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ABSTRACT

A review of research on television's major compositional factors was undertaken to determine the status of such research and to note the major variables involved in the structure of television pictures. It was found that such research could be grouped in four categories--lighting and color, staging, editing, and sound--and that these areas covered only a small portion of the compositional variables involved in the structure of television images. It was suggested that one reason for the slow development of empirical research on television composition was the inability of early media theorists to distinguish television from film in terms of scope and nature. Other possible explanations for the dearth of research on television composition are the complexity inherent in the control and measurement of television's compositional factors and the lack of understanding of biometric research procedures, particularly in the areas of perception, neurology, and physiology. (Author/RL)

EMPIRICAL STUDIES ON TELEVISION COMPOSITION

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The purpose of this essay is (1) to provide a profile of the present status of empirical investigation on television composition, (2) to underline the major variables involved in the structure of television pictures, and, (3) to review the recorded quantitative research studies on television's major compositional factors.

The movement towards the empirical investigation of the compositional principles pertinent to the television medium has had a very slow start. The academic study of the factors involved in the structure of the medium-lighting, color, staging, editing, and sound-has just begun to emerge. Quantitative research on the nature and the effects of television's compositional factors is minimal.

There are several reasons for this lack of research and their brief review is necessary since it will explain why certain compositional factors have been singled out repeatedly, while others have been completely ignored. The three most important reasons for the lack of quantitative research studies on television composition are (1) misconceptions about the differences and similarities of the visual communication media, (2) the complexity of the subject, and (3) the lack of understanding of biometric research procedures.

The failure to recognize the key differences between the media of film and television is a major reason for the lack of empirical research in television composition.[1] In the past, television scholars have relied on principles borrowed from studies on film, not recognizing the innate differences between the two media. It is time to pursue television as a unique medium.

Several scholars of television composition such as Tarroni,[2] Millerson,[3] Zettl,[4] and Davis[5] have underclined these differences which cover the areas of lighting, color, staging, time-motion, editing, and sound. Some examples will be useful in explaining the lack of empirical investigation in each of these areas. According to Tarroni:

> In television, we have, without any possible doubt, an instrument (the camera and other technical equipment), a material (for after all, sound waves and light waves are themselves a material), and a technique (the artist must carry out a series of operations which are by no means identical with those carried out by a film director or the producer of a play).

The lighting "materials," "instruments" and "techniques" employed by television are considerably different from the ones utilized by film. Consequently, the effects produced by the images of the two media are different. Zettl warns us that the aesthetic potentials of such compositional factors of television lighting as "outer orientation," "inner orientation," "external lighting," "internal lighting," etc.,[7] unique to the TV medium, have not yet been fully explored. The empirical investigation of these factors is overdue.

Visual images created by film cameras and projected onto the large film screen are different than those produced and seen on the small TV screen. Picture quality, screen size, and image size are different. The effects of such variables on the viewer's perception and response have not been empirically measured. There are some structural commonalities among the visual communication media of painting, photography, film, and television mostly in such compositional factors as screen direction, object and area proportions, perception of colors, balance, shape, scale, dimension, form, etc.[8, 9] Several empirical studies on these factors have been conducted, particularly in the area dealing with the field forces theory, which cover most of these variables.[10]

In the composition of television and film pictures, the elements of time, motion and editing are crucial factors which are applied differently in the two media. The timing and the editing techniques employed such as the dissolves, superimpositions, etc., mechanically and aesthetically differ in the two media.[11] Empirical studies measuring how each of these factors effect viewers are lacking.[12]

Confusion over television's nature and uncertainties over its purpose have contributed greatly to the lack of studies on TV sound. It is known that television used to be thought of as radio with visuals. This false notion has been a major stumbling block in the exploration of the proper criteria of matching pictures with sounds.[13]

The study of the syntax of visual messages is a complex endeavor.[14] It is not easy to achieve complete control and total isolation of variables for observing and testing the effects of visual stimuli as factors of pictorial composition. Recognizing the complexities and the difficulties that such studies present, researchers have suggested the use of advanced, precise, non-linear measuring methods and techniques.[15]

For the most part, communication researchers in the past lacked the knowledge and understanding of related research in other disciplines. They adopted the research approaches, methods of investigation, and data gathering techniques of behavioral scientists and speech behaviorists who lack knowledge of studies in perceptual psychology (visual and auditory), neurology (studies dealing with the functions of the eyes and the brain in processing visual and auditory information) and physiology which are necessary for the understanding of the structure of visual messages.[16]

The principle components mentioned above have been underlined and discussed by the pioneering studies of Kepes,[17] Moholy-Nagy,[18] Taylor,[19] Miller-

son,[20] Arnheim,[21, 22] Dondis,[23] and Zettl.[24] They have provided sound, theoretical bases and have singled-out specific compositional factors awaiting more exploration and scientific verification. Among the oldest film studies, which were either extended to television or borrowed by television researchers are studies on: (a) the impact of color, (b) the effect of motion, (c) shot content, (d) camera angle and speaker credibility, etc.[25] These studies examine visual communication variables which are common to both media. Although it would be false to conclude that their effects would be the same when applied to television, their contributions to the study of television composition is significant.[26]

In the following sections, the empirical studies on television composition underlining the variables under investigation will be briefly reviewed. For purpose of clarification, the various studies have been grouped under the major headings of inquiry such as (1) lighting and color, (2) staging, (3) editing, and (4) sound.

Research Studies on TV Lighting and Color

Lighting and color as aesthetic agents in the media of still photography, film and later in television, have been singled out and discussed by such scholars as Faber[27] who theorized on the role of light and color in revealing the environment, Arnheim[28] who mainly examined light and color paintings, still photography and film, Millerson[29] who discussed the role of light and color in the structure of TV pictures, Dondis[30] who outlined the role of light and color as primers of the visual message, including paintings, photographs and moving images, and Zettl[31] who dealt specifically with light and color as compositional factors (aesthetic agents) of television pictures.

The existing quantitative studies in which some aspect of lighting and/or color for film and television were either the principle variable under investi-

gation or a secondary one are (1) those dealing with the effects of lighting angles, (2) those which discuss the differences, similarities and effects of color vs. black and white pictures, and (3) those which examine color as an effective factor in instructional materials.

As speculated by Millerson[32] and Zettl,[33] Tannenbaum and Fosdick's study on lighting angles[34] showed that by manipulating the angle of the key light source, viewer's perception was affected. As a compositional factor, "low-angle" or "high-angle" lighting of subjects can create either a negative viewer response (low-key) or a positive one (high-key).

The perceptual differences between black and white and color images were explored by researchers in audio-visual communication media. Vandermere's[35] study on the differences between color and black and white in instructional films has been used by data researchers as the bridge between film and video studies on the subject. Scanlon's[36] experimental study on viewers' perception of color and black and white television was the first attempt to measure such differences. Additional studies on the subject followed. The most representative ones are Winn and Everett's [37] study on the effectiveness of rating color and black and white pictures, Katzman and Nyenhuis's[38] study on color and black and white as perceptual stimuli, Booth and Miller's[39] and Spangenberg's[40] studies both which deal with the differences between learning from black and white and learning from color stimuli, and Winn's[41] study on the structure of multiple free associations to words, black and white pictures, and color pictures. These studies scientifically explored those areas in which color pictures are preferable over balck and white ones when they are used to (1) provide plain information, (2) attract viewers' attention to specific objects or situations, (3) facilitate learning and (4) enhance and/or elicit viewers' aesthetic responses.

Empirical studies dealing with the use of color as a contributing factor in enhancing the viewer's ability to receive instruction are, Dwyer's[42] and Kanner's[43] studies which deal with color stimuli as instructional variables and Huntley's[44] study on color as an emotional factor in television. Snowberg[45] found that the best background colors for legibility are (in order of importance) white, yellow, green, red, and blue. Franzwa's[46] study on picture familiarity and detail retention of visual content found that color pictures of familiar animals were retained better than their black and white drawn counterparts. In their book Learning From Television: What the Research Says, Chu and Schramm[47] provide valuable insight into the use of television in education.

This brief review illustrates how the number of empirical studies on television lighting and color as compositional factors are limited. Schramm points out this need in the conclusion of his persuasive article with these remarks:

> I fear the preceding pages have provided that whereas one can derive stimulating general ideal from theoretical research in television, when a producer wants to translate these into specific guidance, he must rely either on his own creative instincts or on formative research. And without in the least underestimating the value of creativity, I would say that I have seldom seen an activity that has a greater need than ETV for formative research.[48]

Research Studies on TV Staging

This section reviews empirical studies which deal with placement and interaction of visual elements within the concentrated space of the television screen. The studies that concern this inquiry are those empirical investigations which attempt to verify existing theories of effective composition of moving images. They cover such compositional factors as (1) size of images, (2) camera angle, (3) shape, form, proportion or direction of action, (4) perception of space, object size and depth cues, (5) field forces, and (6) multi-screen presentations.

The following empirical studies measure viewer responses to variation of image size. Tiemens'[49] visual analysis of staging techniques used during the filming of the 1976 Presidential Debates suggested that image size was a contributing factor in viewers' preference for one candidate over another. It also suggested that such variables as vertical vs. horizontal placement of visuals and framing vector orientation and asymmetry of visual elements were equally important factors in the study. Wood's[50] study on image size and speaker credibility relationships and McCain and Perenky's[51] study on the effect of camera shots in enhancing performers' attractiveness were both inconclusive possibly due to the inappropriate testing procedures employed. Acker and Tiemens'[52] study on image size as an element of visual language, Williams[53] study on the value of varying television shots, Wurtzel and Dominick's[54] study on the interaction of acting style and shot selection, and Baggeley and Duck's[55] study on the physiological effects of image variation, all underline the different effects that the size of images appearing on the screen have on viewers.

Camera angle as a variable of visual composition has been studied by researchers in photography, film, and lately in television. Tiemens'[56] study on the relationships between camera angle and credibility of speaker, along with Mandell and Shaw's[57] study on the effects of camera angle and body movements and Baggeley and Duck's[58] experiments on the effects of camera angle in educational TV programs are among the pioneering ones. The McCain et al.,[59] study on the effects of camera angle on source credibility and attraction is among the most recent ones on the subject. Extended from previous research on photography and film and expanded into television, these studies provide valuable insight into the general study of television composition. Such studies are positive contributions towards the building of the theory of television aesthetics.

Research on viewers' preference for certain shapes and viewers' perception of the orientation of objects within the visual field were conducted by such scholars as Dwyer,[60] who attempted to measure visual illustrations of different shapes and effectiveness of form, French,[61] who manipulated the complexity of various pictorial patterns to measure childrens' perception and response and Myatt and Carter,[62] who alternated such pictorial variables as colors, shapes, proportions and picture detail in order to measure their total pictorial effects on children. Viewers' preference for such patterns and simple figures as triangles, circles, squares and rectangles in order of preference has long been observed and studied by perceptual psychologists.[63] Studies on TV viewers' preference for visual stimuli based on the findings of such research is warranted.

Some significant empirical studies have been done on viewers' perception, cognition and response to such visual communication factors as depth cues, relative size and placement of objects on the depth axis by people of different cultures. These are Mangan's[64] study on the iconic (pictorial) literacy and education of people of different cultures, Evans and Seddon's[65] study on the perception of depth cues among Nigerian students, Deregowski's,[66,67] studies on depth cues and on pictorial perception of people from different cultures, Miller's[68] study on the perception of pictorial materials by people of different cultures and Nicholson and Sedden's[69] study on the perception and understanding of pictorial spatial relationships by Nigerian students. The rapid development of sattelite communication has skyrocketed the need for a global understanding of visual communication signals among all cultures.[70] Studies in this area will fulfill this need.

Observed and theorized first by such scholars as Arnheim,[71] Millerson,[72] Dondis,[73] and Zetti,[74] are the compositional factors involving the placement of visual elements within the picture field along with their interrelation-

ships and their interactions. Such factors, which are also called field forces (precisely because they forcefully interact and energize the field) are (a) asymmetry of the screen, (b) main direction, (c) magnetism of the frame, (d) attraction of mass, (e) figure-ground relationships, (f) psychological closure and (g) vectors. Empirical investigations derived from the generic theory called "field forces theory"[75] are of paramount importance to the study of television composition. Such studies cover the key variables involved in the construction of television pictures, including light and sound. The principles of visual composition such as movement, direction, balance, shape, form, growth, space, tension, expression, etc.,[76] along with the principles of visual perception such as constancy, space, depth, distance, motion, etc.,[77] and the neurological principles governing the processing and the cognition of visual stimuli by the two hemispheres of the human brain,[78] are all taken into consideration by the systematic study of the individual field forces.[79] A detailed review of existing research on field forces is provided by the author elsewhere.[80] However, it is worth reviewing those quantitative studies on the asymmetry of the screen, magnetism of the frame and figure-ground interrelations which, although inconclusive, have contributed greatly to the study of television composition. Avery and Tiemens'[81] study on the syntax of visual messages concluded that the semantic differential as a technique of measuring aesthetic dimension (such as the asymmetric placement of visual elements within the field) is more accurate than the Likert scale technique. Fletcher's[82] study on asymmetry employed a magnitude estimating measure. Although the study confirmed the left and right asymmetry of visual elements within the screen, it was inconclusive as to which side of the frame (left or right) is predominent or preferred. The only studies existing on figure-ground relationships as a field force in television pictures are

Baggaley and Duck's[83] study on the effects of adding background elements behind the newscaster and Coldevin's[84,85] two studies on the same topic. On magnetism of the frame as a field force, the exploratory study by Herbener, et al[86] emphasizes the importance of the frame in visual composition. Unfortunately, empirical investigations on the field forces of attraction of mass, main direction, psychological closure and vectors are non-existent.

The list of studies on the subject of multi-image presentations is very extensive. Practitioners, theorists, and researchers of multi-image communication cover both aspects,[87] the perception and the effects, of such presentations.[88] Zettl and his associates at San Francisco State University,[89] have extended such research to the specific study of multi-screen television. The factors they observed were (1) difference between divided screen and multi-screens; (2) number of screens and screen configuration; (3) screen Gestalt; (4) screen emphasis and vector structure; (5) montage; and (6) technical considerations. Explaining his approach, Zettl states:

> Rather than dividing a single screen into smaller units and thereby reducing each spatial field in size, we expand the field of the television screen into several self-contained, yet interdependent, space-time entities. Very much like the tiles of a mosaic, the multiple screens combine and expand into a complex, yet clarified and intensified screen Gestalt.[90]

Evaluating his findings Zettl emphasizes the need for additional investigation and research which are "essential if we are to develop a valid and useful multi-screen aesthetic".[91]

It is evident from this review that empirical studies on television staging are lacking. Only a small fraction of the compositional factors involved in the structure of television images have been studied formally.

As the possibilities for more such studies have increased, so has the immediate need for further research. As Herbener, et al states:

> The possibilities are extensive, and as graphic communication becomes increasingly influential in our lives, the empirical exploration of these possibilities becomes increasingly important.[92]

Research Studies on TV Editing

Time, motion and editing, collectively constitute the third major area of inquiry in television composition. In order to arrive at the television editing techniques that he considered unique to the medium of television, Zettl[93] extensively discusses the factors of time and timing in the making of the TV picture. Malik[94] also emphasizes the important part that movements (electronic beam, camera, inner movement) play in the construction of the moving image. Time and motion, as compostional factors, are considered the synthetic catalysts of television editing which Zettl calls "tertium quid", the third thing.[95] The significance of timing, movement and editing or montage as aesthetic energizers which stimulate viewer response has also been underlined by Millerson who has suggested various television editing techniques.[96]

Prior to television, the film montage theories developed by Eisenstein,[97] Pudovkin,[98] Arnheim,[99] Goldberg[100] and Gregory,[101] provided the stimulus for empirical research on such film editing topics and production variables as "The Effects of Motion and Cutting-Rate in Motion Pictures" by Penn,[102] "Film Movement and Affective Response and Effect on Learning and Attitude Formation" by Miller,[103] "The Bilateral Effect of Film Context" by Foley,[104] "Cognitive Aspects of Sequence in Visual Communication" by Worth;[105] etc. The writings of Millerson[106] and Zettl[107] have provided the theoretical concepts and the bases for research studies on TV editing already conducted and ones that must be pursued in the future.

The effects of such TV editing factors as "cutaways" or "cutting on action," "editing for a three person interview" or "ABC cutting," were studied by Baggeley and Duck[108,109] who conducted several experiments on such educational television production variables. However, qualitative research and verification on TV editing factors observed by Zettl[110] such as "continuing or converging index and motion vectors," the effects of such complex editing techniques as "analytical" or "sequential" or the effect of such idea-associative montage techniques as "comparison" and "collision" are lacking.

It has been speculated that the small size, low quality television picture requires fast-paced timing to attract and keep viewer attention. This often causes a hyper-activity or what Berger calls 'hyperkinisis'[111] in the viewer. According to Berger:

> The more we react to signals rather than symbols (though the relationship between the two is complicated, I admit), the more impulsive we become, the more we approach hyperkinesis. The programming on television also contributes to our excitability. In some commercials, for example, there may be as many as 70 or 80 quick cuts in a 60 second advertisement, which means that we become terribly 'speeded-up' as we watch the images flickering before us.[112]

However, Anderson's, et al[113] study which examines hyperactivity, impulsivity, disorganized behavior and shortened attention spans in pre-school children watching Sesame Street found no evidence to support the notion that "rapid television pacing has an immediate negative impact on preschool childrens' behavior."[114]

Undoubtedly, more such systematic research is needed on all these and other compositional factors pertinent to TV editing. The rules for selecting shots and the laws dictating their juxtaposition are crucial factors in television composition. As Millerson puts it:

> We may not know why we are influenced in particular ways by certain visual arrangements, but their effects are regular enough to provide us

> with rational working principles, so we no longer need to distribute subjects around tentatively, hoping that they will produce the effect we want. We develop a background of understanding that helps us to arrange, correct, and improve camera shots in an organized fashion.[115]

Research Studies on TV Sound

The study of the proper construction and arrangement of visual and auditory elements within the visual field (for communicative purposes), is what TV composition and TV aesthetics is all about. The conventional TV picture, and consequently the conventional TV program, consists equally of sights and sounds. The program's aesthetic impact depends entirely on the harmonic interaction and co-existence of both of these elements. Some observers, in fact, go as far as to suggest that "the ears may be more vital than the eyes in getting the most of television."[116] Critics of educational television productions claim that "historically the producers and reproducers of educational broadcast materials have concentrated on the video to the detriment of audio."[117]

The audio component of the ordinary television receiver has always been low in quality and incompatible with the video component. Partly because of misunderstandings as to what can be broadcast and partly because of the economics involved in correcting it, the sound quality of the average home television receiver is no better than that found in an inexpensive transistor radio. In explaining the reasons for such low quality television sound components, Schubin states:

> Why don't set manufacturers improve their sound systems? They say it's because television stations don't transmit programming that requires good sound. The television stations say they don't transmit such programs because their networks don't feed them. Their networks don't feed them because network audio lines are incapable of high fidelity transmission. And the common carrier in charge of the audio lines? They claim there is no need to upgrade the lines--witness the fact that the set manufacturers have not improved their sets.[118]

Empirical research on any aspect of television sound is minimal. Although there are numerous books on television sound (mostly "how to" manuals on the nature and the use of microphones, tape recorders, turntables, etc.), only a few scholars such as Zettl[119] and Millerson[120] have stressed the significance of TV sound as an aesthetic agent equally as important as visuals. Zettl, for example, observes that television "demands close-up [clear, distinct and supportive] sounds, small sounds brought close to the ears of the perceivers, very much like the visual close-up that can elevate a simple gesture to an intense art."[121] And Millerson theorizes that television's aural-visual relationships are due to (1) the picture's impact on the sound S⟶P, (2) the sound's impact on the picture P⟵S, (3) the cumulative effect of sound and picture S+P=E, and (4) some further idea carried by picture and sound combined S+P=X.[122] Both authors have provided a series of additional such observations and suggestions on television sound and picture combinations which require further investigation and verification.

Most of the quantitative research on the nature of sound (its perception and its effects on listeners) traditionally has been conducted by physicists,[123] perceptual psychologists,[124] and musicologists.[125] Equally, the bulk of studies on sound in the media of film and television is to be found in (1) studies dealing with the impact of audio in prepairing instructional materials in education, (2) studies compairing audio recorded messages as opposed to live instruction and (3) studies compairing the effectiveness of multiple audio channel recordings of instructional materials for educational purposes.

Among the studies exploring the impact of audio in preparing instructional materials in education are Dworkin and Holden's[126] pioneering study compairing filmstrip sounds with those of the classroom lecture and

Hempstead's[127] study on the influence of media-message components on student recall and attitude towards the learning experience. The representative studies comparing audio recorded messages as opposed to live instruction are the Morrel, et al[128] study investigating the cognitive and effective effects of audio-programmed electronic feed-back and oral-teacher feedback and a similar one by Mair and Griffith.[129] On the subject of multiple channel recording, Hartzman's[130] study on recognition learning under multiple channel presentations and Nasser and McEwen's[131] study on the impact of alternative media channels in learning are among the most important ones. A comprehensive review and reliable evaluation of the results of research on the use of audio-visual media for teaching adults is reported by Campeau,[132] although it is slightly outdated.

Empirical research studies on (1) the nature of television sounds, (2) the functions of TV sounds, (3) the characteristics of television sound as opposed to film sound and (4) the criteria for combining TV sound harmonically and compatibly with their respective pictures are non-existent. We have been provided with the observations and the theoretical concepts. What we need now is to empirically investigate and substantiate these observations. As Zettl suggested some time ago:

> A careful analysis of the relationship of pictures and sounds, their rhythmic and structural similarities and differences, their harmonic and contrapountal combinations, can, of course, lead to significant insights into the aesthetic potentials of the television medium.[133]

Summary

In summary, the slow development of empirical research on television composition is due to (1) the inability of early media theorists to separate the scope and the nature of television from those of the film, (2) the complexity inherent in the control and measure of television's compositional factors, and (3) the lack of understanding of biometric research procedures

(mostly in the areas of perception, neurology and physiology). Such negligence covers all aspects of film and television composition.

Existing empirical studies on television composition cover various visual composition factors. These were grouped into the four main areas of lighting and color, staging, editing, and sound.

1. The research studies on TV lighting and color include the compositional variables (a) which deal with the effects of lighting angles, (b) those which discuss the differences, the similarities and the effects of color vs. black and white pictures, and (c) those which examine color as an effective factor in instructional materials.
2. The research studies on TV staging include such compositional factors as (a) size of images, (b) camera angle, (c) shape, form, proportion or direction of action, (d) perception of space, object size and depth cues, (e) field forces and multi-screen presentations.
3. The research studies on TV editing include such compositional factors as (a) television timing and (b) continuity editing. A few pioneering studies on key film editing factors were also acknowledged.
4. Research studies on TV sound (as a compositional factor) are totally lacking. A few studies on the use of sound in preparing instructional materials were cited.

The very limited empirical studies on television composition found in this essay should encourage scholars to pursue additional research in this area. After all, television is a new and rapidly advancing medium. The technological developments in such areas as TV production automation, computerized editing, digital television, color synthesizers, etc., have, we suspect, a direct influence on the study of television composition and viewers' response to such visual messages. The structure of the visual

message is a complex phenonenon to study. Empirical investigation of the various compositional factors that contribute to the structure of the visual messages will help us to understand them and discover the unique characteristics of the medium. As Dondis points out:

> To understand visual media, to express ideas in visual terminology, it will be necessary to study the components of visual intelligence, the basic elements, the syntactical structures, the perceptual mechanisms, the techniques, the styles and systems. By studying them, we can control them as man has learned to understand, control and use language. Then, and only then, will we achieve visual literacy.[134]

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