LIGHTING DESIGNS FOR A MODERN DANCE: PREFERENCES OF MEN AND WOMEN

A DISSERTATION

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BY

STINA M. MERRILL

GYMNASTIKLÄRARE EXAMEN, M.S.

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We hereby recommend that the dissertation prepared under our supervision by Stina Margareta Merrill

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be accepted as fulfilling this part of the requirements for the Degree of Doctor of Philosophy

Committee:

Joel Parker
Chairman
Bert E. Fyle Jr.
Marita V. Gaydine
Lucasia
Thornton A. Klos

Accepted:

Mary Evelyn Huey
Dean of Graduate Studies

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER I

ORIENTATION TO THE STUDY

Dance, as any performing art, can be fully realized only in performance. In order to be appreciated and understood dance must be perceived moment by moment. It must possess clarity of form and action and its movement quality must have the sufficient forcefulness to result in a total impression of the whole. This culminating effect is achieved by adding perception upon perception. Thus the total experience is perceived gradually; connections between movement patterns become apparent as the various threads binding the whole together begin to interweave into the unique art form, dance.

The core of the dance performance lies in the dance itself and it behooves each choreographer to become thoroughly familiar with the craftmanship of choreography. It is, however, of great importance for the choreographer to familiarize himself with what Doris Humphrey (1958) calls the supporting factors of dance. Humphrey (1958) considers music, costuming, sets, properties, lighting, and program notes to be the most important of the supporting factors. Thus, to enable the audience to experience the production as a whole,

all factors should collaborate and present a comprehensive design.

Lighting is the one supporting factor that has the ability to blend all the others into a whole by suggesting mood and atmosphere (Gassner, 1944, p. 1). Stage lighting is not only indispensable in order that the audience see the movements, but as a means of unifying the movements with their environment. Lighting is used "also as a method of emphasizing the dramatic value of the performance and heightening our emotional response to them." (Simonson, 1932, p. 632).

Light can become a powerful medium of communication; a tool through which the choreographer communicates. The importance of the impact of lighting upon the audience is apparent and has long been known to lighting designers. The kinds of lighting that most effectively produce such impacts upon an audience remain unknown.

In surveying the literature, few studies dealing with audience response to lighting were found, and none was found to deal with audience preference to lighting designs for dance. According to Seabury (1969) theatre artists have traditionally been more interested in the actual performance than in the effect a performance has on the audience (p. 1271). Seabury (1969) hoped that technological

advancements would cause investigators to develop greater interest in studying such audience reactions.

Stage lighting as an artistic support is a relatively new development in the evolution of dramatic production. Motion pictures and television with their exacting demands upon lighting are, of course, comparatively recent, but until modern times lighting in the theatre has often been inadequate, barely providing sufficient illumination for the action on stage.

Today reliable and controllable light sources are available and lighting designers can debate stage lighting in terms of its contributions to the total impression on the audience. This impression is based upon the intellectual and emotional content of the dance, and the concepts of the choreographer and the designers (Skelton 1955). These contributions are usually considered under some or all of the following categories (Selden & Sellman, 1959, pp. 220-227): (1) selective illumination of the dancer and the set, if used, so that they may be readily seen; (2) revelation and reinforcement of form, an emphasis of the third dimension for both the dancer and the set; (3) composition of the stage picture by light distributions with variations in highlight, shadows, and color; (4) presentation and reinforcement of emotional and psychological situations; and (5) arranging and ordering of the stage picture in a simple, easily perceived pattern of

light leading to a sense of reality or credibility. These functions of lighting are presumed to be common to all dramatic lighting, whether it be stage, television, or motion picture.

A lighting designer for a theatrical production is unique among artists. His work is not an end in itself nor does it exist because of itself. Instead, it is created to aid, clarify, and augment the work of other artists together with whom he must work in close association. In theory, the lighting designer must create effects that effectively express the thoughts and intent of the choreographer. In actuality, he usually coordinates his designs not only to express the thoughts and intent of the choreographer as they are interpreted by the dancers, but also to unify and harmonize with other supporting elements, particularly music and costuming. Therefore, the lighting designer must work under limitations imposed on him from without, simultaneously creating an art object that is satisfying to himself (Huntley 1956).

One of the limitations imposed on the lighting designer is the necessity of affecting the audience with his lighting designs in a way that agrees with the intent of the dance. The audience that sees his work may be a highly select group, but nevertheless is composed of individuals with different likes and dislikes, especially when it comes to the interpretation of the dance. Their artistic tastes might

be highly divergent because of differences in their age, sex, educational level or previous exposure to dance.

The audience goes to the theatre not to see the building, not to see the technical magic of the stage, but to see a performance (Humphrey 1960). Therefore, it is the choreographer who must establish the analogies of his ideas expressed in movement, so that his intent becomes clear to the spectators. Lights, sets, costumes should be subtle and support the action on the stage, always reminding the audience that the stage is a platform for the choreographer's expression (Lewisohn 1969).

Is there some way that the lighting designer may be guided with a knowledge of the beliefs, prejudices, likes and dislikes of the audience? It can hardly be expected that a lighting designer would invariably use such a guide in an inflexible manner if such a guide were available; however, it would be a help in much the same fashion that the available information on the principles, elements, and factors of movement serve the beginning choreographer. No such guide exists. Presently, there are conventions of common technical usage of stage lighting that have served as a primer for lighting designers (Huntley 1956).

Purpose of the Study

The general purpose of this study was to obtain information concerning lighting designs as a supporting element in

dance performance. Light, because of its spatial manifestations and its mobility, closely approximates the movement medium. They both exist on the same terms in time and space and have the power to evoke individual responses. Although audience responses to visual stimuli often cannot be verbalized, members of the audience can indicate their individual preferences to a dance or lighting design. If these preferences differ to a significant degree from one educational level to another and from one sex to the other, the lighting designer may gain insight into the designing of lighting effects for dance.

Specific purposes of the study were to test the following hypotheses:

1. There is no statistically significant difference in the proportionate distribution of the expressed preference of males and females with respect to four lighting effects for a specific dance composition as determined by the Chi-square statistical technique.

2. There is no statistically significant difference in the proportionate distribution of the expressed preference of four educational levels with respect to four lighting effects for a specific dance composition as determined by the Chi-square statistical technique.

3. There is no statistically significant difference in the proportionate distribution of the expressed preference

of subjects with a dance background and those without previous dance background.

Statement of the Problem

The present investigation was designed to determine if there is a difference in the preference of educational level and of sex groups with respect to four lighting effects designed for a specific dance composition. The lighting effects used were: (1) area lighting, (2) path lighting, (3) special area lighting, and (4) silhouette lighting. A total of 259 male and 309 female subjects, who had little or no formal dance instruction was tested. The public school students were chosen from the Allegany County School District in Allegany County, Maryland, and the college students were enrolled at Frostburg State College in Frostburg, Maryland. Additionally sixty-five subjects were selected, all of whom had had a minimum of three years of dance instruction, from the University of Maryland in College Park, Maryland, to indicate preference of lighting design. The subjects were drawn from four educational levels: fifth grade, eighth grade, eleventh grade, and college juniors.

Upon the basis of the findings, a conclusion was drawn with respect to lighting design preference by the selected educational groups of male and female subjects.

Definition of Terms

For the purpose of clarification, the following definitions and/or explanations of terms were established for use in the present study:

Modern Dance: Lockhart and Pease (1973) define modern dance as "symbolic movement which has been organized, integrated and objectified for individualized expressive purpose [p. vii]."

Dance Composition: Lockhart and Pease (1973) define dance composition as "The arrangement of dance movement into meaningful whole; the process of building a composition [Ibid]."

Preference: Good (1959) defines preference as:

> A favorable evaluation of some object, course of action, method, end, or such, as compared to other possibilities that are rejected; a selection that may be intellectual or emotional in origin, that is always volitional at least at the act of choosing, and that concerns any of the value realms such as aesthetics or morals [p. 408].

Lighting Design: Lounsbury (1967) explains lighting design as the "lighting designer's layout, showing illuminated areas on the stage and mounting positions of all instruments used to light the production [p. 96]."

Area lighting: Lounsbury (1967) explains area lighting thus: "For convenience in lighting, the stage is usually considered to be divided into six or nine areas

(according to actor's right and left as he faces the audience) [p. 7]." These smaller areas are contiguous and of more or less the same size and shape. The lighting of these areas is primarily to give adequate visibility to the dancer's face. The angle of the light beam, therefore, comes from approximately forty-five degrees above eye level. Each area is illuminated by two lighting instruments, placed preferably ninety degrees apart. This system of two light sources for every area of the stage is called "cross-spotting," and helps to emphasize the three-dimensional effect of the body (Skelton 1955).

Path lighting: Skelton (1955) explains path lighting thus:

> Path lighting divides the stage into twelve basic areas, and can be used either one at a time or in combinations. They are particularly well suited for dance since they correspond more closely to frequently used movement paths than in the case of area lighting [p. 63].

Three of these light paths transverse the stage thereby creating a side-lighting effect. The lighting instruments were located in the wings of the stage (area on the side of the stage not in view of the audience), mounted on standards. The angle of the light beam came from approximately chest level, and each area or path was illuminated by two instruments placed opposite each other in corresponding wings. This lighting effect is excellent for its sculpturing or form-giving effect on the body (Skelton 1955).

Special area lighting: Lounsbury (1967) defines special area lighting effect as "a spotlight set for a specific purpose for a specific play, as distinguished from standard area spotlight [p. 139].

Particular parts of the stage can be lighted separately to give added or specific emphasis. Because the special illumination is confined to a certain area, a lens instrument is usually used to achieve the desired control. The beam of light can, if desired, be shaped to correspond with a certain outline such as a circle or a square. The instrument, usually mounted behind the teaser (border or drapery, hung downstage forming an inner frame for the stage) should have a position that directs the beam most squarely at the desired place.

Silhouette effect: Lounsbury (1967) defines silhouette as an ". . . effect achieved by the application of light on the backdrop [p. 86]." The illuminated background thereby makes any object or shape visible as a solid black form against the light surface. Both McCandless (1953) and Bentham (1957) recommend that a group of floodlights, evenly spaced, be hung in the fly space above the stage as far down-stage as possible to give a fairly direct throw at the large surface.

Delimitations of the Study

The present study was subject to the following delimitations:

1. A total of 259 male and 309 female subjects selected from the Allegany County School District, Cumberland, Maryland and from Frostburg State College, Frostburg, Maryland, and 65 subjects from the University of Maryland, College Park, Maryland.

2. A single dance composition composed in the modern dance idiom and determined suitable as a complete composition by a panel of experts on the basis of selected criteria.

3. The length of the dance composition not to exceed ninety seconds.

4. The style of the dance composition which was limited to non-literal movement.

5. The ability of the selected dancer to replicate the dance composition for each lighting design.

6. The four lighting effects selected for the dance composition: area lighting, path lighting, special area lighting, and silhouette lighting.

7. The suitability of the objective instrument used to determine the subjects' preference.

Summary

Stage lighting, as a supporting element in a dance performance, is used to permit the audience to see the movements, unify them with their environment, emphasize the dramatic value of the dance and create the desired emotional responses to the performance. The importance of the impact of lighting upon the audience is apparent, but the kind of lighting that most effectively produce such impacts are unknown.

Although audiences often are unable to verbalize their reactions to various visual stimuli they can express their preferences to them. If such preferences vary significantly between educational levels and between sexes, the lighting designer may gain insight into the designing of lighting effects for dance.

The orientation to the study, statement of the problem, definitions and/or explanations of terms, purpose of the study, and delimitations of the study were presented in Chapter I of this dissertation. The problem of the investigation was to determine if there was a difference in the preference to four lighting effects, designed for a specific dance composition, between four different educational levels, between the two sexes and between dancers

and non-dancers. Upon the basis of the findings, a conclusion was drawn with respect to the expressed preferences.

In Chapter II of this dissertation, the investigator will review related literature concerning preference for lighting effects.

CHAPTER II

REVIEW OF RELATED LITERATURE

The literature pertinent to the present study is to be found in areas concerned with audience response to various elements in the investigation. Before reporting on specific studies in the area of audience response, however, it is desirable to point out to the reader some of the specific difficulties encountered in this field of research.

Ogden (1938) points out that the theatrical producer, director, or choreographer must be primarily concerned with the general effects created on a stage. Theatre is created for an audience rather than an individual observer, and the choreographer must therefore concentrate on the overall effect he is creating on that audience rather than the effect on some isolated subject. Yet, in an attempt to identify a problem and limit the scope of a study, the investigator must concentrate on separate elements of theatrical production. The fact that theatre is consciously trying to create a specific mood, feeling, or attitude is therefore of considerable help to the experimenter seeking areas of possible measurement.

One reason for the lack of scientific work in aesthetics is that the experts often appear to be unwilling to

submit their ideas to rigorous investigation. Bird (1932) states that

> . . . in all but its simpler and cruder forms the aesthetic experience is confined to a small number of people, and these people have a strong sentimental dislike of introducing what they call the cold light of scientific investigation into the region of fine feeling. (It is pleasant to have an accomplishment that is restricted to only a few of the elect). Scientific investigation might very conceivably upset this superiority, and this would be an excellent reason for the aesthete's dislike for science [p. 24].

Another reason, probably the most important one, lies in the difficulty of experimentation in a field where introspection must be used to a considerable degree. Some progress has been made in this field, however, with the expansion of statistical methods (Bird 1932). Munro (1928) notes that we must work with what is presently available in the research of the arts. He states:

> Another implication of an experimental attitude in aesthetics will be a willingness to make the best of the materials at hand, as to both data and hypotheses. Too rigorous an insistence on reliability and objectivity of data, too impatient a zeal for universally valid generalizations, may be an obstacle in a field where these cannot be attained at once if ever [pp. 16-17].

Munro (1928) also points out that the measure of a science does not lie in the number of machines and gauges, but in the basic way of thinking. This thinking must remain flexible and adaptable to the problems that arise and that are peculiar to the investigation at hand.

Many aestheticians have refrained from experimental investigation because they consider the likelihood of arriving at any definite conclusions to be small. This is particularly true in theatre where the investigator must deal with color and form, as in painting; and with rhythm, melody, and harmony as in music. He must also simultaneously incorporate intellectual thought and the spoken word (Huntley 1956). The dancer, additionally, must be able to manipulate his body to make it a suitable instrument for expressing and clarifying the choreographer's intent.

> There is a general fault in the application of the conventional scientific methods to the field of aesthetics in that it is unable to measure the individual beyond the level of "warmth" or some such feeling, that can be experienced with any person with sense organs [Huntley, 1956, p. 22].

New methods and tools of research are emerging. Some of these are the "semantic differential" method developed by Osgood, the "forced choice" method, and the Meier Audience Response Recorder. What is needed is a method of measuring the subjective feelings of the observer at the moment he is experiencing the art object, without at the same time destroying the normal attitude of contemplation. It is commonly thought that little of value to the aesthetician can be learned from observing facial expressions, taking the pulse, or measuring the blood pressure. To ask some members of the theatre audience to express their preference by pressing

buttons on the arm of their seats, as is done in the Meier Audience Response Recorder appears to eliminate those very conditions under which they would normally view a performance (Huntley 1956).

A popular area for research in aesthetics appears to be the field of color. This may be because color can be controlled more easily than many other variables, which makes it desirable for experimentation. Today, music is controllable in many similar ways, yet research in this field has largely been directed toward the construction of tests that purport to determine mental ability. According to Arnheim (1965) the principal reason for this type of study is that manufacturers wish to increase their sales.

Whatever direction research will take, and whether it could foster a new approach to research in aesthetics is unknown. Experimental research in this field needs to strive toward methods of investigation that will examine the problems set forth in relation to the complete art object. The integration of the data gathered into a useable state that has meaning to the world of art remains one of the basic problems (Munro 1956).

The potential value of studies in audience response to dance lies not only in the gathering of the data, but equally in laying the groundwork for research in the field of dance production techniques that might lead to further

efforts in understanding the complete interaction of dance presentations. To combine all the unifying factors into one consolidated aesthetic theory of dance is a project best left to the future, but as a good foundation for such a venture it may be possible to learn certain things regarding some of the elements that go into a dance production and how they affect audiences.

Unpublished Material

A survey disclosed that no research had been completed that is identical to the present study. The following summaries are illustrative of completed studies that are related to the present one.

Huntley (1956) conducted an experiment in which the emotional reactions of a theatre audience to colored lights were investigated. It was hoped that the increased knowledge of color psychology would aid the theatre lighting designer in problems of his particular concern.

Fifty-nine subjects were asked to indicate their reactions to colors. In a first experiment, three colors, and in a second experiment, seven colors, were projected against a light gray screen standing on the stage of a small theatre. The Semantic Differential testing technique of Osgood was applied to the subjects who were to indicate their reactions to the colors in terms of sets of polar opposite

words. The results were treated statistically and it was found that there are certain sets of words that seem to have more meaning than others when used to describe colors. Among the most satisfactory pairs of words were "hot" and "cold" and "heavy" and "light." The hue "the attribute of a color which determines its name in everyday speech" (Kornerup & Wanscher, 1969, p. 9) seemed to be the determining factor in emotional reaction to color, except to the word pair "heavy" and "light," where saturation "the degree of departure of a given hue from a neutral gray of the same value" (Munsell, 1969, p. 1) appeared to have been a more important consideration. Words such as "pleasant" and "unpleasant" seemed to have little meaning for color description. The Semantic Differential technique was found to be satisfactory for use in research in the field of theatre aesthetics. The technique, however, uses words at polar extremes that are non-preferential.

Thayer (1960) attempted to determine the influence of conventional film lighting on audience response. The premise was that certain lighting techniques have been used so frequently and accepted so uncritically that they have become established as conventions of dramatic lighting.

Three dramatic scenes were filmed so that for each scene there were versions in which the lighting was in accord

with conventions, contrary to conventions, and shadowless or flat. All other variables of staging, acting, and directing were controlled as closely as possible. The films were viewed by 297 subjects divided into nine equal groups. Each group saw a single film only once and their attitudes were quantified by the use of bipolar adjective scales which seem comparable to the Semantic Differential technique. The data were treated by the Analysis of Variance and yielded the following findings: Films that were lighted following conventional techniques were rated as technically superior to productions where conventions were violated. The same films were not rated more believable than productions where the lighting conventions were violated or the lighting flat. Lighting does not seem to be a determinant of mood, and the attitudes of the audience toward characters are probably not affected by lighting.

Goltry (1969) completed a study in which he attempted to assess the theory of dominance of characters by their placement on stage, and the effect of increased light intensity on the placement of a subordinate character. Information was also sought concerning tension felt by the subjects while making dominance ratings of characters lighted against expectations.

Sixty subjects were arranged randomly into ten groups. The control group viewed seven two-character configurations

under equal lighting conditions. Subsequent groups viewed the same configurations under lighting conditions that increased light intensity on the subordinate character with one standard light-board increment per group. Subjects were asked which character they felt should have said the line they heard from off-stage. The Two-Way Analysis of Variance was used for the choices of who spoke the line, the dominance rating, and the felt tension ratings. Differences of statistical significance were found in all three tests among the treatment groups. Increase in light intensity tended to augment the dominance of the subordinate character by placement in all but one configuration. A light intensity increase of one standard lightboard increment caused more felt tension in the audience than did larger increases or equal light intensity on both characters.

Attempts to determine color preferences in the theatre with the use of projected light were done by Kuney (1940) who attempted to determine if some colors were preferred over others for background lighting in scenes of plays. The scenes chosen for this experiment had little meaning in terms of tragedy or comedy and were, therefore, poorly suited for the purpose, which was to determine color preference and the dramatic meaning of the scene. Kuney (1940) also failed to establish the initial color preferences of the subjects so it was impossible to determine if their preferences had undergone

a change when the colors were seen in conjunction with a scene. His results were, therefore, inconclusive.

A similar experiment was conducted by Pierce (1942) in an attempt to determine the preferences for red and blue light on the faces of actors in certain scenes. Serious, comical, and farcical scenes were used and several groups of subjects were asked to state their preferences with the order of presentation being changed for each group. Pierce found that there was a slight blue preference for the serious scenes with red preference for comic scenes and increased red preference for the farcical scenes. This conclusion reinforces the generalization, common in the theatre, regarding the desirability for warm colors for comedy and cool colors for tragedy.

Matson (1953) attempted to determine the effect of years of formal education in audience response to simple and complex dramatic material. Four age levels, eleven to twelve years, thirteen to fourteen years, fifteen to sixteen years, and sixteen years and older, representing 232 subjects were chosen for this study. They were subjected to dramatic material classified into six categories, three illustrating the simple, and three illustrating the complex, concepts of ideational content. The Meier Audience Response Recorder was used to obtain data, which were analyzed by means of a numerical value scale. Descriptive statistical methods were

used in the analyses of the data. Matson found that as the years of formal education increased the interest changed significantly from the simple to the complex.

Witt (1964) and Wulftange (1962) completed independent studies pertaining to audience response to various aspects of drama as perceived through different media. The presentations varied from face-to-face, television, audio-tape, Readers Theatre, to silent reading methods of rendition. It was found that the methods of presentation have different values in terms of evaluation, understanding, and use of the dramatic material presented to the subjects.

Published Material

Walton and Morrison (1931) completed a study in which they attempted to determine preference of colored lights, both singly and in combinations, among male and female university students, and to learn what factors were responsible for the selections. Data were obtained by the Method of Paired Comparisons from about 340 students.

The subjects' preference were found to be the color blue, followed by green, red, amber, and uncolored. Saturated colors were preferred to mixtures. The order of preference differed somewhat between sexes, and the male subjects were more consistent than the female subjects. According to the authors, analysis of the reasons for color preferences

indicated that among many factors, social conditioning was significant.

Work has also been done to test the apparent heaviness of colors. Bullough (1906-08) used various color combinations within bisected geometrical figures with the intent to determine the weight of colors rather than only the most pleasing proportions. Bullough defined "weight of colors" as increasing with their saturation. He found that the darker colors appeared heavier than the light ones and they were generally preferred at the bottom of a bisected triangle, without regard to proportional bisection of the figure. Michaels (1924) conducted a study of the change in color preference with increasing age and found that although such a change does exist the results did not point consistently in any one direction.

Several studies have been conducted, using both children and adult subjects, to determine color preference in surface colors (Garth 1924) (Miziguchi & Saoki 1926) (Valentine 1913) (Winch 1909-10). The method most commonly employed has been to allow the subjects to arrange color disks in order of preference. The first three preferences, in all instances, were found to be blue, green, and red, followed by a second group of violet, orange, yellow, and white. Some variations have been found in preferences among the colors listed in the latter group of colors. Increase in age and

education showed an increase in preference for blue, with a drop in the preference of other colors.

Summary

The present review of literature included a discussion of some of the specific difficulties encountered in conducting research in the area of audience response. This was followed by a brief review of research studies, primarily in the areas of audience response to light and color. There are few studies dealing directly with research on stage lighting, and they have little applicability to dance.

Chapter III contains a description of the procedures used in the development of the study.

CHAPTER III

PROCEDURES OF THE STUDY

This research evaluated audience preferences among various lighting designs as supporting elements in dance performance. The investigator attempted to determine if there were differences in the preferences by age and sex with respect to four generalized lighting effects that are commonly used for dance productions. The subjects were asked, additionally, to indicate why they made their particular choice. An 8 mm movie film was viewed by 633 subjects from the Allegany County School District, Frostburg State College, and the University of Maryland during the fall semester of the academic year of 1973-1974. In this chapter the procedures followed in the development of the study are described under the following headings: (1) Preliminary Procedures; (2) Choreographing the Dance; (3) Selecting the Lighting Designs; (4) Hanging and Focusing the Lights; (5) Filming and Editing the Dance Composition; (6) Selecting the Panels of Experts; (7) Selecting the Subjects; (8) Administering of the Pilot Studies; (9) Selecting the Statistical Treatments; (10) Overcoming the Order Effect; (11) Collecting Data; (12) Statistical Treatment; and (13) Preparing the Final Written

Report. The chapter concludes with a brief summary of its contents.

Preliminary Procedures

Prior to the actual collection of data, a number of preliminary procedures were executed. The investigator surveyed, studied, and assimilated information pertinent to the study from available documentary and human sources of data. The selection of the variables for the study, type of stage lighting effects and subject groups, were discussed with Mr. Paul Hutchins in the department of Speech and Theatre at the Texas Woman's University and Dr. Joel Rosentsweig, Director of the Dissertation Committee, in the College of Health, Physical Education and Recreation at the Texas Woman's University.

As a result of the review of literature it was determined that no completed study duplicated the specific design of the present investigation. The investigator developed and presented her tentative outline for research during a graduate seminar of the College of Health, Physical Education, and Recreation at the Texas Woman's University, in Denton, Texas on November 15, 1973. The outline was revised in accordance with the suggestions offered by the members of the Dissertation Committee and filed as a Prospectus of the approved study in the Office of the Dean of Graduate Studies.

Choreographing the Dance

The dance sequence utilized in this study was choreographed in conjunction with Mrs. Rosann McLaughlin Cox, who was conducting a parallel investigation at the Texas Woman's University. In Mrs. Cox's study four different kinds of musical accompaniment serve in the same capacity as test variables instead of the lighting designs in the present investigation.

The dance composition was choreographed in the modern dance idiom. The style chosen for the dance was limited to non-literal movement. It was considered that only non-thematic dance, dance that was just an exposition of movement, would suffice. It was believed that the alternative dance styles could more easily render one lighting design more appropriate than the others. The elements of dance composition followed in the choreography are those established by Horst and Russell (1963). These are: space design, rhythm, and texture.

The choreographers took particular care to design the movement patterns so that they would lend themselves to all of the chosen lighting designs. Ninety seconds was considered to be a suitable length for the composition. This duration was believed to give the viewers sufficient time to form an opinion about the lighting designs without becoming

too repetitious. The combined viewing time of the entire film was approximately seven minutes, including instructions, titles, and the dance shown four times, each time with a different stage lighting effect.

Selecting the Lighting Designs

Motion picture lighting, while offering many possibilities for lighting design not available to the stage lighting designer, is also restricted by technical requirements. Such restrictions include the number and power of the light sources, a more precise focusing of the lights and specific requisites of the film. Nevertheless, film lighting is concerned with the same basic functions of light that are considered to be important on stage. A certain light intensity, depending on lens and film speed, is required before images can be recorded on the film with clarity and without introducing excessive grain. By reducing or eliminating the light in certain areas, a person or object in the picture may be rendered partially or wholly invisible or conversely more compelling when entering an illuminated area (Thayer 1960).

The audience of a motion picture is dependent upon the lens of the camera for clues to three dimensional effects. The images as they are projected on a flat screen depend entirely upon one single "eye," the lens, to show relation-

ships of highlights and shadows. Motion picture lighting is therefore designed to reinforce the depth cues in the projected image (Thayer 1960).

The minimal requirement of any lighting design is to provide sufficient visibility to allow the audience to see comfortably and clearly. In addition the dancer must have plasticity or a three-dimensional quality. This quality is achieved essentially by specific illumination: separation of the dancer from his background, the use of back lighting, and by contrast and variety in the application of highlights, shade, and shadows (Selden & Sellman,1959, pp. 220-23).

The four lighting designs chosen were area lighting, path lighting, special area lighting,and silhouette lighting. All of the requirements of stage lighting listed above except three dimensionality could be fulfilled in the chosen designs. Area lighting is traditionally used to provide good visibility and three dimensionality was achieved by separating the dancer from the background by applying considerably less light on the backdrop. Path lighting, represented by side lighting, supplies a good level of visibility and the three dimensionality is particularly apparent by highlighting the dancer from the sides thereby creating a shadow effect almost opposite to the area lighting effect. The special area lighting and silhouette lighting were chosen particularly for their dramatic qualities. Special area lighting is three

dimensional and provides a high level of variety in the creation of highlights and shadows. The silhouette effect, although it creates a two dimensional image, was chosen for its form revealing quality.

These lighting designs were chosen because they were considered to be sufficiently different to be easily discernable and thereby facilitate the choice by the audience. The designs are also commonly used for stage productions, thereby increasing the breadth of their applicability. Each lighting design is simple and could therefore be used in medium sized or small theatres that are reasonably well equipped, such as may be found on most high school and college campuses.

Hanging and Focusing the Lights

One restriction imposed upon the lighting designer of motion pictures as opposed to stage productions is the size of the performing area. In order for the dancer to be fully visible and present a large enough image upon the viewing screen, the performing area has to be reduced considerably from the average stage.

The performing area used for filming the dance was a square ten feet by ten feet and the lights were therefore mounted on light standards instead of regular electric battens

for all but the silhouette effect, which utilized one electric batten and two light standards.

Approximately 9500 watts were used for each lighting design, divided among sixteen to twenty lighting instruments. No color medium was used for any of the lighting effects, but in order to eliminate hot spots a fine mesh metal screen was inserted in front of some of the larger instruments.

For the area lighting effect the performing area was divided into six smaller areas. The instruments were mounted on the crossbar of four light standards, ten to twelve feet off the floor, as illustrated in figure 1, page 33. The light standards were placed so that the angle of the lightbeams came as closely as possible from a forty-five degree angle above the eye-level of the dancer. Each area was illuminated by two instruments placed approximately ninety degrees apart. An attempt was made not to allow the light beams to overlap. The instruments were connected to two Aerial Davis dimmer boards with the dimmer reading at maximum intensity.

The path lighting effect used was a combination of the paths that transverse the stage thereby creating a side-lighting effect. The lighting instruments were located on both sides of the performing area, three standards on each side as illustrated in figure 2, page 34. The instruments were mounted on the uprights of the standards at about two and one-half, four and one-half, and six feet above the floor.

Backdrop

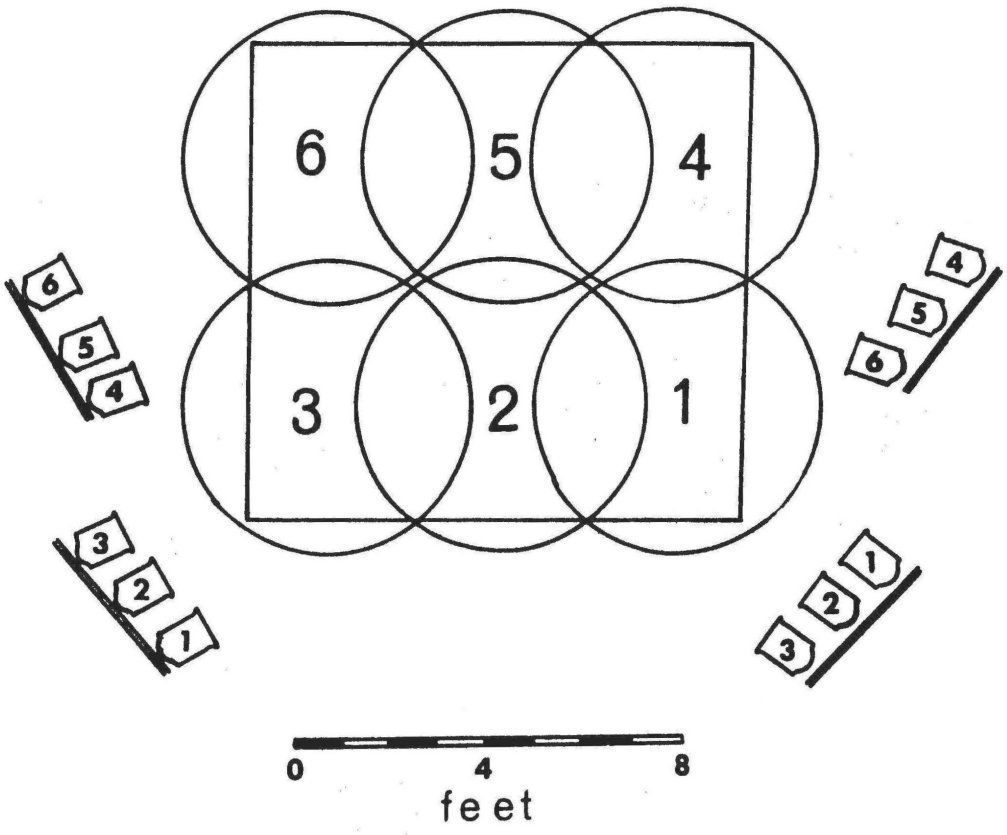
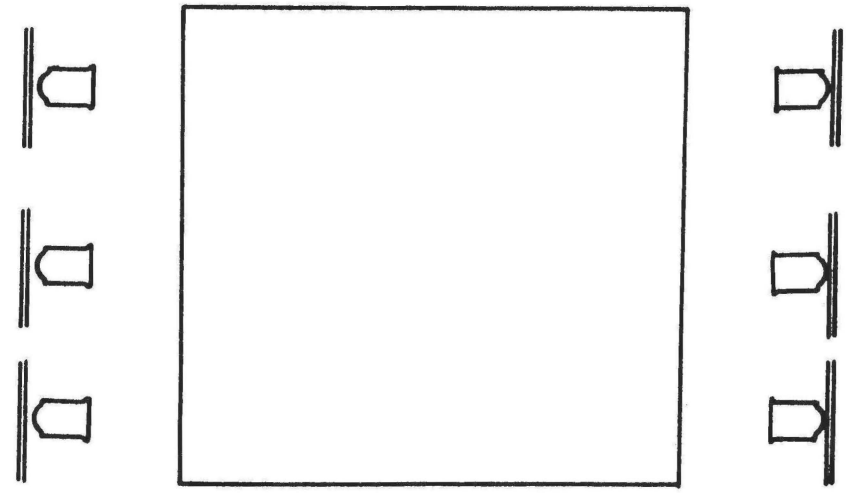
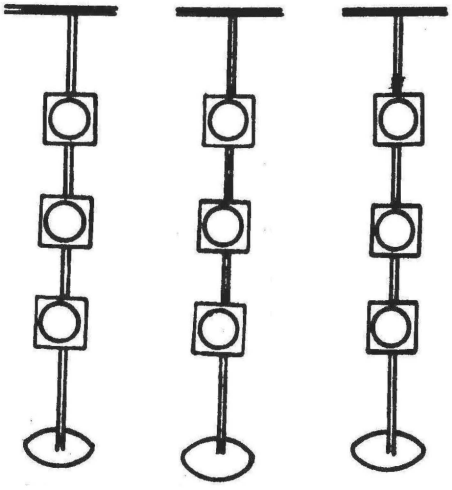


FIGURE 1
AREA LIGHTING
(plan view)

Backdrop



(plan view)



(elevation)

FIGURE 2
SIDE LIGHTING

They were focused horizontally across the performing area. The instruments were connected to two Aerial Davis dimmer boards with a dimmer reading at maximum intensity.

The special area lighting effect was designed so that the dancer would move in and out of the highlighted areas. They were placed in areas where they would give emphasis to those movements that were choreographically most important. The placement of the highlighted areas is illustrated in figure 3, page 36. Area one was illuminated by two instruments, one mounted almost immediately above the special area and one diagonally downstage left, forty-five degrees above the dancer's face. The light beams were square forming a square design on the floor. Area two was lighted so that the light beams came from one direction only, on a diagonal line from downstage right. The instruments were mounted close to forty-five degrees above the dancer's face. Area three was illuminated by two lighting instruments utilizing the same kind of mounting as for the area lighting effect. For area four three lighting instruments were placed in the wings, center right. The instruments were mounted approximately four, eight, and twelve feet off the floor on the upright of a light standard and focused diagonally downward to cover the dancer on all three levels utilized in the movement sequence performed in that particular area. The instruments were connected to two Aerial Davis dimmer boards with the dimmer

Backdrop

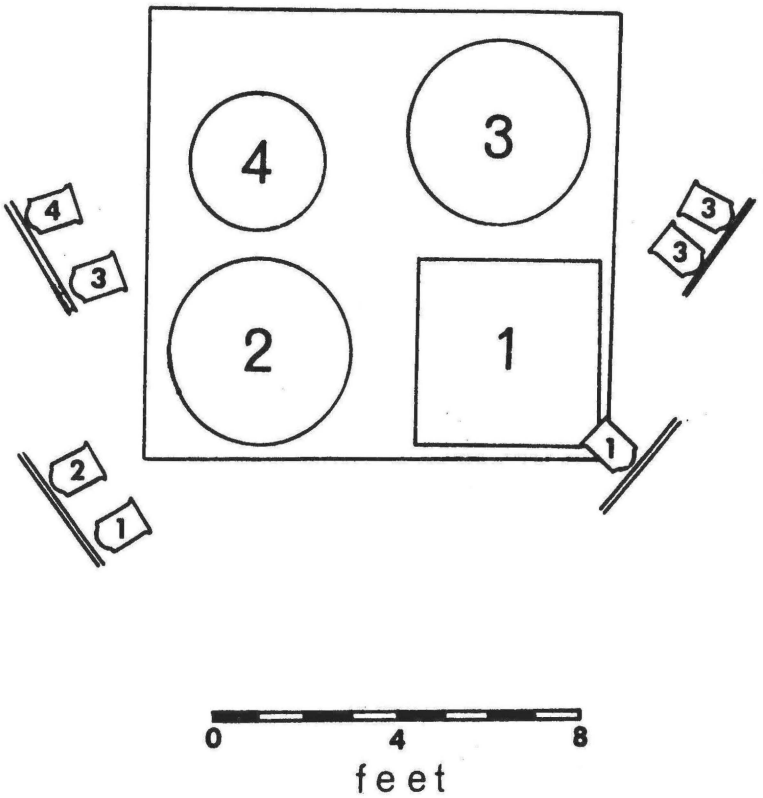


FIGURE 3

SPECIAL AREA LIGHTING
(plan view)

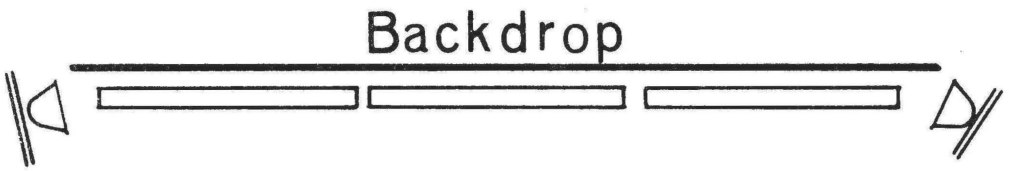
reading at maximum intensity. Figure 3 shows the placement of the instruments.

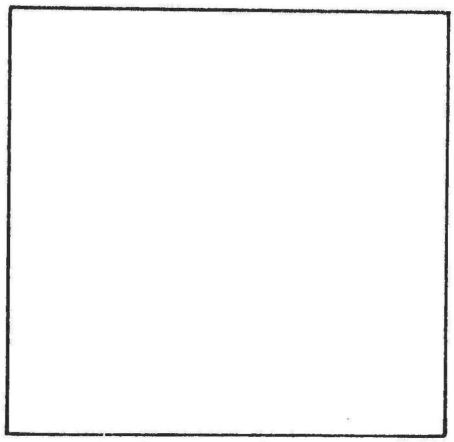
The silhouette effect was achieved by the application of light to the backdrop. Three borderlight sections (with twelve individual reflectors) were mounted in the fly space above the stage as far down-stage as possible to give a direct throw of light primarily on the upper half of the backdrop. Additionally three floodlights were mounted up-stage right and left respectively. These instruments were mounted on lighting standards, one, three, and five feet above the floor and focused to illuminate the lower half of the backdrop. All these instruments were connected to a Ward Leonard resistance dimmer board with a dimmer reading at maximum intensity. Figure 4, page 38, shows the placement of the instruments.

Filming and Editing the Lighting Designs

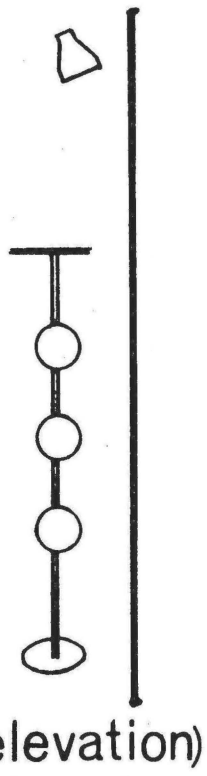
The filming was done on the stage in Compton Theatre at Frostburg State College by Dr. Glen K. Merrill. Only a relatively small portion of the stage was used, a ten foot by ten foot square, the upstage edge of the square approximately ten feet from the backdrop, easily permitting the backdrop to be lighted or darkened as the design dictated.

The camera used was a Kodak XL-55 movie camera with a maximum aperture of f 1.1. All filming was done at a normal speed of 18 frames per second. The camera had automatic aperture control that could not be overridden.





(plan view)



(elevation)

FIGURE 4
SILHOUETTE LIGHTING

A second, optically superior camera with manual aperture control was available, an Argus Showmaster 822T. However, its maximum aperture is f 1.9. The combination of available illumination and film speed was inadequate to give proper exposure at an aperture as small as f 1.9. For some designs, especially area lighting, a smaller aperture (one-half stop) would have been desirable to compensate for the averaging effect of the Kodak instrument's light meter. Nevertheless, it was not possible to do this with the Argus because of an insufficient amount of light or with the Kodak because of its construction. A paradox was created in which the dancer was slightly over-illuminated, but insufficient light was available to correct the situation.

The Kodak XL-55 has a zoom (variable focal length) lens. It is not possible to determine the exact focal length used for filming the lighting designs although it was essentially constant. This constancy was assured by positioning the camera, on a tripod, at an identical location relative to the ten foot by ten foot square in which the dance was performed (minimum camera-subject distance was 33.5 feet). Two reference marks on the floor of the stage were used to adjust the variable focal length to produce the same (moderately wide) lens setting with each use.

Some early filming was done employing Ektachrome 160 film (ASA 160) because it was felt that the fast film would be

necessary to produce adequate exposure on stage. The grain produced by the Ektachrome was unacceptable. By drastically reducing the performing area and massing the lighting instruments it was possible, however, to use slower film. The less grainy Kodachrome II (ASA 25) that was used for the final filming also permitted the grain that was present to be obscured by a highly contrasting background.

A Weston V light meter was used to ascertain that essentially uniform light was available in those areas that had to be uniformly illuminated. The nature of the Kodak camera prohibited any direct application of the light meter readings thus obtained for aperture settings; the readings were simply used to assure uniform illumination. Illuminated areas averaged seven point five on the Weston light meter.

Another device used to predetermine quality of the illumination was a Polaroid Land Camera 450. The Polaroid film is substantially more sensitive to changes in illumination than is the human eye and permitted several photographs to preview the quality and constancy of light prior to the performance and filming of the dance and lighting designs.

The filming of a lighting design was done as soon as the instruments were mounted, focused, and the light quality had been checked. The time involved in preparing the performing area, set up the camera equipment, and for the dancer to prepare herself and the actual filming took approximately

four to five hours. Therefore it became necessary to do the filming on four separate days. After the filming of each lighting design the dancer was asked to assume a stationary position in the performing area where she was filmed for approximately ten seconds. This piece of film was used as a review of all the lighting designs at the end of the viewing of the test film.

The film titles utilized were placed on a deep blue felt background, using die-cut lettering to form the sentences. Each title was filmed by the Kodak XL-55 camera placed about five feet from the prearranged title.

The film was sent to a commercial laboratory for processing. After the film had been edited it was reviewed and approved by the dissertation committee. Thereafter the film was copied to obtain four copies in addition to the original film. These copies were in turn edited in a predetermined order to include the titles with instructions for the test subjects, the dance with the four lighting designs, each one appropriately numbered, and the ten second review of each lighting design, numbered and organized in the same order as the actual film.

Selecting the Panels of Experts

Two panels were selected to judge the suitability of the dance composition and the lighting designs used in this

study. A person so selected was chosen on the basis of experience and expertise in the fields of dance and stage lighting.

The persons selected to judge the suitability of the dance composition were: Dr. Gloria A. Bonali, State University College, New Paltz, New York; Dr. Faith Clark, Western Illinois University, Macomb, Illinois; and Dr. T. Ray Faulkner, Eastern Michigan University, Ypsilanti, Michigan.

The persons selected to judge the suitability of the lighting designs were: Dr. Ned A. Bowman, University of Pittsburgh, Pittsburgh, Pennsylvania; Dr. David R. Press, Frostburg State College, Frostburg, Maryland; and Dr. Joel E. Rubin, Vice President, Kliegl Brothers Universal Electric Stage Lighting Company Incorporated, Long Island City, New York. A copy of the evaluations appear in the Appendix.

Selecting the Subjects

The subjects selected for this study were chosen to represent four different educational levels and both sexes in as equal a representation as circumstances permitted. The chosen educational levels were: upper elementary school, junior high school, senior high school, and college students. The size of each sample group was to be a minimum of 100 subjects per category of subjects, divided approximately equally between each sex. The four educational levels chosen were

represented by the following grades: (1) fifth grade, (2) eighth grade, (3) eleventh grade and (4) college juniors. Additionally, a group of sixty-five subjects was selected on the basis of educational level and experience in dance. Each subject in this group had to be a college student with a minimum of three years of dance training.

The fifth, eighth, and eleventh grade students were selected from the Allegany County School District, Maryland. The college students were selected from among the junior students at Frostburg State College, Frostburg, Maryland. The group of dancers were all students enrolled in dance courses at the University of Maryland, College Park, Maryland. A description of the present investigation was submitted to the Allegany County Board of Education asking permission to utilize the students in the Allegany County School District as test subjects. A copy of this proposal is included in the Appendix. Permission was granted by the assistant school superintendent, Mr. Theodore P. Foote, who also selected schools with students that best represented the children in Allegany County, Maryland.

Permission to test junior students at Frostburg State College was obtained from the Dean of the College, Dr. Kenneth Jablon, through a personal interview. The same method was used to obtain permission from Mr. Mark Ryder, Chairman,

Department of Dance at the University of Maryland to test the students enrolled in dance courses at that University.

Administering the Pilot Study

Prior to beginning the principal testing a pilot study was conducted. In this pilot study not only was the test instrument validated as a vehicle for measuring audience response to the four light designs, but also from it was obtained a listing of reasons that prompted the subjects to select the designs they did. This initial questionnaire was empirically constructed.

The subjects used in the pilot study totaled 151, none of whom were used in the main study: twenty-three sixth graders, nine male and fourteen female, from Pullen Elementary School; fifteen ninth graders, eight male and seven female, and sixty-five twelfth graders, thirty-four male and thirty-one female, from Beall High School; and forty-eight college students, twenty-seven male and twenty-one female of all rank classifications from Frostburg State College. All institutions are situated in Frostburg, Maryland. After viewing the film and indicating their preference of lighting design, the subjects were asked to write their reason or reasons for selecting that particular design. On the basis of the 166 responses thus obtained the reasons were grouped into twenty-three categories. After further study of these categories by

the dissertation committee chairman, Dr. Joel Rosentswieg and the investigator, the categories were condensed to six. These six reasons were chosen because they were the most frequently stated ones and most of the others differed only slightly from those selected. The six reasons for selecting a particular lighting design were then added to the test instrument. Additionally, if none of the reasons listed on the test instrument coincided with the subject's reason for selecting a design, he was given the option of stating his reason in a space provided and indicating a seventh category "other." To overcome the order effect in the choice of reasons they were listed in six alternate sequences on the test ballots. Thus not fewer than twenty-four different ballots were employed. Four color-coded ballots corresponded to the four different sequences in which the lighting designs were presented. Each of these sets of similarly colored sheets actually contained six differently printed ballots, each one corresponding to one of the randomized sequences of reasons. Within each stack of a single colored ballot the six sequences were interwoven so that a similar number of subjects would receive each sequence of reasons. A listing of the selected reasons can be found on a sample of the test instrument in the Appendix.

The second subsidiary study was done to establish the reliability of the test instrument. The test-retest method

was used with a ten-day interval between the original test, and the retest for all groups involved. The subjects used in the second study formed a part of the test group in the main study. These consisted of twenty-five fifth graders, eleven male and fourteen female; twenty-eight eighth graders, thirteen male and sixteen female; thirty-one eleventh graders, thirteen male and eighteen female; and twenty-four college juniors, five male and nineteen female. The results from the two tests were computed using the crossbreaks technique which yielded a reliability coefficient of .824. (Kerlinger 1964).

Selecting the Statistical Treatment

The Chi-square test was selected as the best method of treating the data. The decision to use Chi-square was based upon the need to analyze nominal frequency data. Roscoe (1969) stated that

> Chi-square tests of independence are extremely useful statistical procedures for determining if nominal (or higher level) measures are related. If one of the variables is group membership and the other a criterion of some sort, the test may be used to determine whether two or more populations are distributed in the same fashion with respect to the criterion [p. 196].

Therefore, the Chi-square test enabled the investigator to determine the relationships between sex, educational and preference of lighting designs as completely as possible.

Roscoe (1969) mentioned some distinguishing characteristics of the Chi-square test:

1. The data may be recorded on nominal or higher order scales.

2. The Chi-square tests are used to test the significance of multiple discrete variables.

3. Fixed sample size is not a precondition to the test [pp. 196-203].

Chi-square tests are considered among the most valuable of the nonparametric procedures available to the behavioral scientist. It was believed that the Chi-square test would provide the greatest understanding of audience preference of stage lighting effects for the dance composition.

Overcoming the Order Effect

In order to insure that the sequence in which the four lighting designs were presented to the test subjects did not influence their preference, care was taken to present the four designs in a differing random order to the test subjects. The number of possible sequences for four designs is twenty-four. These twenty-four sequences were listed and each assigned a serial number from one through twenty-four. A computer program that generates random numbers was employed and it selected serial numbers (in random order) twenty-three, twenty, seventeen and ten. These correspond to four-three-one two; four-one-two-three; three-four-one-two; and two-three-one-four respectively. Numbers had previously been assigned

to the lighting designs as follows: one = area lighting, two = side lighting, three = special area lighting, and four = silhouette lighting. A copy of the computer program and a list of the twenty-four sequences are shown in the Appendix. All educational groups were divided into four approximately equal subgroups. Each of the four subgroups viewed a different film sequence during the final testing.

Collecting the Data

The data for the present study were collected through the administration of a questionnaire after showing the four lighting designs for the same dance composition. The test administrator supervised all the tests given to the fifth, eighth, and eleventh graders. Additionally, he tested all but five of the groups of college students used as test subjects. These five tests were administered by the investigator to facilitate the showing of the film simultaneously at two locations.

The testing schedule was established according to the following criteria: (1) available testing time for the test administrator and the investigator; (2) availability of subjects at a given time; (3) number of subjects available in each educational institution; (4) length of time to administer the test; and (5) travel and organizational time between test sites. By arrangement with the Allegany County Board of

Education the test schedule for each public school was arranged with the principal of the individual school. Each public school was scheduled for one day of testing plus retesting of one subgroup ten days later. To establish the testing schedule for Frostburg State College the investigator contacted the chairmen of nine departments. After consulting the class lists, one or two classes containing primarily junior students were chosen. The instructors were contacted and permission to administer the test in their classes was obtained. The reason for testing students in nine different departments was to acquire a representative cross-section of the junior students. The departments represented were the departments of Biology, Fine Arts, Geography, Health and Physical Education, Modern Foreign Languages, Music, Psychology, Sociology, and Speech and Theatre. The testing at Frostburg State College was done within one week. In addition to a representative cross-section of college students (exemplified by members of the junior class at Frostburg State College), a special group of college age subjects was tested at the University of Maryland in a single day. The criterion for the selection of this group was that the participating subjects each had a minimum of three years of dance instruction. Testing areas included a theatre, an auditorium, classrooms, and a dance studio. The testing areas may be

considered to have been free from distractions and could be adequately darkened.

On each day of testing in the public schools the test administrator introduced himself to the principal. The principal usually directed the test administrator to the room selected for the test to be given. Individual class instructors were normally met at the place where their classes were to be tested. The instructor either brought the students to the testing area or allowed the test administrator to test the students in their classroom. Each group of subjects was divided into a minimum of four subgroups that were tested separately in order to expose each group of subjects to all four films showing the different combinations of the four lighting designs. At the end of the testing a time and date was set with one of the instructors for the retesting of one of the subgroups. On the college level the test administrator arrived before each class had begun, prepared the classroom for testing and administered the test during the first part of the class period. The entire administration of the test took approximately fifteen minutes. After the subjects were seated, the ballots were distributed. The administrator explained the purpose of the study, described the procedures, showed the film, and asked the subjects to mark their ballots. After the ballots were marked and collected the subjects returned to their regular school schedule.

At the completion of the testing, the test administrator returned to the main office to thank the principal and to inform him when additional testing would take place or that the testing had been completed. After all of the data were collected, letters of appreciation were sent to the Allegany County Board of Education, the individual school principals, the Dean of the College at Frostburg State College, and the chairman of the Department of Dance at the University of Maryland.

Statistical Treatment

The raw data for the present study were tabulated and categorized by preference according to sex, educational level and dance experience. These data were first tested simultaneously as a single Global Chi-Square matrix. The Global Chi-Square in this instance was three-dimensional with the parameter dimensions being educational level, sex, and light design selection. The organization of combinations of variables to be treated statistically as two-dimensional matrices was (1) between sexes within each educational level; (2) between educational levels within each sex; (3) between educational levels with sexes combined; (4) between sexes with educational levels combined; (5) between individual educational levels; (6) dancers <u>versus</u> non-dancers with both sexes combined within each educational level; (7) dancers <u>versus</u> non-dancers with both sexes and educational levels

combined. All tests involving the dancers were done with the sexes combined because of the unavailability of male dancers.

The computer program used for the two-dimensional statistical analyses was a Chi-Square test of independence. The data were organized according to the variables to be tested and encoded in the proper format for the computer program. The data cards were key punched from the code sheets and the tests were run consecutively as a single batch by the computer (Univac 1100 series) at Towson State College in Baltimore, Maryland. The two-dimensional Chi-Square contingency table program used for subsequent tests was written by Ted H. Heithecker, of the University of Texas at Arlington, Texas. It was modified to be compatible with the hardware in Towson and executed both by remote job entry and on site batch processing. Because of the difficulty in dealing with three-dimensional matrices, the Global Chi-Square test was calculated by a combination of two simple computer programs (BASIC, demand mode). From the Chi-Square tests it was concluded which test groups differed statistically from others and whether or not some of these differences were greater if related to sex, educational level or dance experience.

The reasons selected by the subjects for choosing particular designs were tabulated by preference for each group based upon sex, educational level, and dance experience. The data were tabulated to illustrate the distribution in the

selection of particular reasons coinciding with different lighting designs. Selections between the four lighting designs were discrete and objective, permitting more rigorous statistical testing, whereas the reasons listed were subjective and overlapping. The reasons tend to integrate, they are literal; and commonly, the same word connotes different things to different subjects. Based upon these qualifications, higher level statistics were not believed to be justified by these data.

Preparing the Final Written Report

The preparation of the final written report of the study entailed the writing of each chapter in accordance with the tentative outline, submitting it to the members of the dissertation committee for suggestions and/or corrections, and revising each chapter in keeping with the expressed wishes of the committee members. A summary of the research was prepared, and a bibliography was compiled.

Summary

This chapter included a description of: (1) Preliminary Procedures; (2) Choreographing the Dance; (3) Selecting Lighting Designs; (4) Mounting and Focusing the Lights; (5) Filming and Editing the Dance Composition; (6) Selecting the Panels of Judges; (7) Selecting the Subjects; (8) Administering of Pilot Studies; (9) Selecting the

Statistical Treatment; (10) Overcoming the Order Effect; (11) Collection of Data; (12) Statistical Treatment; and (13) Preparing the Final Written Report.

Preliminary procedures consisted of: (1) surveying, studying, and assimilating information pertinent to the study from available documentary and human sources of data; (2) selection of the variables for the study; (3) preparing a tentative outline of the study for presentation in a Graduate Seminar held in the College of Health, Physical Education and Recreation; (4) revising the tentative outline in accordance with suggestions made during the Graduate Seminar; and (5) filing the tentative outline in the form of a Prospectus in the Office of the Dean of Graduate Studies at the Texas Woman's University.

The dance composition was choreographed in the modern dance idiom. The composition was non-thematic, an exposition of movement only, so that no one lighting design was rendered more appropriate than the others.

The minimal requirements of the lighting designs chosen were sufficient visibility for easy viewing and filming and three-dimensionality of the dancer. The lighting designs chosen were area lighting, path lighting, special area lighting, and silhouette lighting. The performing area used for filming was a square ten feet by ten feet and the

lights were therefore mounted on standards in close proximity to the dancer. No color media were used.

The filming was done on fine-grained super 8 mm color film, at normal speed (18 frames per second), with focal length kept constant. The uniformity of the light was insured by monitoring it with a Weston V light meter and confirming effects with a Polaroid Land Camera 450. The filming was done on four separate days because of the time involved in mounting and focusing the instruments. After editing the films, including appropriate titles and instructions, the film was duplicated to obtain four copies that in turn were edited in a predetermined order.

To overcome the order effect a computer program that generates random numbers was used to select the four sequences in which the four light designs were presented. Additionally, all educational groups were divided into four subgroups and each subgroup was subjected to a different film sequence.

Two panels were selected to judge the suitability of the dance composition and the lighting designs to be used. Each person selected was chosen on the basis of academic recognition, experience, and expertise in the fields of either dance or stage lighting.

The subjects selected for this study were chosen to represent four different educational levels and both sexes in an approximately equal representation. The specific grades

utilized were fifth, eighth, eleventh, and college juniors. Additionally a group of sixty-five college subjects was selected on the basis of experience in dance.

Prior to the main testing a pilot study was conducted to obtain alternatives to be used with the test instrument to determine the subjects' reasons for preferring a particular lighting design. From the responses obtained, categories were combined or eliminated until reduced to six. These six reasons were added to the test instrument (ballots) and used in the final testing together with a seventh write-in category. Another study was done to establish the reliability of the test instrument. The test-retest method was used with a ten day interval between tests. The crossbreaks technique was used to compute the reliability coefficient which was .824.

The Chi-square test of independence was selected as the best method of treating the data because it enabled the determination of the relationships between the selected ordinal data variables as thoroughly as possible.

Each group tested was subdivided, and the movie viewed by each subgroup presented in a different sequence of light designs to overcome the order effect. The total testing time per group was approximately fifteen minutes.

The raw data were prepared for the computer and Chi-squares computed for six different kinds of tests. The

reason-responses were tabulated to illustrate the distribution in the selection of reasons for lighting designs. Upon the completion of the statistical treatment, the final written report was prepared.

Chapter IV contains the findings of the study.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

In this chapter of the dissertation the data are presented and evaluated. The procedures followed in the development of this chapter are described under the following headings: (1) Distribution of test scores; (2) Global Chi-Square test; (3) Subsequent Chi-Square tests; (4) Interpretation of Preference Distribution; and (5) Choices of Reasons Selected by Respondents. The chapter concludes with a brief summary of its contents.

Distribution of Test Scores

The grand total of 633 subjects was tested. Distribution of test scores is shown in Table 1, page 59. These are the values that were tested statistically. There were only two male dancers who met the criteria for acceptance stated in Chapter III. Because of the unavailability of male dancers male and female subjects in the group of dancers were combined.

Global Chi-square Test

The Global Chi-square test was used to test all the variables of the three-dimensional matrix simultaneously. The data for all subject groups, males, females, and

TABLE 1

LIGHTING DESIGN PREFERENCE

Educational Level	Area Lighting	Side Lighting	Special Area Lighting	Silhouette Lighting	Subtotal	Total
5th graders						
Male	26	11	12	17	66	
Female	28	12	13	27	80	146
8th graders						
Male	19	6	7	21	53	
Female	10	14	15	22	61	114
11th graders						
Male	12	6	6	29	53	
Female	9	10	5	36	60	113
College juniors						
Male	11	20	9	47	87	
Female	8	30	19	51	108	195
Dancers	3	29	7	26	65	65

educational level, were placed into the selected categories and tested for statistical significance. Figure 5, page 61, illustrates the observed and expected values and the Chi-square contribution of each cell in the matrix, respectively. The Chi-square value for the entire matrix was 69.6477. Tabular Chi-square at the .05 level of significance with 9 degrees of freedom was 16.9 (for the .01 level of significance the tabular Chi-square was 21.7).

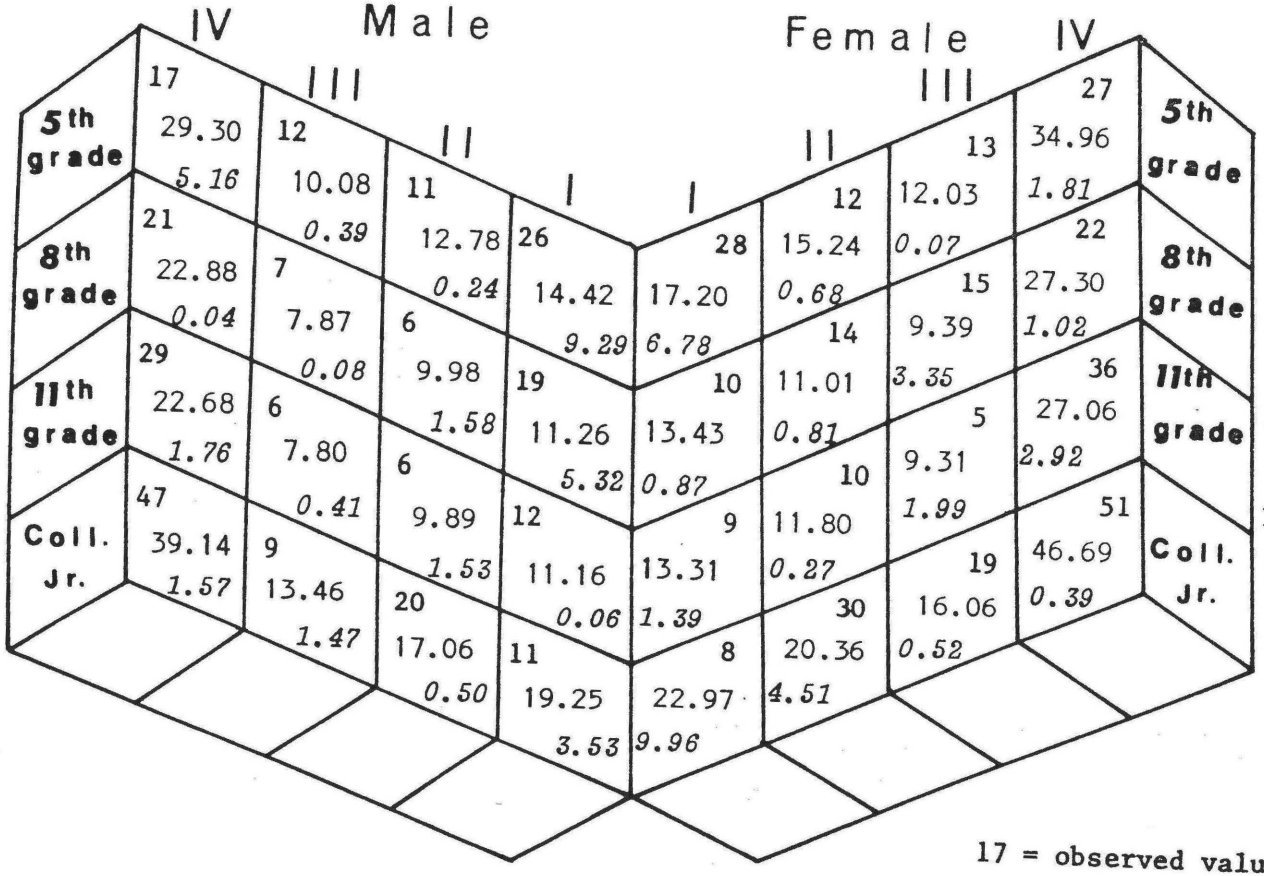
Because of this statistical significance, subsequent two-dimensional Chi-square tests were made to determine where the differences lay.

Subsequent Chi-Square Tests

The following two-dimensional Chi-square tests of independence were run: (1) between sexes for each educational level; (2) between educational levels within each sex; (3) between educational levels, sexes combined; (4) between sexes with the educational levels combined; (5) between individual educational levels; (6) between dancers and each educational level; and (7) between dancers and all other groups, all educational levels and sexes combined.

The results of the first category of tests between sexes for each educational level, are shown in table 2, page 62. Only one of the four tests showed statistical significance. The eighth grade was the only educational level that

FIGURE 5
GLOBAL χ^2 MATRIX



I = Area Lighting

II = Side Lighting

III= Special Area Lighting

IV = Silhouette Lighting

17 = observed value

29.30 = expected value

5.16 = χ^2 *value*

TABLE 2

COMPARISON BETWEEN SEXES FOR
EACH EDUCATIONAL LEVEL

Educational Level	Calculated X^2	Tabulated $X^2/.05$	df
5th grade	1.098	7.8	3
8th grade	8.405*		
11th grade	1.847		
College juniors	3.993		

*Significant at the .05 level. P.05 = 7.8

TABLE 3

COMPARISON WITHIN AND BETWEEN SEXES
BETWEEN EDUCATIONAL LEVELS

Sex	Calculated X^2	Tabulated $X^2/.05$	df
Within			
Male	27.038*	16.9	9
Female	35.808*		
Between			
Male and Female	54.413*	16.9	9

indicated a difference in this preference for lighting effects between boys and girls. This value exceeded tabular Chi-Square value by a small amount and is the only exception to statistical homogeneity within this category of tests. No reason can be offered for this finding.

The Chi-Square tests that compared responses between educational level within each sex showed statistical significance (beyond the .01 level) for both sexes (table 3, page 62). Although the internal differences among the females were somewhat higher, it was noted that both males and females show changing preference in response with differing educational level and that the kinds of changes were roughly similar between sexes. These changes are discussed in the section entitled "Interpretation of Preference Distribution" presented on page 66.

The test that combined the sexes for each educational level (table 3, page 62) and measures responses between the levels produced statistical significance beyond .01 level (calculated X^2 = 54.413, tabular X^2 at the .01 level = 21.7 with 9 degrees of freedom. The first three categories (tables 2 and 3) of tests logically led to the belief that the important relationship is between educational levels and preference, and that in general there is only a chance relationship between sex and preference.

This belief was further indicated by the fourth category of tests in which all male subjects were combined and tested against a similar combination of all females (table 4). The resulting Chi-square was calculated to be 7.588 in contrast to a tabular Chi-square at the .05 level of u.8 (with 3 degrees of freedom). This was not statistically significant at the .05 level. This reinforces the belief that sex has little influence on preference.

TABLE 4

COMPARISON BETWEEN SEXES AND EDUCATIONAL LEVELS COMBINED

Group	Calculated X^2	Tabulated $X^2/.05$	df
Male and Female	7.588	7.8	3

A fifth two-dimensional test was performed comparing each educational level with every other educational group. Table 5, page 65, indicates that with the exception of the test between fifth and eighth graders, they were all significant at the .05 level. A definite trend was found in the Chi-square values. Increasingly higher Chi-square values were encountered with increasing distance between educational levels.

The last two categories (6 and 7) of two-dimensional Chi-square tests involved comparing dancers with the fifth,

TABLE 5

COMPARISON BETWEEN INDIVIDUAL EDUCATIONAL LEVELS

Grade Level	5th Graders	8th Graders	11th Graders	College Juniors
5th Graders		4.066	21.410*	41.284* →
8th Graders	4.066 ←		9.869*	17.053* →
11th Graders	21.410* ←	9.869* ←		10.629* →
College Juniors	41.284* ←	17.053* ←	10.629* ←	

* = statistically significant Chi-square values at 3 df.

eighth, eleventh, and college junior groups, and finally, comparing the sum of all educational levels with the dancers (dancers versus others). Table 6, page 66, indicates that all tests had a significant statistical difference between the dancers and each of the other designated groups studied. It should be noted that all test results were significant beyond the .01 level with the exception of the dancers versus college juniors. The difference in preference of lighting between these groups of subjects was significant at the .05 level of probability. It would appear justified to state that the dancers form a distinct group with their own preferences.

TABLE 6

COMPARISON OF DANCERS WITH EACH EDUCATIONAL LEVEL

Grade Level Sexes Combined	Calculated X^2	Tabulated $X^2/.05$	df
5th Graders	35.165*		
8th Graders	23.038*		
11th Graders	23.634*	7.8	3
College Juniors	8.834*		
Dancers versus all	26.777*	7.8	3

P.05 = 7.8 P.01 = 11.3

The choices of the dancers most closely correspond to their educational peers, the college juniors, suggesting that the selection was an acquired characteristic of the educational level with specific differences, probably a result of unique experiences. This is predicated upon an assumption that the college student is likely to be more open to, or more experienced in, diverse aesthetic events than students at lower educational levels.

Interpretation of Preference Distribution

Fifth graders indicated a strong preference for area lighting (table 1, page 59) and this cell contributed a large

part of the Chi-square value in all tests where it appeared. The second choice of the fifth graders was the silhouette lighting. The preference for special area lighting and side lighting was considerably lower than for the first and second choices with the smallest preference indicated for side lighting (table 1, page 59).

Among eighth graders, where the only demonstration of a statistical difference between the sexes was noted, (table 2, page 62) both males and females showed a preference for the silhouette effect. A difference may be found (table 1, page 59) in the male subjects' choice of area lighting second, with special area lighting and side lighting as distant third and fourth selections. The female subjects contrasted this by a preference for special area effect ranked second followed by a third ranking preference for side lighting. The least chosen lighting effect for the female subjects was area lighting.

The preference for silhouette lighting was observed among the eleventh graders to an even greater degree than that of eighth graders. This was especially true for the female subjects. There was a decrease of almost one-third in the proportion of subjects who selected special area lighting and the side lighting effect over the silhouette effect. The number of eighth and eleventh grade female subjects who selected area lighting effect was almost identical, whereas,

there was a decrease in the preferences by the male subjects for the same lighting effect (table 1, page 59).

The trend toward a decrease in the preference for area lighting by educational level continued among both male and female college junior students. The increased preference for side lighting for this educational level was striking in comparison to the other educational groups and a large preference for the special area lighting effect, especially in comparison to the eleventh grade subjects, was observed among the females. In contrast, the males' preference toward special area lighting remained essentially the same as for the males in the lower educational grades (table 1, page 59). An increased number, but actually a small proportionate decrease in the preference for the silhouette effect, was observed for both sexes (i.e., 57.5 per cent for the eleventh graders and 50.3 per cent for the college juniors) in relation to lower educational levels.

The dancers showed preference for the side lighting effect with their second preference, the silhouette effect, almost equal in choice. Special area lighting and area lighting were selected as the preferred modality of lighting by very few dancers (table 1 and figure 6). Dancers appear to form a distinct group differing significantly from all others tested (table 5, page 65). Although dancers respond more like the college juniors, their peers, than any other

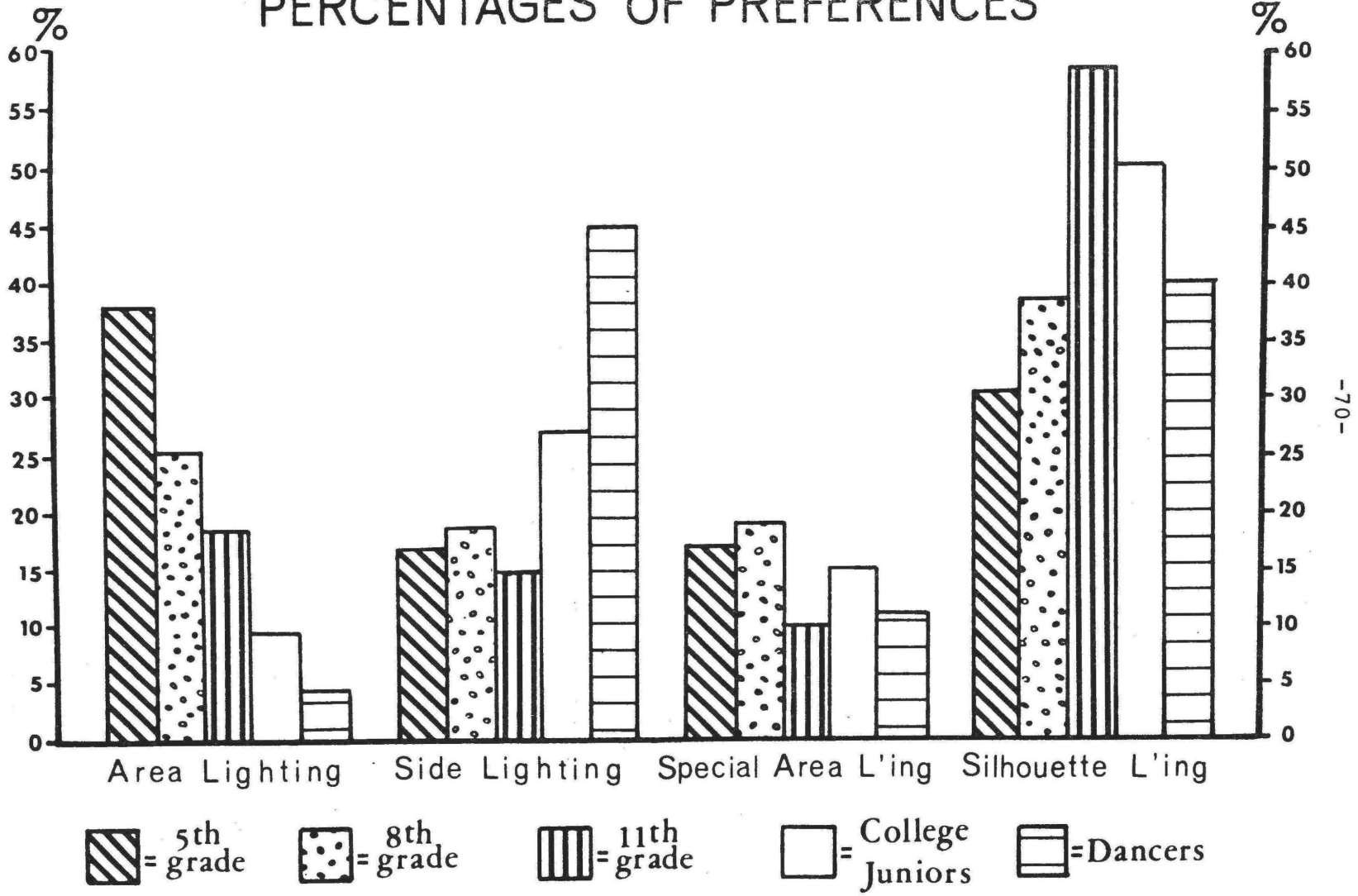
single group, they are different statistically from each of the other subgroups measured in this study (table 6, page 66).

No peak is shown for the special area lighting, the preference for which generally decreases with educational attainment. The most consistent trend in preference among all the lighting designs is exhibited by area lighting (figure 6, page 70). The fifth graders show the highest preference for this lighting design and there is a decreasing trend with an average of eight per cent for each subsequent educational level. Fifth, eighth, and eleventh graders indicated a relatively consistent and low preference for the side lighting (figure 6). This lighting type increased by about ten per cent with the college juniors (25.6 per cent) and an unusual jump to 44.7 per cent was obtained with the dancers who showed a preference for this lighting design.

The special area lighting effect was unique because of the low preference that is generated among all the groups tested. This lighting design, the special area lighting, was the single most unpopular design and corresponds closely with the preference shown by the lower educational levels for the side lighting effect (figure 6).

The most popular lighting design was the silhouette effect. Three groups of subjects, eighth grade, eleventh grade, and the college juniors showed the greatest preference

FIGURE 6
PERCENTAGES OF PREFERENCES



for this lighting design and it was the second choice for the two remaining groups, the fifth graders and the dancers (figure 6, page 70).

Choices of Reasons Selected by Respondents

Reasons for the preferences of the subjects are depicted in tables 7 through 11, pages 72, 73, 74, 75, and 76. Fifth graders, who selected area lighting as most popular, indicated that this form of lighting allowed them to see the dancer better and that this was the most common reason for selecting one form of lighting over another. Moreover there was a high correspondence of those ballots selecting area lighting and reason number three "The lighting produced the most pleasing color effect." This reason was also consistent with simple area lighting or cross-spotting technique. No particularly strong propensity for any one reason was shown among the relatively few fifth grade subjects preferring side lighting. Those who chose special area lighting indicated that they did so primarily because it enabled them to see the dancer better, a reason not entirely consistent with the areas of light and shadow in special area lighting. Secondarily, the female respondents selected the light and shadow effect on the dancer's body; presumably a more appropriate selection because the dancer moved through pools of light and shadow. The largest group among those selecting silhouette lighting,

TABLE 7

REASON FOR PREFERENCE--5TH GRADERS

Reason	Area Lighting		Side Lighting		Special Area Lighting		Silhouette Lighting		Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
1. The lights made the movements most enjoyable and graceful	3	5	2	4	0	1	4	3	9	13	22
2. The lights produced the most pleasing light and shadow effect on the dancer's body	2	1	1	4	2	4	4	12	9	21	30
3. The light produced the most pleasing color effect	6	8	3	2	2	1	1	1	12	12	24
4. The light made the dance more mysterious and dramatic	2	4	2	2	2	2	3	6	9	14	23
5. The light was less disiracting and/or contrasting	1	1	0	0	0	0	3	3	4	4	8
6. The light permitted me to see the dancer better	11	10	3	0	6	5	2	2	22	17	39
7. Other	0	0	0	0	0	0	0	0	0	0	0
Total	25	29	11	12	12	13	17	27	65	81	146

TABLE 8

REASON FOR PREFERENCE--8TH GRADERS

Reason	Area Lighting		Side Lighting		Special Area Lighting		Silhouette Lighting		Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
1. The lights made the movements most enjoyable and graceful	5	0	1	3	1	4	1	3	8	10	18
2. The lights produced the most pleasing light and shadow effect on the dancer's body	1	4	0	1	1	1	10	5	12	11	23
3. The light produced the most pleasing color effect	3	1	0	2	2	3	1	1	6	7	13
4. The light made the dance more mysterious and dramatic	0	2	4	6	2	3	4	9	10	20	30
5. The light was less distracting and/or contrasting	2	0	0	1	0	0	2	0	4	1	5
6. The light permitted me to see the dancer better	8	3	0	1	1	3	1	4	10	11	21
7. Other	0	0	1	0	0	1	1	0	2	1	3
Total	19	10	6	14	7	15	20	22	52	61	113*

*Excludes one ballot incorrectly executed.

TABLE 9

REASON FOR PREFERENCE--11TH GRADERS

Reason	Area Lighting		Side Lighting		Special Area Lighting		Silhouette Lighting		Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
1. The lights made the movements most enjoyable and graceful	3	3	0	0	1	0	4	4	8	7	15
2. The lights produced the most pleasing light and shadow effect on the dancer's body	2	0	3	2	3	2	3	10	11	14	25
3. The light produced the most pleasing color effect	0	2	1	3	0	1	1	0	2	6	8
4. The light made the dance more mysterious and dramatic	0	1	0	3	0	0	18	13	18	17	35
5. The light was less distracting and/or contrasting	0	0	1	0	0	0	1	4	2	4	6
6. The light permitted me to see the dancer better	7	2	0	1	2	2	0	5	9	10	19
7. Other	0	0	0	0	0	0	1	0	1	0	1
Total	12	8	5	9	6	5	28	36	51	58	109*

*Excludes four ballots incorrectly executed.

TABLE 10

REASON FOR PREFERENCE--COLLEGE JUNIORS

Reason	Area Lighting		Side Lighting		Special Area Lighting		Silhouette Lighting		Total		Total
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	
1. The lights made the movements most enjoyable and graceful	1	2	4	4	0	0	8	13	13	19	32
2. The lights produced the most pleasing light and shadow effect on the dancer's body	3	0	9	18	3	7	4	2	19	27	46
3. The light produced the most pleasing color effect	1	3	2	2	0	4	0	1	3	10	13
4. The light made the dance more mysterious and dramatic	0	0	4	5	5	5	22	15	31	25	56
5. The light was less distracting and/or contrasting	1	0	0	0	0	2	3	10	4	12	16
6. The light permitted me to see the dancer better	4	3	0	1	0	0	0	7	4	11	15
7. Other	0	0	0	0	1	1	8	3	9	4	13
Total	10	8	19	30	9	19	45	57	83	108	191*

*Excludes four ballots incorrectly executed.

TABLE 11

REASON FOR PREFERENCE--DANCERS

Reason	Area Lighting	Side Lighting	Special Area Lighting	Silhouette Lighting	Total
1. The lights made the movements most enjoyable and graceful	1	1	0	5	7
2. The lights produced the most pleasing light and shadow effect on the dancer's body	0	19	4	3	26
3. The light produced the most pleasing color effect	0	2	0	0	2
4. The light made the dance more mysterious and dramatic	1	4	1	7	13
5. The light was less distracting and/or contrasting	0	1	1	2	4
6. The light permitted me to see the dancer better	1	0	1	3	5
7. Other	0	2	0	4	6
Total	3	29	7	24	63*

*Excludes two ballots incorrectly executed.

dominated by females, also chose the reason having to do with light and shadow on the dancer's body, ostensibly because the dancer's body was totally in shadow. A sizeable minority chose reason number four for the silhouette effect "The light made the dance more mysterious or dramatic."

Eighth graders selected area lighting for the same reason as the fifth graders, because it enabled them to see the dancer better (table 8, page 73). This total was dominated by males. Approximately one-third of the females selected the same reason. The eighth grade males indicated that "The light made the movements most enjoyable and graceful" and was the second most popular reason for selecting one lighting design. Females split fairly equally between two reasons, "The light permitted me to see the dancer better," and "The light produced the most pleasing light and shadow effect on the dancer's body." Among those who chose side lighting the most popular reason for both males and females, indeed half of the total, was "mysterious and dramatic." Reasons for selecting special area lighting were almost equally distributed among four categories, "The lights made the movements most enjoyable and graceful," "The light produced the most pleasing color effect," "The light made the dance more mysterious and dramatic," and "The light permitted me to see the dancer better." Although there was little trend apparent in these data, at least the respondents largely

rejected as reasons that "The light produced the most pleasing light and shadow effect on the dancer's body," and "The light was less distracting and/or contrasting." Silhouette lighting had two strong reasons for its selection by eighth graders, that it produced pleasing light and shadow and that it made the dance more mysterious or dramatic.

Eleventh graders (table 9, page 74) who selected area lighting chose the same reason most commonly selected by the younger groups, that is, it permitted them to see better. This dominance came mostly from males who substantially outnumbered the females. The females were divided fairly evenly between "The light made the movements most enjoyable and graceful," "The light produced the most pleasing color effect," and "The light permitted me to see the dancer better." Only twenty-two out of 146 subjects said that it made the movements more enjoyable and graceful.

Relatively few eleventh graders chose side lighting, but among those who did, its light and shadow and color effect seemed to be most popular. Special area lighting was chosen by a few subjects, but it appeared that the shadow effects had the greatest influence. Four respondents, one-third of all who selected special area lighting, stated that it permitted them to see the dance better. This reason was somewhat surprising in view of the fact that the special area lighting design featured intentional areas of light and

darkness. Respondents who preferred silhouette lighting did so because it was more mysterious or dramatic. Less than a quarter of the group dominated by females, selected the only other popular reason, the light and shadow effect. This change in emphasis, the selection of the silhouette design in conjunction with the reason that it is more mysterious or dramatic instead of for its light and shadow effect, is believed to reflect increasing aesthetic awareness and maturity.

The college juniors (table 10, page 75) who chose area lighting did so for the most popular single reason, it permitted them to see the dancer better. Almost equally important to those selecting area lighting was the pleasing light and shadow effect on the dancer. The juniors rejected as reasons that "The light made the dance more mysterious or dramatic," and "The light was less distracting and/or contrasting," the remaining reasons for selecting area lighting were fairly equally divided among the following reasons: "The light made the movements most enjoyable and graceful," and three "The light produced the most pleasing color effect." Side lighting, truly popular for the first time at this educational level, was chosen mostly for its light and shadow effect on the dancer's body, a most appropriate combination because side lighting highlights the sides of the dancer's body often leaving the rest of the body in shadow. This

selection was more popular with the females than the males. Equal numbers of subjects chose special area lighting for its light and shadow effect, and for its mystery and drama. Silhouette lighting was the overwhelming favorite among college juniors. As with the eleventh graders the most popular reason for selecting silhouette lighting was that it made the dance more mysterious or dramatic. Another sizable group, however, chose the reason that it made the movements enjoyable and graceful, probably another indication of increasing aesthetic sense. Another minority said that the lighting was less distracting and/or contrasting.

Very few dancers chose area lighting (table 11, page 76). Because of the limited number of dancers who chose area lighting no satisfactory rational can be determined for their choice of this lighting type. Side lighting, distinctly the dancers' favorite, was overwhelmingly chosen because of its light and shadow effect on the dancer's body. The emphasis on body movement that was recognized by the dancers may be considered consistent with their greater experience in viewing dance movement. Only a few dancers chose special area lighting and the reason was the same as for the side lighting, the light and shadow effect on the dancer's body. Surprisingly, there seems to have been no central reason among dancers for selecting the silhouette lighting, other than they rejected the reason of its color effect. Silhouette

lighting was selected by almost as many dancers as side lighting, the preferred lighting design.

Although difficult to quantify, some trends may be detected. Younger and less experienced subjects seem to place primary emphasis on visibility and are less interested in what might be considered the more "aesthetic" values. Eighth graders and more especially eleventh graders place more emphasis on the dramatic, mysterious effects and secondarily with the illumination of the body, possibly in connection with increasing sexual awakening among this age group. College juniors show some of the same characteristics, but are more responsive to movement quality by commonly selecting the reason based upon the grace of the movements. In contrast to the other groups, the dancers show particular interest in light and shadow upon the body, presumably because of their greater experience with the relationship between light and movement.

None of the fifth graders rejected the six prepared reasons and utilized the open seventh choice. Three eighth graders made statements of their reasons; one essentially duplicated reason number four (the dancer was mysterious and dramatic); a second, for side lighting, stated that it seemed more "mellow"; and the third liked the darkness of the special area lighting. The only eleventh grader who prepared a

reason chose the silhouette effect because the greater contrast appeared to better hold one's interest.

College students were more verbose. Nevertheless, analysis of the statements of the thirteen respondents presenting individual reasons indicated that nine of them agree quite closely with the six reasons provided. Of the remaining four, three agreed that their primary reason for preferring the silhouette effect was that the dancer appeared to be unclothed. In spite of the sexual implications, the fact remained that the distractions of color and clothing were eliminated in the silhouette effect. The last of the respondents indicated that the special area lighting effect was preferred because it "accentuated the vertical lines of the dance." This is an astute observation and correct within the framework of the lighting design that employs vertical shafts of light.

Six dancers gave reasons for selecting particular designs. This relatively large number might be expected from individuals who have had more experience in lighting and movement than the other groups of subjects. Two of the reasons stated that a particular design is interesting or flattering, and although they may not exactly duplicate the reasons given, they do not differ greatly. The remaining four are relatively unlike those given by the other dancers or by other groups and their derivation appears to be artistic and even particularly

choreographic in nature. Therefore, it seemed appropriate to quote these four reasons, as received, in their entirety:

1. "Starkness of black and white is exciting" (silhouette lighting).

2. "This design seemed to best suit the darting, somewhat elusive nature of this particular dance." (side lighting).

3. "Less distraction with color, facial features, etc. More emphasis on design. More like a graphic--etching or ink--drawing" (silhouette lighting).

4. "The light made an interesting paradox ambiguous --where is front and where is back? But starkly clear in emphasizing the negative shapes the body makes" (silhouette lighting).

Summary

This chapter includes the analysis of the findings as they appeared under the following headings: (1) Distribution of Test Scores; (2) Global Chi-square Test; (3) Subsequent Chi-square Tests; (4) Interpretation of Preference Distribution; and (5) Choices of Reasons Selected by Respondents.

A total of 633 subjects was tested and the collected data were tested statistically. The Global Chi-square test was used to test all the variables of the three-dimensional

matrix simultaneously. The Chi-square value thus obtained was 69.6477, which indicated a statistical significance beyond the .01 level of significance. Because of this statistical significance, subsequent two-dimensional Chi-square tests were made to determine where the differences lay.

Seven different kinds of two-dimensional Chi-square tests were computed: (1) between sexes for each educational level; (2) between educational levels within each sex; (3) between educational levels sexes combined; (4) between sexes with the educational levels combined; (5) between individual educational levels; (6) between dancers and each educational level; and (7) between dancers and all others, all educational levels and sexes combined. No overall statistical significance was indicated between preferences of the sexes for all educational levels except the eighth graders who showed a significant difference at the .05 level. No statistically significant difference occurred between the sexes where all educational levels were combined. Statistically significant differences were found in all the tests that compared responses between educational levels, as well as between dancers and non-dancers for each educational level as well as all educational levels combined.

The interpretation of the preference distribution indicated that fifth graders show a strong preference for area lighting; whereas, both eighth graders and eleventh graders

showed a clear preference for silhouette effect. The silhouette effect was still the most popular among the college juniors, but the preference for the side lighting effect doubled for this group. The side lighting effect was even more popular among the dancers. Silhouette lighting was almost as popular among the dancers as side lighting.

The indicated reasons for the preferences were on the whole quite consistent with the selections of the lighting designs. The fifth graders chose the area lighting because it enabled them to see the dancer better. Area lighting was chosen for the same reason by the eighth graders, and the silhouette lighting was chosen because of its pleasing light and shadow effect as well as because of its mystery and drama. The eleventh graders, who favored the silhouette effect, did so because it was mysterious and dramatic, and those who liked the area lighting did so primarily for the same reasons as the younger groups. The overwhelming favorite among the college juniors, the silhouette lighting, was selected because it was mysterious and dramatic. The second ranked choice of college juniors, side lighting, was usually chosen for its light and shadow effect on the dancer's body. Side lighting was the favorite among the dancers and it was so because of the light and shadow effect it had on the dancer. The same reason was indicated among those dancers selecting the special area lighting effect.

Most of those subjects who rejected the six prepared reasons stated their own reasons in terms that partially or wholly agreed with one or more of the prepared statements. The respondents who indicated reasons that were quite unlike those given by other subjects appeared to prefer a given lighting effect based upon personal artistic or choreographic experience.

Chapter V presents the summary, conclusion, and recommendations for further studies.

CHAPTER V

SUMMARY, CONCLUSION, AND RECOMMENDATIONS FOR FUTURE STUDIES

Summary of the Investigation

Stage lighting is a supporting element in a dance performance and is used to permit the audience to see the movements, unify them with their environment, emphasize the dramatic value of the dance and create the desired emotional responses to the performance. The impact of lighting upon the audience is apparent, but the kinds of lighting that most effectively produce such impacts are unknown.

Although audiences often are unable to verbalize their reactions to various visual stimuli, they can express their preferences to them. If such preferences vary significantly between educational levels and sexes, the lighting designer may gain insight into the designing of lighting effects for dance.

Stage lighting is only one of many supporting factors that help make a performance. Lighting, however, has the distinct ability to integrate all the others into a whole by creating mood and atmosphere. In addition to being indispensable to enable the audience to see the stage action and to

unify the movements with their environment, stage lighting can become a powerful medium in communicating ideas to the audience. The lighting designer tries to create effects that appropriately express the thoughts and intents of the choreographer. The artistic tastes of the audience may be divergent and dependent upon differences in age, sex, educational level, and on previous exposure to dance. Thus, the stage lighting designer would do well to apprise himself of lighting design preferences of different age and educational groups.

The present study was designed to determine if there is a difference in the preference by educational level and sex groups with respect to four lighting effects designed for a specific dance composition. The lighting effects chosen were: (1) area lighting; (2) side lighting; (3) special area lighting, and (4) silhouette lighting. A 8 mm movie with the four lighting designs, illuminating the same dance composition, was shown to 259 male and 309 female subjects, with little or no formal dance instruction. These students were chosen from the Allegany County School District, and Frostburg State College in Maryland. Additionally, sixty-five dancers from the University of Maryland in College Park, Maryland, were selected as subjects because of their

previous dance training. All of the testing was done during the fall semester of the academic year 1973-1974.

The review of literature included a discussion of specific difficulties encountered in the field of audience response research. Probably, the most difficult problem to overcome is that of finding a way to measure the subjective feelings of the observer at the moment he is experiencing an art object, without at the same time, destroying the attitude of contemplation. A review of research studies in audience response indicated that they have dealt with preferences to color, stage settings, and stage actions. None was directly related to dance. Still others; not directly involved with the use of a stage, tested subjects' preferences and reactions to colors.

The procedures for the study were divided into thirteen sections. The preliminary procedures for the study consisted of: surveying, studying, and assimilating information pertinent to the study from available documentary and human sources of data; (2) selection of the variables for the study; (3) preparing a tentative outline of the study for presentation in a Graduate Seminar held in the College of Health, Physical Education and Recreation; (4) revising the tentative outline in accordance with suggestions made during the Graduate Seminar; and (5) filing the tentative outline in

the form of a Prospectus in the Office of the Dean of Graduate Studies at the Texas Woman's University.

The dance composition was choreographed in the modern dance idiom. The composition was non-thematic, an exposition of movement only, so that no one lighting design was rendered more appropriate than the others.

The minimal requirements of the lighting designs chosen were: sufficient visibility for easy viewing and filming, and three dimensionality of the dancer. The lighting designs chosen were area lighting, side lighting, special area lighting, and silhouette lighting. The performing area used for filming was a square ten by ten feet and the lights were therefore mounted on standards in close proximity to the dancer. No color media were used.

The filming was done on fine-grained color film, at normal speed, with focal length kept constant. The uniformity of the light was insured by monitoring it with a Weston V light meter and confirming the effects with a Polaroid Land Camera 450. The filming was done on four separate days because of the time involved in mounting and focusing the instruments. After editing the films, including appropriate titles and instructions, the film was duplicated to obtain four copies that in turn were edited in a predetermined order. To overcome the order effect a computer program that generates random numbers was used to

select the four sequences in which the four light designs were presented. Additionally, all educational groups were divided into four subgroups and each subgroup subjected to a different film sequence.

Two panels were selected to judge the suitability of the dance composition and the lighting designs to be used. A person selected as a judge was chosen on the basis of experience and expertise in the fields of dance and stage lighting.

The subjects selected for this study were chosen to represent four different educational levels and both sexes in an approximately equal representation. The specific grades utilized were fifth, eighth, eleventh, and college juniors. Additionally a group of sixty-five subjects was selected on the basis of educational level and experience in dance.

Prior to the main testing, a pilot study was conducted to obtain alternative answers to be used with the test instrument to determine the subjects' reasons for preferring particular lighting designs. From the responses obtained, categories were combined or eliminated until reduced to six. These six reasons were added to the test instruments (ballots) and used in the final testing together with a seventh write-in category. Another study was done to establish the reliability of the test instrument. The

test-retest method was used with a ten day interval between tests. The crossbreaks technique was used to compute the reliability coefficient which was .824.

The Chi-Square test of independence was selected as the best method of treating the data because the study involved ordinal data. Preferential data cannot be given a value beyond linearity and rank.

Each group tested was subdivided, and the movie was viewed by each subgroup presented in a different sequence of light designs to overcome the order effect. The total testing time per group was approximately fifteen minutes.

The raw data were prepared for the computer and Chi-squares computed for a three-dimensional Global Chi-square matrix and seven different kinds of two-dimensional Chi-square tests. The reasons selected by the respondents were tabulated in an effort to establish the motivation behind the selection of a particular lighting design and how this motivation might change with sex and educational level. Upon the completion of the statistical treatment, the final report was prepared.

Summary of the Findings

The Global Chi-square test was computed to determine the degree of difference, if any, between lighting designs for all educational levels and both sexes. The Chi-square

value for the entire matrix was 69.6477 which indicated a statistical significance beyond the .01 level. Because of this significance, subsequent two-dimensional Chi-square tests were made to determine where the differences lay.

Seven different kinds of two-dimensional Chi-square tests were computed. No overall statistical significance was indicated between the preferences between sexes for each educational level, except for the eighth graders where there was a statistical significance at the .05 level. Nor was a statistically significant difference found between the sexes when all educational levels were combined. Statistically significant differences were found in all the tests that compared responses between educational levels, as well as between dancers and non-dancers for each educational level as well as with all educational levels combined.

The interpretation of the preference distribution indicated that fifth graders show a strong preference for area lighting, whereas both eighth graders and eleventh graders showed a clear preference for the silhouette effect. The silhouette effect was still the most popular among the college juniors, the preference for the side lighting effect was almost equal for this group. The silhouette lighting effect was more popular among the dancers than among the other groups.

The indicated reasons for the preferences were, on the whole, quite consistent with the selections of lighting designs. The fifth graders chose the area lighting because it enabled them to see the dancer better. Area lighting was chosen for the same reason by the eighth graders, and the silhouette lighting was chosen because of its pleasing light and shadow effect as well as because of its mystery and drama. There was little trend apparent in the remaining data received from this group. The eleventh graders, who favored the silhouette effect, did so because it was mysterious and dramatic, and those who liked the area lighting did so primarily for the same reasons as the younger groups. The overwhelming favorite among the college juniors, the silhouette lighting, was selected because it was mysterious and dramatic. The second ranked choice, side lighting, was usually chosen for its light and shadow effect on the dancer's body. Side lighting was the distinct favorite among the dancers, and it was so because of the light and shadow effect it created on the dancer. The same reason was indicated among those dancers selecting the special area lighting effect.

Conclusion to the Study

Educational level, presumably based upon age and maturity, affects the preference among lighting designs for

dance. With increased education including dance education, the preference of lighting designs becomes more sophisticated and aesthetic.

Discussion

It is believed that age is the primary variable that caused the change in audience preference among the lighting designs selected for this study. At the educational levels treated, it is not thought likely that actual differences in education had much to do with these changes, although further studies that attempt to distinguish preferences among college educated and non-college educated adults would certainly be worthwhile. Formal education is not believed to place much emphasis upon aesthetic activities; therefore, it would appear that the maturation of the subjects rather than the education was the influential variable.

The role played by sexual maturation is difficult to evaluate. Certainly a portion of the increased awareness of the importance of body outline among both male and female subjects may be traced to this source. Although some of the lighting designs, such as the silhouette, would probably increase in popularity among post puberty subjects for purely aesthetic reasons, a large portion of their popularity may stem from sexual awakening. The selection of finer increments of age/educational level might help to distinguish

what part of this change in emphasis is related to sexual maturation, and which is produced simply by increased cultural attainment. Concurrently, it might be possible to correlate this change with the expected earlier puberty in girls so that carefully controlled replication might indeed illustrate certain limited differences based upon sex. Coarser and less critically selected sample intervals, such as those used herein, are inadequate to reflect such minor differences, if indeed they are present. What is striking in the present data is that both male and female subjects selected the same lighting designs and did so for essentially the same reasons.

Results from the various statistical tests are highly consistent in relation to several implications that have already been discussed; for example, the preference of younger children for simple and uncomplicated illumination, of sub-adults for silhouette lighting, and of dancers for side lighting. The consistency of these statistical results is of an extremely high order, so much so that one is able to describe trends between the different age groups. Although it may be possible to misinterpret the reasons that caused the subjects to make these choices there can be no doubt in categorizing the kinds of choices they made.

Any list of reasons must necessarily put words in the mouths of the subjects. Therefore, using six stereotyped characterizations of common reasons hampers the individuality and spontaneity of the respondents in stating the reasons underlying their preferences. Furthermore, there is a great danger of extrapolating simple reasons far beyond their stated intent. It is also likely that many subjects selected particular reasons through misunderstanding of their content, and the latitude for semantical differences is broad. Thus, what to one subject may produce pleasing light and shadow (silhouette effect) may actually, properly speaking, have no shadow at all. Nevertheless, these and other problems aside, some reasons for selections of lighting designs are quite clear. The younger children are consistent in selecting the most light simply because they wish to see clearly. The cause and effect relationship is believed to be unmistakable.

The strong preference for silhouette lighting and the reasons for selecting it among junior and senior high school students are not so clear. One suspects that several factors are involved, many of them probably related to maturation. Whatever the ultimate cause, the important factor is that results such as these permit the exploitation of these preferences in sub-mature audiences. Psychological reasons can be derived from these findings and these are

quite beyond the scope of this study. These aspects aside, there remains high concordance between the selection of the silhouette design and the reasons stated by eighth and eleventh graders for selecting it.

High diversity in preference and in selected reasons exemplifies the college age subjects. Such a finding might be expected as the college age group has the most varied background and their education is beyond the norm, which might provide for even greater diversity than adults without such an advantage.

Dancers show a characteristic preference for the side lighting effect. There would appear to be little doubt that they selected this effect because it had some advantage peculiar to dance as opposed to some other stage activity. One can speculate that this is because the side lighting effect is frequently thought to be best to illuminate the kinetics of movements of a dancer's body. Whether the real reason is this simple or involves more exotic aesthetic principles the affinity of dancers for this lighting design is strong.

Recommendations for Further Studies

The following possibilities are suggested for further research:

1. Replication of this study for similar sample groups from different geographic areas to determine if socio-economic background causes a change in preference.

2. The inclusion of other adult subject groups including middle aged and elderly theatre audiences to determine if an increased maturation and experience will change preference.

3. Testing a non-thematic dance composition with responses of white light versus various colored lights, all employing the same lighting design to determine if specific color effects affect the preference.

4. A testing procedure in which the subjects would match lighting designs (exemplified by a brief non-thematic dance) with dances choreographed to express different moods as comedy, tragedy, farce, and melodrama to determine if a specific color is preferred with a stated mood.

5. The inclusion of adult subject groups, with and without college education. The purpose of the study would be to determine if there is a change in preference due to maturation or formal education.

APPENDIX

B A L L O T

Please check the correct entry:

Your sex

____ Male

____ Female

Your age/grade

____ 5th grade ____ 11th grade

____ 8th grade ____ College

PLEASE CHECK YOUR PREFERENCE:

☐ DESIGN 1

☐ DESIGN 2

☐ DESIGN 3

☐ DESIGN 4

THANK YOU!

PLEASE INDICATE THE REASON FOR YOUR CHOICE:

☐ The light produced the most pleasing light and shadow effect on the dancer's body.

☐ The light produced the most pleasing color effect.

☐ The light made the dance more mysterious or dramatic

☐ The light was less distracting and/or contrasting.

☐ The light permitted me to see the dancer better.

☐ The light made the movements most enjoyable and graceful.

☐ Other (please describe):

_____

_____

To: Allegany County Board of Education
108 Washington Street
Cumberland, Md. 21502

From: Mrs. Stina M. Merrill
Department of Health and Physical Education
Frostburg State College
Frostburg, Md. 21532

Subject: Permission to employ students in the Allegany County School District for research for doctoral dissertation.

Description of Study:

Title: Lighting Designs for a Modern Dance: Preferences of Men and Women.

Purpose of the Study: To obtain information concerning lighting designs as a supporting element in dance performance. The investigation is designed to determine if there is a difference in the preference by age and by sex with respect to four lighting effects designed for a specific dance composition.

Subjects: Selection of subjects will encompass four educational levels: 5th grade; 8th grade; 11th grade, and college juniors; additionally one group of dancers of college age. A minimum of 100 to 150 per group is needed.

Testing Procedures: The subjects will be shown a 6 minute 8 mm color movie. This movie shows the same dance four times, each time with a different stage lighting effect. The students will be told that there is no right or wrong answer, but are asked to indicate which lighting effect they like best and why they made their choice. A "paper-pencil" test instrument will be used. Estimated time for entire procedure is 10 minutes.

Steps taken to protect rights and welfare of the individuals involved:

1. There are no potential risks to the human subjects involved
   a. No lighting effect is better than another
   b. Subjects are not pressured into pleasing the investigator, but simply to state their preference and reason for their choice.

c. No psychological projective technique or behavioral technique will be used.

2. The subjects will remain anonymous

Estimated beginning date of study: November 26, 1973

Estimated duration: One to two weeks. Hopefully all the testing can be completed before the Christmas Vacation.

Degree sought: Doctor of Philosophy in Dance and Related Arts

Place of Study: Texas Woman's University, Denton, Texas 76204

Dissertation supervisor: Dr. Joel Rosentswieg

EVALUATION OF THE DANCE COMPOSITION

The dance composition, as viewed on the film, meets the following criteria presented by the investigator: The movements are non-literal and are visually satisfying in terms of space design, rhythm, and texture as these elements of dance are explained by Louis Horst and Carroll Russell, Modern Dance Forms (San Francisco: Impulse Publications, 1961), pp. 29-50.

Gloria A. Bonali

Dr. Gloria A. Bonali
Professor
State University College
New Paltz, New York

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Faith Clark

Dr. Faith Clark
Associate Professor
Western Illinois University

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T Ray Faulkner PhD.

Dr. T. Ray Faulkner
Associate Professor
Eastern Michigan University

EVALUATION OF THE LIGHTING DESIGNS

The four lighting designs (area lighting, side lighting, special area lighting, and silhouette lighting), as viewed of the film, meet the following criteria presented by the investigator: (1) Each of the four lighting designs was distinguishable; (2) The four lighting designs are standard in the sense that they are commonly used for stage lighting; and (3) The four lighting designs can be reproduced on any reasonably well equipped stage, such as may be found on most school campuses.

Ned A. Bowman

Dr. Ned A. Bowman, Associate Professor
University of Pittsburgh

EVALUATION OF THE LIGHTING DESIGNS

The four lighting designs (area lighting, side lighting, special area lighting, and silhouette lighting), as viewed on the film, meet the following criteria presented by the investigator: (1) Each of the four lighting designs was distinguishable, (2) The four lighting designs are standard in the sense that they are commonly used for stage lighting, and (3) The four lighting designs can be reproduced on any reasonably well equipped stage, such as may be found on most school campuses.

David R. Press

David R. Press, Associate Professor
Frostburg State College

EVALUATION OF THE LIGHTING DESIGNS

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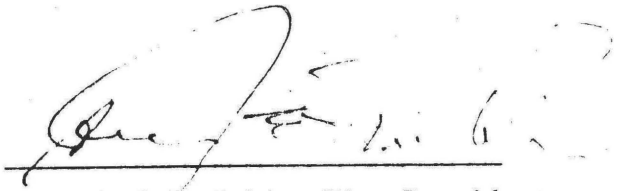

Dr. Joel E. Rubin, Vice President
Kliegl Brothers, Universal Electric
Stage Lighting Co., Inc.

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