popularity of the faded denim look in fashion may be a factor in their acceptance of color change.

Hypothesis VI. Acceptance of color change for clothing items worn at home is not significantly different for consumers of different ages.

Chi-square values showed acceptance of color change in clothing worn at home to be significantly different for consumers of different ages in only 1 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected .

Chi-square values were significant for intense blue at color level 3-4. It was found at this level that young and middle age consumers were similar in their acceptance, but older consumers (especially women) were much less accepting of color change in clothing to be worn at home.

In considering age-sex groups it was found for level 2 of intense red that younger males were more accepting of color change in clothing to be worn at home than any other group, and younger females were less accepting of color change than any other group. At this level (R-2) older consumers were more accepting than were middle age consumers of color change in clothing to be worn at home. It was expected that younger consumers would consistently be more accepting of color change in clothing to be worn at home; however, this was not shown to be the case in the present study except for younger men in selected instances.

Hypothesis VIII. Acceptance of color change for clothing items to be worn in public is not significantly different for consumers of different sex.

Chi-square values showed acceptance of color change in clothing worn in public to be significantly different for consumers of different

sex in only 4 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for pastel blue at color levels 2 and 3, intense red at color level 3, and intense blue at color level 2. In all instances males were more accepting of color change in clothing to be worn in public. It is interesting again to note that the males are significantly more accepting in terms of red and blue and at the more extreme levels of color change. Another statement that the values might express is that males may be less concerned with appearance in public than females.

Hypothesis IX. Acceptance of color change for clothing items worn in public is not significantly different for consumers of different ages.

Chi-square values showed acceptance of color change in clothing to be worn in public to be significantly different for consumers of different ages in only 2 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for intense yellow at level 3-4 and intense blue at level 4-5. In the yellow fabrics at level 3-4 older consumers were found to be more accepting of color change in clothing to be worn in public. In the blue fabrics at level 4-5 acceptance of color change in clothing to be worn in public tended to decrease with increasing age.

In considering significant age-sex group responses and age and sex interactions it is shown by chi-square values that significant relationships existed at color levels 2 and 3 of pastel yellow, color level 2 of pastel blue, color levels 2 and 3 of intense yellow, color level 2 of intense red, and color levels 3 and 4 of intense blue. No consistent pattern was shown as highest degree of acceptance seemed to vary among the age-sex groups. Some tendency was shown that overall younger males were often more accepting and younger females often less accepting of color change in clothing to be worn in public than were the other age-sex groups.

Hypothesis XI. Acceptance of color change for expensive clothing items is not significantly different for consumers of different sex.

Chi-square values showed acceptance for expensive clothing items to be significantly different for consumers of different sex in only 3 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for pastel blue at levels 2 and 4-5 and for intense red at color level 3. In all instances males were more accepting of color change for expensive clothing items than were females. These values may again indicate that males are somewhat less particular about color performance of even expensive clothing; again the difference is in the colors of blue and red.

Hypothesis XII. Acceptance of color change for expensive clothing items is not significantly different for consumers of different ages.

Chi-square values did not show acceptance for expensive clothing items to be significantly different for consumers of different ages

in any of the tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Hypothesis XIV. Acceptance of color change for inexpensive clothing items is not significantly different for consumers of different sex.

Chi-square values did not show acceptance of color change in inexpensive garments to be significantly different for consumers of different sex in any of the tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Since significant differences were not found, neither males nor females can be designated as more accepting of color change in inexpensive clothing.

Hypothesis XV. Acceptance of color change for inexpensive clothing items is not significantly different for consumers of different ages.

Chi-square values did not show acceptance of color change in inexpensive garments to be significantly different for consumers of different sex in any of the tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

One significant age and sex interaction was shown in intense blue at color level 3. In this instance older males and middle aged females were more accepting of color change in inexpensive garments than any other groups. This may be a factor dependent on poor color perception

or possibly an apathetic attitude towards their clothing.

Hypothesis XVI. Acceptance of color change in fabrics is not significantly related to uniformity of color change in the clothing item.

Chi-square values showed acceptance of color change in fabrics to be significantly related to uniformity of color change in a clothing item in only 2 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for intense yellow at color level 3-4 and intense red at color level 4. As mentioned in the findings, percentages of yes responses show that at all color levels uniform color change is more acceptable than non-uniform color change. In all cases acceptability declines as the amount of color change increases.

Hypothesis XVII. Acceptance of color change in fabrics is not significantly related to the end use of the clothing item.

Chi-square values showed acceptance of color change in fabrics to be significantly related to the end use of a clothing item in only 2 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was not rejected.

Chi-square values were significant for pastel blue at color level 4-5 and intense red at color level 4. As mentioned in the findings, percentages of yes responses show that at all color levels color change is more acceptable in clothing to be worn at home than in public. In

all cases acceptability declines as the amount of color change increases.

Hypothesis XVIII. Acceptance of color change in fabrics is not significantly related to cost of the clothing item.

Chi-square values showed acceptance of color change in fabrics to be significantly related to cost of the clothing item in only 6 of the 36 tests of the null hypothesis. Therefore, the null hypothesis was rejected.

Chi-square values were significant for pastel yellow at color level 3-4; pastel red, pastel blue, intense yellow, and intense red at color level 2; and for intense blue at color level 4. As mentioned in the findings, percentages of yes responses show that at all color levels color change is more acceptable in inexpensive than in expensive garments. In all cases acceptability declines as the amount of color change increases.

Summary

Ability to perceive color difference between the original and test fabric samples was not shown in any instance of this study to be consistently related to age, sex, or age and sex of the consumer. It was demonstrated in several instances that some consumers (especially those in the older age group) perceived color differences between the original and the color control level 5 test samples where no difference actually existed. This was interpreted as possible evidence of the

consumer trying to please the researcher or always give a "correct" response.

Adequate support for any of the alternative hypotheses was not found. Therefore, none of the 18 null hypotheses of the study was rejected.

In instances where significant relationships existed between the variables it was suggested that perception declines with increasing age, that overall males are more accepting of color change than are females, and that in some instances acceptance of color change increases with increasing age. Significant age and sex interactions showed no consistent patterns.

In all colors and at all color levels it was consistently found that uniform color change is preferred over non-uniform color change, color change is more acceptable in clothing to be worn at home than in public, and color change is more acceptable in inexpensive than in expensive clothing. In all instances acceptability decreased as color change increased.

RECOMMENDATIONS

Uses of the Present Study

The study of consumer expectations and requirements for color performance in textiles is an almost untouched field. For those interested in investigating this topic, the present study may be of value as a basis for further research.

When the findings and conclusions of the present study are combined with the results of the regional study on the same topic, the total conclusions drawn may be a help to the textile industry and to governmental agencies in developing more realistic performance standards and labeling laws for textile products.

Those involved in retailing may find the present study helpful in better understanding of consumer consumption patterns and consumer complaints on textile color performance. By using this knowledge they would be better able to serve and satisfy their segment of the market.

Those involved in working with consumers in the older age group may consider the findings of this study an aid to better understanding of how people in this age group feel about some aspects of color in fabrics and clothing items.

Recommendations for Improvement of the Present Study

The present study could be improved by testing a larger population and one that is more evenly stratified in terms of age and socio-economic levels, so that one particular age group would not dominate a given socio-economic level. Such a sampling procedure could add another factor to the findings concerning socio-economic level. Another improvement might be the use of a more widely used index of social status.

Retesting of the same participants at a later date would help establish reliability of the measure used. Further exploration of the reliability of the measure used might be evident if the proximity of the mounted fabric samples was changed for the later presentation to the consumer. Other possibilities might be the use of larger fabric samples or actual garments, and also the use of additional colors of fabrics.

Another helpful change in data collection might be the development of a non-verbal response sheet for the consumer to mark as the fabric samples are presented. This would help alleviate the repetitious and boring nature of posing the same questions so many times. With many consumers the repetition seemed to make them somewhat nervous. Work on some rewording in the questionnaire would also be helpful, since there is some question in the researcher's mind as to

whether the questions, especially Q2, were always understood by the consumers.

Another improvement would be either to delete or to apply the demographic data collected concerning the number of dependents of the consumer and the type of laundry facilities used. These data were collected for the WRCC-9 project, and findings will be reported in a future publication.

Recommendations for Further Research

Further study could pursue the development of a method in which the fabric samples could be shown to a large group of consumers in a slide presentation. This would facilitate speed in testing and would also provide a possible comparison between screen and personal presentation. Also the validity of screen presentation could be determined.

Another possible avenue of study would be developing and employing pupillometric measures (photographic measure of pupil response) to determine acceptance of color change. These results could then be compared to the findings of the present study.

Finally, further investigation into present consumer complaints on color performance in textiles would be extremely helpful. Such questions as which colors seem to give the most fading problems, cost

of the problem fabric or garment, time span in which fading occurred, and type of care given the problem fabric or garment could be posed and lead to a wealth of information in this area.

SUMMARY

Statement of the Problem

Research is constantly being carried on to improve dyes and thus color performance in textiles. Color performance standards for textiles are set by government and industry, but so far little consideration has been given to how consumers feel about present standards and what they feel is essential in terms of color performance in textiles.

Purpose of the Study

The purpose of this study was to assess consumer perception and acceptance of color change in textiles and to investigate related consumer variables which may be associated with the consumer's reactions. The objectives were to research possible relationships between (1) the degree of color change perceived and found acceptable and: uniformity of the color change within the clothing item, cost of the clothing item, and whether the clothing item was to be worn in public or at home; (2) perception and acceptance of color change and: age, sex, and socio-economic level of the consumer. Eighteen null hypotheses were drawn predicting no relationships between pairs of variables cited above.

Procedure

The sample of male and female subjects 25-34, 45-54, and 65-74 was randomly selected from the Corvallis voter's registration files. Postcards were mailed to the consumers explaining the study, and later they were contacted by phone to determine if they were willing to participate. In the final study there were 10 to 15 members in each age-sex group with a total of 86 consumers being interviewed.

In order to meet specifications of the regional study, the viewing area, viewing instrument, questionnaires, and methods used in conducting the research corresponded to the standard conditions set by the regional committee (WRCC-9). The McGuire-White Index of Social Status was used to determine socio-economic level of the participants.

The data were collected in a 30 to 45 minute interview in which the consumer was presented 36 pairs of fabric samples consisting of an original and a test fabric. The six colors represented were pastel and intense yellow, red, and blue. Each color had been faded to five different levels under laboratory conditions. For each color six pairs of fabric samples at the five levels of fading plus a control level were presented to the consumer. He was asked whether he perceived a color difference between the two fabrics (original and test), and then five questions concerning his degree of acceptance of the color change.

The questions determined acceptance for uniform and non-uniform color change in garments, acceptance of color change in garments to be worn in public and at home, and acceptance of color change in expensive and inexpensive garments. A short break during which the demographic data were collected was given in the interviewing to separate the presentation of the pastel and intense colors.

Findings and Conclusions

Analysis of the major findings for each color in the study allowed the researcher to draw conclusions that of the 18 posed null hypotheses none was rejected. This strongly indicates that perception and acceptance of color change in textile fabrics are not in any way related to the age, sex, or age and sex of the consumer. Because of distribution of numbers in the class divisions, the socio-economic variable was not analyzed statistically.

In instances when significant differences were found it was indicated that:

Accuracy of perception of color change declines with increasing age, and older people were the most likely to perceive a color difference at the control level where none existed.

Males were generally more accepting of color change than were females, especially in terms of non-uniform color change.

Acceptance of color change in some cases increased with increasing age.

Age and sex interactions gave no consistent color change perception or acceptance patterns.

Uniform color change was more acceptable than non-uniform color change.

Color change was more acceptable in clothing to be worn at home than in that to be worn in public.

Color change was more acceptable in inexpensive clothing than in expensive clothing.

Acceptability of color change in fabrics declined as the amount of color change increased.

Recommendations

Results of the study indicate a need for establishing validity of the measures and instruments used. Also use of a larger population that is stratified in terms of age and socio-economic level would eliminate dominance of any socio-economic level by any one age group.

It is suggested that further research include other ways to measure consumer acceptance of color change. This could include development of a screen presentation of fabric samples and

pupillometric measures of acceptance. Studies done under the new conditions could then be compared to the present study. Further investigation into consumer complaints on color performance in textiles is also suggested.

BIBLIOGRAPHY

American College Dictionary. 1962. Editor, C.L. Barnhart. New York, Random House, 1444 p.

Barker, Donald G. 1971. Color perception requirements of 4, 000 jobs. Journal of Employment Counseling 8, no. 1:26-30.

Bartley, S. Howard. 1970. Some misconceptions concerning perception. American Journal of Optometry and Archives of American Academy of Optometry 47, no. 4:259-266.

Burnham, Robert W., Randall M. Hanes, and C. James Bartleson. 1963. Color: a guide to basic facts and concepts. New York, John Wiley and Sons, Inc. 249 p.

Burnham, Robert W., J.W. Onley, and R.F. Witzel. 1970. Exploratory investigation of perceptual color scaling. Journal of the Optical Society of America 60, no. 10:1410-1420.

Chen, Yih-wen. 1971. Visual discrimination color normals and color deficients. Audio Visual Communications Review 19, no. 4:417-431.

Coates, E. and B. Rigg. 1968. An introduction to instrumental measurements of colour difference in relation to colour tolerance. Journal of the Society of Dyers and Colourists 84, no. 9:462-466.

Coates, E. and F.L. Warburton. 1968. Colour-difference measurements in relation to visual assessments in the textile field. Journal of the Society of Dyers and Colourists 84, no. 9:467-474.

Corvallis Area Chamber of Commerce. 1970. General social and economic characteristics. U.S. Department of Commerce Bureau of the Census, 1970 Census of the Population. Corvallis, Oregon. 18 p.

Cruz-Coke, Ricardo, M.D. 1970. Color blindness, an evolutionary approach. Springfield, Illinois, Thomas. 156 p.

Hurvich, Leo M. 1971. Color vision deficiencies. In: Color vision: A symposium conducted at the spring meeting of the National Research Council, 1971. Washington, D.C., National Academy of Sciences, 1973. p. 1-33.

Keasey, Charles Blake, James A. Walsh, and Gary P. Moran. 1969. The effect of labeling as an informational social influence upon color perception. The Jornal of Social Psychology 79, no. 2:195-202.

Mather, James, Charlotte Stare, and Sharon Breinin. 1971. Color preference in a geriatric population. Gerontologist 11, no. 4 part 1:311-313.

McGuire, Carson and George D. White. 1955. The measurement of social status. Research paper in Human Development no. 3 (revised). Austin, Texas, University of Texas, 10 p.

National Institute of Drycleaning Technical Bulletin T469, March 1971.

Norwick, Braham. 1969. Color quality control. American Dyestuff Reporter 58, no. 5:33-37.

Parl, Boris. 1967. Basic statistics. New York: Doubleday and Company, Inc. 364 p.

Paulson, Helen M. 1971. Comparison of color vision tests used by the Armed Forces. In: Color vision: Symposium conducted at the spring meeting of the National Research Council, 1971. Washington, D.C., National Academy of Sciences, 1973. p. 34-64.

Portland State University, Center for Population Research and Census, Population estimate for Corvallis, Oregon, July 1, 1973.

Rushton, W.A.H. 1965. Chemical basis of colour vision and colour blindness. Nature 206, no. 4989:1087-1091.

_____. 1969. O say can you see. Psychology Today 3, no. 5:46-53.

Siegel, Michael H. and Ann B. Siegel. 1971. A comparison of techniques for measuring hue appearance. Behavioral Research Methods and Instruments 3, no. 1:1-4.

Siegel, Sidney. 1956. Nonparametric statistics for the behavioral sciences. New York: McGraw-Hill Book Company, Inc. 312 p.

Smith, Daniel. 1963. Visual color evaluation: lighting and the observer. American Dyestuff Reporter 52, no. 6:50-52.

Smith, Genevieve M. 1969. Quality control: textile product evaluation. American Dyestuff Reporter 58, no. 1:22-26.

Stearns, E.I. 1974. Measurement of color and color differences. Part I. Textile Chemist and Colorist 6, no. 2:38-49.

_____. 1974. Measurement of color and color differences. Part II. Textile Chemist and Colorist 6, no. 3:45-51.

Steiniger, Lynn B. and Rachel Dardis. 1971. Consumers' textile complaints. Textile Chemist and Colorist 3, no. 7:33-37.

Technical Manual of the American Association of Textile Chemists and Colorists. 1972. AATCC, Research Triangle Part, N.C., 48, 370 p.

Vogel, Theodore, Ralph A. Stanziola, John Auman, Kenneth M. Lobb, Robert A.F. Tausendfreund. (Deleware Valley AATCC). 1972. Color . . . as we see it. Textile Chemist and Colorist 4, no. 4:31-34.

Walker, Helen and Joseph Lev. 1953. Statistical inference. New York: Holt, Rinehart, and Winston.

Wardell, Dwight L. 1969. Eyes right, the tests for color matching. American Dyestuff Reporter 58, no. 6:17-22.

Webster's New World Dictionary. 1970. Editor, David B. Guralnik. New York, World Publishing Co., 2nd edition. 1962 p.

Western Regional Coordinating Committee (WRCC-9). 1973. Consumer reaction to color performance in textiles. Proposal for research. 17 p.

APPENDICES

APPENDIX A

Random Entry

Drawer Number	1st Entry Point	2nd Entry Point	3rd Entry Point
1.	front	back	middle
2.	middle	front	back
3.	back	middle	front
4.	front	middle	back
5.	back	middle	front
6.	middle	back	front
7.	front	middle	back
8.	middle	front	back
9.	middle	front	back
10.	back	middle	front
11.	back	front	middle
12.	front	middle	back
13.	front	middle	back
14.	middle	back	front
15.	front	middle	back
16.	front	back	middle
17.	back	front	middle
18.	back	front	middle
19.	middle	front	back
20.	front	back	middle
21.	middle	front	back
22.	front	back	middle
23.	front	middle	back

APPENDIX B

Postcard

Dear Consumer: February 17, 1974

I am a graduate student at O.S.U. conducting research on consumer reaction to color in fabrics.

Your name has been randomly selected from the Corvallis population as a member of the sample group. I will be telephoning you in the next few days to see if you can participate, and to make an appointment for you to come to the university to view the fabrics. Participation would require approximately 30-45 minutes of your time. Your assistance in the research is much needed and will surely be appreciated.

Redacted for Privacy Sincerely,
Redacted for Privacy

Dr. Ruth E. Gates (advisor) Susan Carter

APPENDIX C

Telephone Conversation

Hello Mr. or Ms. _____. This is Susan Carter. I sent you a postcard a few days ago about some research that I am working on for my master's thesis. I was wondering if you might be able to participate in this study.

What would be a convenient time for you to come to the University? Do you need a ride?

Do you know where the Home Economics Building is located? You will need to come to Room 223 which is in the West end of the building on the second floor. If you come through the traffic gates you may get a sticker to park on campus.

Thank you so much. I will look forward to seeing you on _____(date)_____ at _____(time)_____.

(Any questions about the study were also answered. The consumers were also assured that it was not necessary for them to have a good knowledge of textiles or color in order to participate in the study.)

APPENDIX D

Number of Consumers Contacted and Number of Consumers Participating in the Study

Group	Number in Sample	Number Contacted	Number Interviewed	Number Contacted but not Interviewed
Females age 25-34	46	35	16	19
Females age 45-54	47	35	17	18
Females age 65-74	47	40	15	25
Males age 25-34	47	38	15*	23
Males age 45-54	45	40	13*	27
Males age 65-74	54*	48	10	38
TOTALS	286	236	86	150

*One male in age group 25-34 and 2 males in age group 45-54 were interviewed and found to be color blind so were counted as not interviewed. The large number in the sample of males 65-74 is due to contacting the Senior Citizen's Club and asking 7 men to participate in the study; only 2 of the 7 agreed to participate.

Reasons Given for not Participating	Female 25-34	Male 25-34	Female 45-54	Male 45-54	Female 65-74	Male 65-74
Not interested.	0	0	1	7	8	14
Too busy, no time.	8	9	5	8	3	3
No longer living in Corvallis.	4	2	2	0	0	1
Out of town.	1	0	2	6	3	1
Ill.	0	0	0	1	6	4
Would rather not participate, but if desperate call back.	3	1	1	0	0	0
Color blind or poor vision.	0	3	1	4	0	2
Made appointment but never came to the interview.	0	2	0	0	0	0
No transportation & wouldn't accept a ride.	0	0	1	1	2	0
No reason.	3	6	5	0	3	10
Deceased.	0	0	0	0	0	3
TOTALS	19	23	18	27	25	38

APPENDIX E

Consumer Reaction Survey Questionnaire

CONSUMER REACTION SURVEY

1. Do you see a difference in color between the two samples?

   _____ Yes

   _____ No

   _____ No response

(The answer is recorded by the interviewer on the Consumer Reaction Data sheet. While pointing to sample "2" the interviewer then asks the second through sixth questions if the answer to number 1 has been yes.)

2. Consider that the two pieces are in one garment. Is the amount of color change acceptable for wear as a dress/shirt?

   _____ Yes, acceptable

   _____ No, unacceptable

   _____ Not applicable

3. Consider that the color change is uniform throughout the garment. Is the amount of color change acceptable for wear as a dress/shirt in public?

   _____ Yes, acceptable

   _____ No, unacceptable

   _____ Not applicable

4. Would this amount of color change be acceptable in a garment to be worn just at home?

   _____ Yes, acceptable

   _____ No, unacceptable

   _____ Not applicable

5. Would this amount of color change be acceptable in an expensive garment?

   _____ Yes, acceptable

   _____ No, unacceptable

   _____ Not applicable

6. Would this amount of color change be acceptable in an inexpensive garment?

_____ Yes, acceptable

_____ No, unacceptable

_____ Not applicable

APPENDIX F

Consumer Response Data Sheet

Code
(State) (Consumer #)

Consumer Response Data Sheet

	Q #1			Q #2			Q #3			Q #4			Q #5			Q #6				Q #1			Q #2			Q #3			Q #4			Q #5			Q #6		
Code	Y	N	NR	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Code	Y	N	NR	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA	Y	N	NA
PY-6-II-2																			Y-6-I-2																	
PY-6-I-3																			Y-6-II-3																	
PY-6-I-3-4																			Y-6-I-3-4																	
PY-6-I-4																			Y-6-II-4																	
PY-6-I-4-5																			Y-6-I-4-5																	
PY-6-I-5																			Y-6-I-5																	
PR-6-I-2																			R-6-I-2																	
PR-6-II-3																			R-6-I-3																	
PR-6-I-3-4																			R-6-II-3-4																	
PR-6-I-4																			R-6-I-4																	
PR-6-II-4-5																			R-6-II--4-5																	
PR-6-I-5																			R-6-I-5																	
PB-6-II-2																			B-6-II-2																	
PB-6-I-3																			B-6-I-3																	
PB-6-I-3-4																			B-6-I-3-4																	
PB-6-I-4																			B-6-I-4																	
PB-6-I-4-5																			B-6-I-4-5																	
PB-6-I-5																			B-6-I-5																	

Demographic Data

1. a b c

2. (A) a b c d _____

(B) G.S. 1 2 3 4 5 6 7 8
H.S. 9 10 11 12 13
Coll. 1 2 3 4
Grad. 1 or more
Other _____

(C) _____

_____

_____

(D) 1 2 3 4 5

(E) 1 2 3 4 5 6 7

3. a b c d e f

4. a b c d

5. (A) 1 2 3 4 5 6 7 8 9 10

(B) 1 2 3 4 5 6 7 8 9 10

6. (A) 1 2 3 4 5

(B) 1 2 3 4

APPENDIX G

Introduction to Consumer

This is a study of color change in facrics. Several pair of colored fabrics will be presented to you in this viewing instrument. The sample on the left is the original, number 1. The sample on the right, number 2, may or may not be the same color. If it is not the same color, the alteration or color change may be due to fading from sunlight exposure, wash fading, or it may be due to ordinary use and care of the fabric.

Now I will give you a trial set that will demonstrate to you the fabrics you will be viewing and the questions you will be asked. We are interested in your immediate response. There is no wrong or right answer. You will be given about ten seconds to respond. If there is anything that is not clear during the trial questions please be sure to ask.

(Present trial fabrics and the six questions. Answer any questions the consumer presents.)

For all answers to be useable the distance from the light source to the viewing instrument must remain the same, so it has to remain on the table and should not be picked up. When we speak of "public" we want you to think of a working type situation or anytime when you might be around friends or other people, but not a really social occasion. In estimating cost of the garment think of inexpensive as any garment under $10.00 and expensive as any garment $20.00 or over.

(Present pastel colors.)

Now we will have a short break and I will ask you a few questions about your occupation and your family. Your answers will be kept confidential and you are identified on this data sheet only by a number. May I get you something to drink? You may feel free to stretch your legs or leave the viewing area if you desire.

(Collect demographic data and then present intense colors.)

Thank you for participating. You have helped so much. I will be sending you a postcard early this summer to let you know the results of this study.

APPENDIX H

Demographic Data

DEMOGRAPHIC DATA

1. Age group of consumer:
   a. 25-34
   b. 45-54
   c. 65-74

2. A. Who is the main wage earner in this family?
   a. husband
   b. wife
   c. welfare
   d. other

   B. What is the highest grade the main wage earner completed in school? (Note: the main wage earner is the person checked in part A. above.)
   grade school 1 2 3 4 5 6 7 8
   high school 9 10 11 12 13
   college or university 1 2 3 4
   graduate school 1 or more years
   other (specify)

   if the main wage earner is a college graduate, what is his/her highest degree_____.

   C. What kind of work does the main wage earner do? Please describe his or her work as specifically as you can; we need to know the type of work done but not the name of the company or business.
   FOR EXAMPLE:

sawyer in a lumber mill	chemical engineer in chemical plant
teacher in a high school	
waitress	salesman for a book company
operates farm of 160 acres	clerk for transport firm
retired college professor	sales clerk for a dept. store
	unemployed

   D. Which of the following statements best describes the working situation of the person named main wage earner? (Show card with these listed instead of trying to read to consumer.)

   1. Works for someone, does not manage the business or farm.
   2. Works for someone, does manage the business or a main part or section of it.
   3. Owns a business (or farm) but hires someone else to manage it.
   4. Owns and manages his or her own business or farm.
   5. Retired.

E. What is the main source of income of the main wage earner? (Again show card with these listed instead of trying to read to consumer.)
   1. inherited and invested
   2. invested income
   3. profits, fees
   4. salary, commission (monthly)
   5. weekly wages, piece work
   6. income from odd jobs
   7. social development or charity

3. Ethnic Group: With what ethnic group do you identify?
   a. Spanish origin
   b. White (U.S.)
   c. Black (U.S.)
   d. American Indian
   e. S.E. Asia
   f. Other

4. Marital Status of Consumer
   a. Married
   b. Single
   c. Divorced
   d. Widowed

5. Number of dependents under age of 18? 1 2 3 4 5 6 7 8 9 10

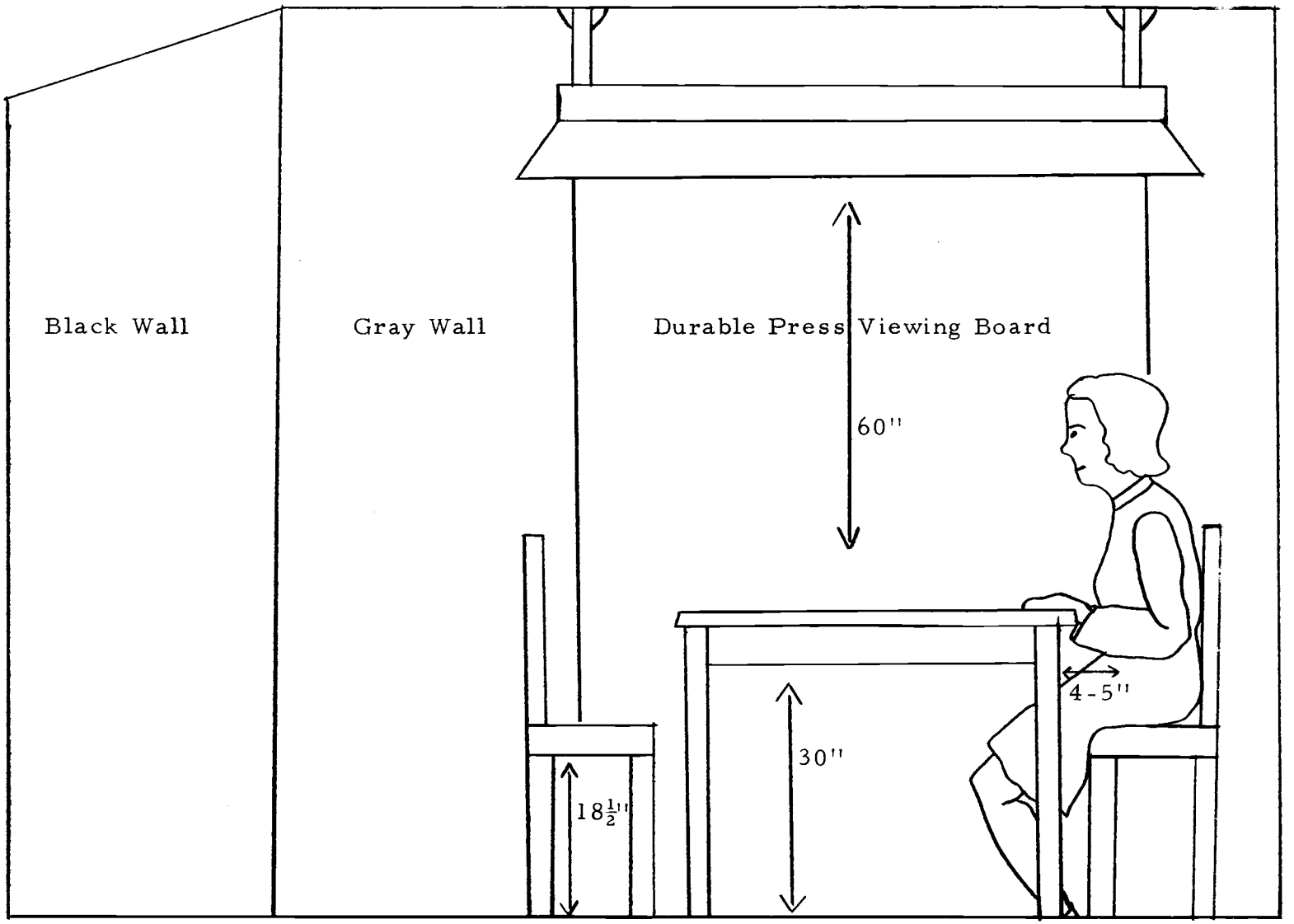
   Number of dependents age 18 and over? 1 2 3 4 5 6 7 8 9 10

6. Type of Laundry Facilities
   a. Type of equipment used
      1. Automatic washer
      2. Wringer washer
      3. Hand washing with tub or basin
      4. Automatic dryer
      5. Line drying

   b. Location of equipment
      1. Owned and used by family
      2. Laundromat
      3. Apartment complex laundry
      4. Commercial laundry

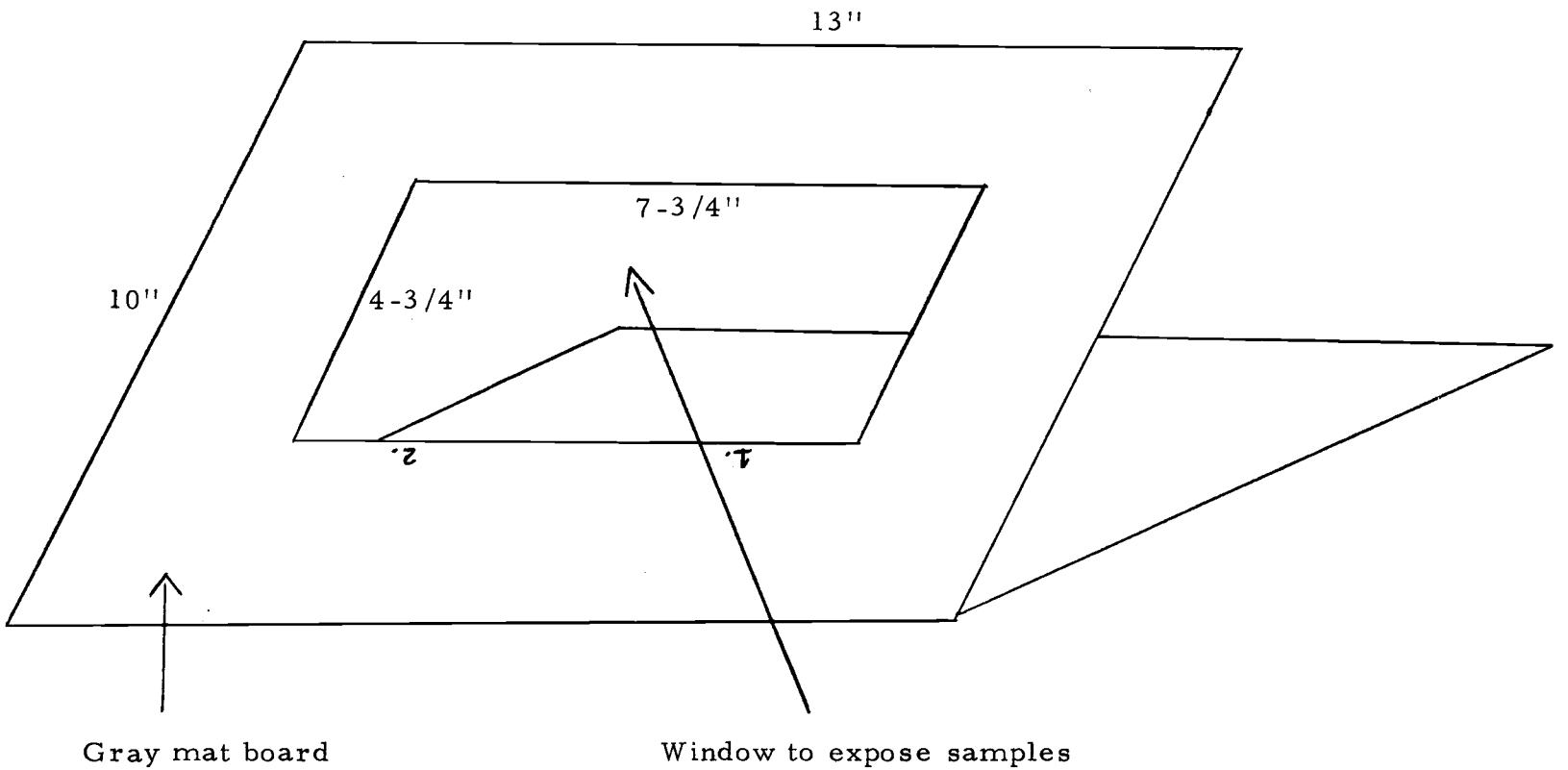
APPENDIX I

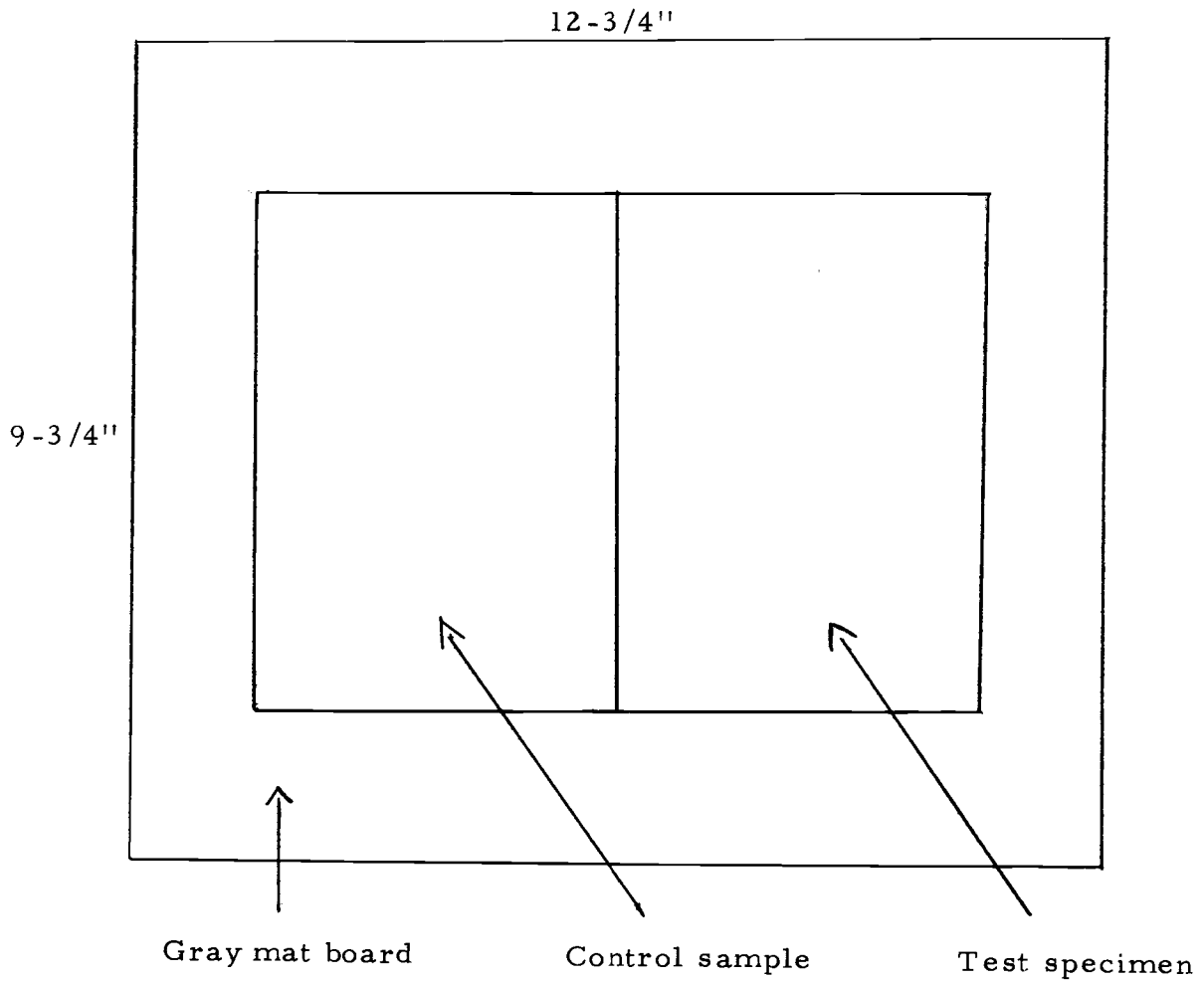
Viewing Area


Black Wall
Gray Wall
Durable Press Viewing Board
60"
4-5"
30"
18½"

APPENDIX J

Viewing Instrument


13"
7-3/4"
10"
4-3/4"
2.
1.
Gray mat board
Window to expose samples


12-3/4"
9-3/4"
Gray mat board
Control sample
Test specimen

APPENDIX K

Dyeing and Fading Specifications

DYED COTTON SHEETING

Dyed in Jigg at 30:1 Ratio

0.30%	Dye	1.50%
0 --	Common Salt	20.00%
1.50%	Sellogen 641	0 --

Start cold. Raise Temp. 4°C/min to Boil. Boil 1/2 hour. Run 20 min. in cooling bath. Rinse. Squeeze. Dry at 95°C.

Red - Direct Red 80 Colour Index 35780 Tetrakis Azo--(Sirius Red F 3BA) (Verona Co.).

Blue - Direct Blue 76 Colour Index 24410 Coppered Disazo - (Solantine Blue 6GKS) (Allied Chem. Co.).

Yellow - Direct Yellow 12 Colour Index 24895 Disazo - (Erie Yellow Y) (Allied Chem. Corp.).

Source: Western Regional Coordinating Committee, 1973.

Dyes of good but not extreme light fastness were used so as to allow fadometer fading in a reasonable time but to have sufficient resistance to normal exposures during repeated handling. First barely noticeable fading should be at about the following exposures

	Pastel	Heavy
Yellow	20 hours	40 hours
Red	20 hours	40 hours
Blue	15 hours	30 hours

These are SFH (Standard fading hours) in the Carbon Arc Fadeometer (Western Regional Coordinating Committee, 1973).

APPENDIX L

Fabrics Used in Study

Pastel Yellow

Yellow

Pastel Red

Red

Pastel Blue

Blue

Red, Level 2

Red, Level 3

Red, Level 3-4

Red, Level 4

Red, Level 4-5

Red, Level 5

APPENDIX M

Index of Social Status

Index of social status--short form (McGuire and White, 1955, p. 2).

Occupation	Rate 1 to 7 on OC Scale . . .	Weight -- x5
Source of Income	Rate 1 to 7 on SI Scale . . .	Weight -- x4
Education	Rate 1 to 7 on ED Scale . . .	Weight -- x3

General conversion table for status indexes (McGuire and White, 1955, p. 3).

Index Score	Relative Status Level	Social Class Prediction	Break Points and Intervals of Indeterminancy	Life Style*	Intervals Employed in Correlation
12	A+	(UC)			
13-17	A	Upper Class	12-22	Super-	16 plus
18-22	A-		(23-24)	ordinate	17-21
23-27	B+	(UM)			22-26
28-32	B	Upper-Middle	25-33	Dominant	27-31
33-37	B-		(34-37)	UM	32-36
38-41	C+	(LM)			37-41
42-46	C	Lower-Middle	38-50	Dominant	42-46
47-51	C-		(51-53)	LM	47-51
52-56	D+	(UL)			52-56
57-61	D	Upper-Lower	54-62	Alternate	57-61
62-66	D-		(63-66)		62-66
67-71	E+	(LL)			67-71
72-75	E	Lower-Lower	67-84	Deviant	72-76
76-84	E-				77 Minus

APPENDIX N

Percentage of Yes Responses to Each Question by Socio-Economic Level, Age, and Sex

Pastel Yellow - Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels 2	3	3-4	4	4-5	5
					%		
Q1: Perceive a color change.	U	100	90	90	80	20	20
	UM	100	100	100	94	45	0
	LM & UL	100	100	100	91	44	9
Q2: Accept if two colors are in one garment.	U	20	45	56	87	100	100
	UM	2	15	23	54	71	0
	LM & UL	0	9	22	39	70	100
Q3: Accept if uniform for wear in public.	U	80	89	100	100	100	100
	UM	68	79	92	98	100	0
	LM & UL	39	74	74	52	100	100
Q4: Accept if uniform for wear at home.	U	90	100	100	100	100	100
	UM	89	100	98	100	100	0
	LM & UL	74	87	91	100	100	100
Q5: Accept if uniform in an expensive garment.	U	40	67	67	100	100	100
	UM	15	34	42	82	92	0
	LM & UL	12	30	39	57	70	100
Q6: Accept if uniform in an inexpensive garment.	U	80	100	100	100	100	100
	UM	70	87	91	100	100	0
	LM & UL	61	87	87	95	100	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 are based on number answering yes to Q1.

Pastel Yellow -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels					
		2	3	3-4	4	4-5	5
		- - - - - - - - - % - - - - - - - - - -					
Q1: Perceives a color change.	AM	100	100	100	93	33	0
	AF	100	100	100	94	56	0
	BM	100	100	100	92	54	0
	BF	100	100	100	94	35	0
	CM	100	100	100	80	30	10
	CF	100	93	93	93	40	20
Q2: Accept if two colors are in one garment.	AM	0	27	33	79	100	0
	AF	0	6	19	33	78	0
	BM	8	38	38	67	71	0
	BF	0	6	18	31	33	0
	CM	10	20	20	38	67	100
	CF	7	7	29	71	83	100
Q3: Accept if uniform for wear in public.	AM	80	93	100	93	100	0
	AF	50	63	81	100	100	0
	BM	69	92	85	92	100	0
	BF	47	65	76	100	100	0
	CM	40	70	100	100	100	100
	CF	80	93	93	100	100	100
Q4: Accept if uniform for wear at home.	AM	100	100	100	100	100	0
	AF	81	100	100	100	100	0
	BM	77	92	92	100	100	0
	BF	76	94	88	100	100	0
	CM	90	100	100	100	100	100
	CF	87	93	100	100	100	100
Q5: Accept if uniform in an expensive garment.	AM	20	40	47	93	100	0
	AF	13	31	38	73	89	0
	BM	15	46	46	67	86	0
	BF	18	24	29	69	67	0
	CM	10	40	50	100	100	100
	CF	27	43	57	71	83	100
Q6: Accept if uniform in an inexpensive garment.	AM	80	100	100	100	100	0
	AF	63	81	88	100	100	0
	BM	69	92	85	92	100	0
	BF	65	82	88	100	100	0
	CM	70	80	80	100	100	100
	CF	67	93	100	100	100	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Pastel Red -- Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels 2	3	3-4	4	4-5	5
		%					
Q1: Perceive a color change.	U	100	100	100	100	100	20
	UM	100	100	100	100	96	2
	LM & UL	100	100	100	100	96	4
Q2: Accept if two colors are in one garment.	U	10	30	30	50	70	100
	UM	2	6	4	8	29	100
	LM & UL	0	0	4	0	36	100
Q3: Accept if uniform for wear in public.	U	60	80	80	100	100	100
	UM	45	79	81	85	96	100
	LM & UL	30	48	57	65	95	100
Q4: Accept if uniform for wear at home.	U	90	90	90	100	100	100
	UM	79	96	96	96	100	100
	LM & UL	74	78	83	91	100	100
Q5: Accept if uniform in an expensive garment.	U	30	30	30	60	90	100
	UM	6	19	19	30	61	100
	LM & UL	9	17	30	13	64	100
Q6: Accept if uniform in an inexpensive garment.	U	80	80	80	90	100	100
	UM	47	74	79	87	98	100
	LM & UL	57	70	74	87	100	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Pastel Red -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels 2	3	3-4	4	4-5	5
		%					
Q1: Perceives a color change.	AM	100	100	100	100	93	0
	AF	100	100	100	100	94	0
	BM	100	100	100	100	100	0
	BF	100	100	100	100	100	6
	CM	100	100	100	100	90	10
	CF	100	100	100	100	100	13
Q2: Accept if two colors are in one garment.	AM	0	13	7	27	57	0
	AF	0	0	0	0	27	0
	BM	0	8	8	8	54	0
	BF	6	6	6	6	21	100
	CM	10	20	20	20	33	100
	CF	0	0	7	7	33	100
Q3: Accept if uniform for wear in public.	AM	53	87	87	87	100	0
	AF	38	63	63	69	93	0
	BM	38	62	69	77	92	0
	BF	41	76	82	82	94	100
	CM	50	70	70	100	100	100
	CF	47	67	73	80	100	100
Q4: Accept if uniform for wear at home.	AM	93	100	100	100	100	0
	AF	63	100	94	100	100	0
	BM	92	85	77	100	100	0
	BF	65	82	94	88	100	100
	CM	100	100	100	100	100	100
	CF	73	80	87	87	100	100
Q5: Accept if uniform in an expensive garment.	AM	13	27	20	33	71	0
	AF	0	13	6	13	47	0
	BM	15	15	23	15	69	0
	BF	6	18	24	29	59	100
	CM	20	30	40	60	89	100
	CF	7	20	33	33	67	100
Q6: Accept if uniform in an inexpensive garment.	AM	47	67	80	87	100	0
	AF	50	75	75	88	100	0
	BM	54	69	62	77	100	0
	BF	41	76	88	88	94	100
	CM	60	80	80	100	100	100
	CF	73	73	80	87	100	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Pastel Blue -- Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels 2	3	3-4	4	4-5	5
		- - - - - - - - - - - - % - - - - - - - - - - - -
Q1: Perceive a color change.	U	100	100	100	100	100	40
	UM	100	100	100	100	100	17
	LM & UL	100	100	100	100	96	35
Q2: Accept if two colors are in one garment.	U	20	20	30	40	70	100
	UM	0	4	4	6	42	89
	LM & UL	4	4	0	9	27	37
Q3: Accept if uniform for wear in public.	U	50	80	80	90	90	100
	UM	51	68	75	79	96	100
	LM & UL	30	52	57	65	91	100
Q4: Accept if uniform for wear at home.	U	80	90	90	100	100	100
	UM	75	87	92	98	98	100
	LM & UL	65	70	87	77	100	100
Q5: Accept if uniform in an expensive garment.	U	30	30	40	50	70	100
	UM	9	15	21	34	64	78
	LM & UL	5	13	17	30	55	75
Q6: Accept if uniform in an inexpensive garment.	U	60	80	90	90	100	100
	UM	53	68	77	87	94	100
	LM & UL	52	65	87	70	96	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Pastel Blue -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels					
		2	3	3-4	4	4-5	5
		-%-					
Q1: Perceives a color change.	AM	100	100	100	100	100	13
	AF	100	100	100	100	100	6
	BM	100	100	100	100	92	23
	BF	100	100	100	100	100	29
	CM	100	100	100	100	100	70
	CF	100	100	100	100	100	20
Q2: Accept if two colors are in one garment.	AM	0	7	13	27	73	100
	AF	0	0	0	0	38	0
	BM	8	15	0	15	58	66
	BF	0	0	6	6	18	80
	CM	20	20	20	20	40	100
	CF	0	0	0	0	27	0
Q3: Accept if uniform for wear in public.	AM	73	87	93	87	100	100
	AF	25	50	69	69	94	100
	BM	69	77	69	69	92	100
	BF	35	59	71	82	94	100
	CM	60	70	70	90	90	100
	CF	20	53	53	67	93	100
Q4: Accept if uniform for wear at home.	AM	93	93	93	100	100	100
	AF	56	81	94	100	100	100
	BM	85	77	85	85	100	100
	BF	65	76	82	94	94	100
	CM	90	90	100	100	100	100
	CF	60	80	93	80	100	100
Q5: Accept if uniform in an expensive garment.	AM	20	20	33	33	87	100
	AF	6	13	19	25	56	100
	BM	15	23	15	46	67	66
	BF	6	18	18	29	47	60
	CM	20	30	50	60	80	100
	CF	0	0	7	27	47	66
Q6: Accept if uniform in an inexpensive garment.	AM	60	73	80	87	100	100
	AF	50	69	81	94	94	100
	BM	62	62	69	62	100	100
	BF	41	59	82	88	82	100
	CM	70	80	90	90	100	100
	CF	47	73	87	73	100	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Yellow - Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels					
		2	3	3-4	4	4-5	5
		- - - - - - - - - - - - % - - - - - - - - - - - -					
Q1: Perceive a color change.	U	100	100	100	100	40	0
	UM	100	100	100	92	66	0
	LM & UL	100	100	100	100	65	4
Q2: Accept if two colors are in one garment.	U	20	30	40	60	100	0
	UM	2	4	9	25	63	0
	LM & UL	0	0	4	13	53	0
Q3: Accept if uniform for wear in public.	U	60	70	90	100	100	0
	UM	30	51	64	87	100	0
	LM & UL	22	39	39	87	100	100
Q4: Accept if uniform for wear at home.	U	80	80	90	100	100	0
	UM	60	77	83	96	100	0
	LM & UL	48	52	57	96	100	100
Q5: Accept if uniform in an expensive garment.	U	20	30	30	90	100	0
	UM	8	23	23	52	83	0
	LM & UL	9	17	17	57	93	100
Q6: Accept if uniform in an inexpensive garment.	U	70	70	80	100	100	0
	UM	32	57	75	92	100	0
	LM & UL	48	61	61	91	100	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Yellow -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels					
		2	3	3-4	4	4-5	5
		- - - - - - - - - - - - % - - - - - - - - - - - -					
Q1: Perceives a color change.	AM	100	100	100	100	60	0
	AF	100	100	100	94	69	0
	BM	100	100	100	100	85	0
	BF	100	100	100	100	82	0
	CM	100	100	100	100	40	0
	CF	100	100	100	100	33	7
Q2: Accept if two colors are in one garment.	AM	7	13	20	47	67	0
	AF	0	0	0	13	73	0
	BM	8	8	31	46	82	0
	BF	0	0	0	6	36	0
	CM	10	20	20	20	75	0
	CF	0	0	7	27	60	100
Q3: Accept if uniform for wear in public.	AM	40	60	60	93	100	0
	AF	13	25	38	87	100	0
	BM	23	54	54	77	100	0
	BF	35	47	59	88	100	0
	CM	20	40	70	80	100	0
	CF	53	73	87	100	100	100
Q4: Accept if uniform for wear at home.	AM	73	80	87	100	100	0
	AF	44	56	69	93	100	0
	BM	62	69	69	100	100	0
	BF	53	71	71	100	100	0
	CM	70	70	80	80	100	0
	CF	60	80	87	100	100	100
Q5: Accept if uniform in an expensive garment.	AM	20	20	27	67	89	0
	AF	0	19	19	40	82	0
	BM	8	31	31	46	91	0
	BF	6	18	18	53	79	0
	CM	10	10	10	60	100	0
	CF	13	33	27	80	100	100
Q6: Accept if uniform in an inexpensive garment.	AM	27	47	80	93	100	0
	AF	25	50	63	87	100	0
	BM	46	62	62	92	100	0
	BF	41	65	65	100	100	0
	CM	50	60	70	80	100	0
	CF	60	73	93	100	100	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q2-Q6 used on number answering yes to Q1.

Red -- Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels 2	3	3-4	4	4-5	5
				%			
Q1: Perceive a color change.	U	100	100	100	100	90	20
	UM	100	100	100	96	92	0
	LM & UL	100	100	100	96	87	4
Q2: Accept if two colors are in one garment.	U	20	40	20	80	78	100
	UM	2	6	8	41	57	0
	LM & UL	0	9	9	28	45	100
Q3: Accept if uniform for wear in public.	U	80	100	90	100	100	100
	UM	43	64	72	86	92	0
	LM & UL	22	61	78	91	95	100
Q4: Accept if uniform for wear at home.	U	90	100	90	100	100	100
	UM	66	83	89	92	96	0
	LM & UL	52	74	96	100	100	100
Q5: Accept if uniform in an expensive garment.	U	40	70	50	80	78	100
	UM	9	19	28	71	80	0
	LM & UL	4	39	39	64	80	100
Q6: Accept if uniform in an inexpensive garment.	U	80	100	90	100	100	100
	UM	43	79	81	92	96	0
	LM & UL	43	74	91	100	100	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Red -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels 2	3	3-4	4	4-5	5
		%					
Q1: Perceives a color change.	AM	100	100	100	93	93	0
	AF	100	100	100	94	88	0
	BM	100	100	100	100	100	0
	BF	100	100	100	100	94	0
	CM	100	100	100	90	80	20
	CF	100	100	100	100	87	7
Q2: Accept if two colors are in one garment.	AM	7	27	13	79	93	0
	AF	0	0	0	27	43	0
	BM	0	23	31	62	77	0
	BF	0	0	0	18	31	0
	CM	20	20	20	44	50	100
	CF	0	0	0	33	46	100
Q3: Accept if uniform for wear in public.	AM	67	87	80	93	100	0
	AF	13	38	50	93	86	0
	BM	54	77	77	92	92	0
	BF	35	65	82	88	94	0
	CM	30	80	70	78	88	100
	CF	53	67	93	93	100	100
Q4: Accept if uniform for wear at home.	AM	93	93	93	100	100	0
	AF	38	81	81	100	100	0
	BM	69	85	92	92	92	0
	BF	53	71	94	94	100	0
	CM	80	80	80	78	88	100
	CF	67	87	100	100	100	100
Q5: Accept if uniform in an expensive garment.	AM	20	47	40	79	93	0
	AF	0	6	19	80	71	0
	BM	15	38	23	69	77	0
	BF	6	24	41	65	81	0
	CM	10	40	40	67	75	100
	CF	20	33	40	60	77	100
Q6: Accept if uniform in an inexpensive garment.	AM	47	80	73	100	100	0
	AF	31	81	81	100	100	0
	BM	54	85	85	92	92	0
	BF	47	71	88	94	100	0
	CM	60	80	80	78	88	100
	CF	53	87	100	100	100	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Blue -- Percentage of Yes Responses to Each Question by Socio-Economic Level and Color Level[a]

Questions	SEL	Color Levels 2	3	3-4	4	4-5	5
				%			
Q1: Perceive a color change.	U	100	100	100	100	100	0
	UM	100	100	100	100	98	0
	LM & UL	100	100	100	100	96	4
Q2: Accept if two colors are in one garment.	U	10	20	20	40	40	0
	UM	0	8	9	13	23	0
	LM & UL	0	4	4	13	9	100
Q3: Accept if uniform for wear in public.	U	40	50	60	80	80	0
	UM	42	66	81	81	92	0
	LM & UL	22	70	65	74	86	100
Q4: Accept if uniform for wear at home.	U	70	90	90	100	100	0
	UM	72	85	91	92	96	0
	LM & UL	39	78	78	96	100	100
Q5: Accept if uniform in an expensive garment.	U	10	30	30	40	70	0
	UM	6	23	38	51	62	0
	LM & UL	9	13	30	30	50	100
Q6: Accept if uniform in an inexpensive garment.	U	60	70	60	90	100	0
	UM	49	72	85	92	96	0
	LM & UL	43	78	83	87	95	100

U = upper class (N = 10)
UM = upper middle class (N = 53)
LM = lower middle class (N = 21)
UL = upper lower class (N = 2)
combined (N = 23)

[a]Percentages in Q2-Q6 based on number answering yes to Q1.

Blue -- Percentage of Yes Responses to Each Question by Age, Sex, and Color Level[a]

Question	Age and Sex	Color Levels					
		2	3	3-4	4	4-5	5
		- - - - - - - - - - - - % - - - - - - - - - - - -					
Q1: Perceives a color change.	AM	100	100	100	100	93	0
	AF	100	100	100	100	100	0
	BM	100	100	100	100	92	0
	BF	100	100	100	100	100	0
	CM	100	100	100	100	100	0
	CF	100	100	100	100	100	7
Q2: Accept if two colors are in one garment.	AM	0	13	20	33	43	0
	AF	0	0	6	6	19	0
	BM	0	23	15	31	42	0
	BF	0	0	0	0	6	0
	CM	10	20	20	20	30	0
	CF	0	0	0	7	0	100
Q3: Accept if uniform for wear in public.	AM	67	73	80	93	93	0
	AF	31	44	56	63	100	0
	BM	46	62	77	69	83	0
	BF	24	88	100	94	100	0
	CM	30	80	80	80	80	0
	CF	20	47	53	73	73	100
Q4: Accept if uniform for wear at home.	AM	87	100	100	100	100	0
	AF	56	75	88	94	100	0
	BM	69	77	85	92	100	0
	BF	59	94	100	100	100	0
	CM	70	90	90	90	90	0
	CF	40	67	60	87	93	100
Q5: Accept if uniform in an expensive garment.	AM	13	33	47	73	79	0
	AF	6	13	19	31	63	0
	BM	15	23	38	46	50	0
	BF	0	18	35	53	59	0
	CM	10	20	50	30	70	0
	CF	0	20	27	27	40	100
Q6: Accept if uniform in an inexpensive garment.	AM	53	80	87	93	100	0
	AF	44	63	81	94	100	0
	BM	54	62	77	85	92	0
	BF	41	88	94	100	100	0
	CM	60	90	80	90	90	0
	CF	47	60	67	80	93	100

AM = males 25-34 (N = 15) BM = males 45-54 (N = 13) CM = males 65-74 (N = 10)
AF = females 25-34 (N = 16) BF = females 45-54 (N = 17) CF = females 65-74 (N = 15)

[a]Percentages in Q 2-Q6 based on number answering yes to Q1.