LISTENER PREFERENCE FOR AMPLITUDE MODULATION STEREOPHONIC RADIO BROADCASTS AS COMPARED TO AMPLITUDE MODULATION AND FREQUENCY MODULATION STEREOPHONIC RADIO BROADCASTS

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PREFACE

Many persons played significant roles in helping me develop and write this project. Dr. Walter Ward should be acknowledged for his help on the statistical portions of this thesis. Dr. James Rhea, my major adviser, and Professor Marshall Allen, who served on my committee, receive my appreciation for their help and encouragement while writing this thesis.

I would also like to thank Jo Lou Spleth for her help in the English Department at Oklahoma State University. Without her assistance in working with the classes I tested, it would have been very difficult to execute the testing so efficiently.

Dan Schroeder, chief engineer for KOSU-FM, has been a great source of information and technical help. I thank him for his help.

Above all, I would like to thank my wife, Ellen. For more than three years she has helped me through the graduate classes and has assisted me with this thesis. It was her suggestion that sparked the idea of the research topic.

I hope it is understood I have isolated a small portion of the communication process. Many factors in a radio broadcast determine what an individual listens to. It is impossible to test with accuracy every influence an individual experiences. This paper isolates three types of Broadcasts (Frequency Modulation Stereophonic, Amplitude Modulation Stereophonic, Amplitude Modulation Monophonic)

produced by radio broadcasting. It is my hope the information in this study will stimulate other persons to look more carefully at the communication process in regards to human behavior.

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LIST OF SYMBOLS

AM	Amplitude Modulation
AMS	Amplitude Modulation Stereo
CD	Critical difference for analysis of variance Gap test
DB	Decibel
df	Degrees of freedom
F	F-ratio
FCC	Federal Communications Commission
FM	Frequency Modulation
FMS	Frequency Modulation Stereo
Hz	Hertz
IPS	Inches Per Second
kHz	Kilo Hertz
L	Left
NAB	National Association of Broadcasters
p	Probability
R	Right
TV	Television
RF	Radio frequency
v.	Versus
$\bar{X}$	Mean score

CHAPTER I

THE PROBLEM

The major question in this study asked if the audio quality of Amplitude Modulation Stereophonic (AM Stereo) would cause radio listeners to choose that medium for their listening preference instead of Amplitude Modulation Monophonic (AM) or Frequency Modulation Stereophonic (FM Stereo). The Federal Communications Commission (FCC) has looked into the feasibility of adopting AM Stereo for broadcast use. This is a new frontier for AM radio broadcasters.

Future manufacturers of AM Stereo transmitters and AM Stereo receivers are revealing technical information to the broadcast industry. There is virtually no information available to the industry dealing with the human preferences.

Information concerning listener/consumer preference for this new type of receiver or service is non-existent. If AM Stereo is adopted, broadcasters will have to decide whether to change their current facilities to AM Stereo from the current AM signals, based on technical information and speculation of human listening preference. If the FCC does approve AM Stereo broadcast standards, decision-makers in the broadcast field need unbiased information to assist them in future decisions on purchasing the new type of equipment needed for AM Stereo stations.

Purpose of the Study

This study investigated the comparative listener preference for AM Stereo, AM, and FM Stereo Broadcasts. The broadcast industry and the FCC were investigating the feasibility of AM Stereo and the possibility of introducing it to the market place. This study is meant to assist those interested in this topic by providing them with added information pertaining to the human preferences for the different Broadcasts. This study is meant to help both the FCC and broadcasters make decisions concerning AM Stereo. The FCC has not made a final decision on this topic. This study also suggested hypotheses for future work since this was the first research into preferences for the three types of broadcasts.

Value of the Study

It is hoped this study will benefit AM broadcasters investigating possibilities of AM Stereo broadcasting, and be a stimulus to mass communication researchers to delve deeper into this topic. Apparently, broadcaster's input from testing of the three Broadcasts was not of great concern to the FCC. This study would be of value to those trying to make decisions about AM Stereo based on both the human element as discussed in this study, and the technical element provided by the manufacturers of the AM Stereo products. Exactly when and who made the first developments in each aspect of broadcast communication will not be chronicled. The literature will focus on the history of AM Stereo.

Limitations

This was not a study of different quality and types of radio receivers. Regular broadcast reception was used. There were no AM Stereo receivers on the market at the time of this study. Thus, for testing purposes, an AM Stereo prototype receiver was used.

Chris Payne of the National Association of Broadcasters said, "If you use current day receivers to do listener research for AM Stereo, the only thing you would be testing is the differences in various types of receivers."[1] Thus, by using the broadcast monitors from licensed broadcast transmitters, the investigator looked at the actual differences in broadcasts not differences caused by receiver distortion. This is one reason receivers were not used.

Virtually no high-fidelity AM receivers existed. At the time of testing, AM receivers' reception quality was so poor even the available top-line tuners gave poor AM reception. The National AM Stereo Radio Committee conducted audio performance tests on common AM receivers on the market. Table I shows the output measurements from a Harris AM transmitter. When a transmitter was at 95 percent modulation, the amount of center frequency distortion, or shift, would not be any greater than 30 percent at 20 Hz modulated frequency or 1.10 percent for 10 kHz modulated frequency.

Table II shows the audio performance of a Delco AM car radio. When the receiver received a signal modulated at 90 percent the amount of distortion in the recovered audio was 3.2 percent. The distortion was generated when the audio was separated from the carrier and during amplification or increasing of the audio signal. The higher the

quality of the receiver the less distortion there would be in the recovered audio. The distortion was a function of the demodulation process, the process of separating the audio from the carrier.

TABLE I

HARRIS MW-1A 1 kW SOLID STATE AM TRANSMITTER
AUDIO RESPONSE AND HARMONIC DISTORTION
MEASUREMENTS TAKEN AT 95 PERCENT
MODULATION[2]

	Response Deviation	Distortion Percent
20	—.25	.30
50	—.30	.40
100	—.20	.27
400	0	.27
1kHz	0	.25
5kHz	—.2	.60
7.5kHz	—.3	.80
10kHz	—.3	1.10

Another limitation was in the respondent sample. Since the testing procedure required such tight controls, and only two persons could be tested at one time, Oklahoma State University English 1323 students were used. Most undergraduate students on the Oklahoma State University campus are required to take this course during undergraduate studies. The author chose ten sections at random from a population of 113 sections comprising 2,213 students in the Spring semester of 1980. One hundred students participated in the study.

TABLE II

HARMONIC DISTORTION VERSUS PERCENTAGE MODULATION OF THE AUDIO PERFORMANCE DATA--DELCO AM PUSH-BUTTON AUTO RADIO MODEL 70BP1[3]

Modulation Percent	Distortion Percent
10	4.5
20	2.0
30	1.5
40	1.7
50	1.7
60	1.9
70	2.1
80	2.5
90	3.2
100	4.6

Definition of Terms

The following terms were used in this study:

Audio - Of or pertaining to electric current and phenomena of frequencies corresponding to normally audible sound waves. The frequencies are approximately 16 to 20,000 Hertz.

Bandwidth - The number of Hertz per second expressing the difference between the limiting frequencies of a continuous frequency band. For example, the 2.5-3.5 kHz band has a width of 1 kHz. (One Hertz, abbreviated Hz, equals one Hertz per second.)

Broadcasting - The dissemination of radio communications intended to be received by the public. (Communications Act of 1934)[4]

Clipping - A distortion characterized by squaring off peaks of an audio signal, often caused by overloading and/or non-linearity.

Hertz - Cycles of signal or tone per second.

Noise - A random sound composed of many different frequencies not harmonically related. If noise is of too great intensity, it will impair the intelligibility of speech and music, reducing the listening pleasure. The average noise level above the threshold of hearing is about 40 decibels.[5]

Monophonic - Single channel.

Stereophonic - Two separate channels

Amplitude Modulation (AM) - The audio waves are impressed on the carrier wave in a manner to cause its amplitude (or power) to vary with the audio waves. The frequency of the carrier remains constant.[6]

Frequency Modulation (FM) - The amplitude remains unchanged but the frequency is varied in a manner corresponding to the voice or music to be transmitted.[7]

FM Stereophonic Broadcast - The transmission of a stereophonic program by a single FM broadcast station, utilizing the main channel and a stereophonic subchannel.[8]

Stereophonic Sound - The nature of man's hearing has prompted engineers to develop a system that permits the simultaneous transmission of speech or music from two separate sources such as both sides of an orchestra. When these signals are reproduced over two separate loudspeakers, spatial effect is produced that gives three-dimensional qualities to the sound. This provides considerable "realism" to the transmitted information.[9]

Multiplex Transmission - The simultaneous transmission of two or more signals within a single channel.[10]

ENDNOTES

[1]Chris Payne, Vice President, Assistant Engineer of National Association of Broadcasters, personal interview on AM Stereo, Washington, D.C., October 15, 1979.

[2]Joseph D'Angelo, "The Dawn of AM Stereo," db The Sound Engineering Magazine, 12 (September, 1978), p. 37.

[3]Ibid., p. 38.

[4]Sidney W. Head, Broadcasting in America: A Survey of Television and Radio (Boston, 1972), p. 131.

[5]Howard M. Tremaine, The Audio Cyclopedia (Indianapolis, 1959), p. 1.

[6]Broadcasting Yearbook 1979 (Washington, D.C., 1979), p. A-4.

[7]Ibid.

[8]National Public Radio Engineering Handbook, National Public Radio, Washington, D.C., January, 1978, Chapter VI, p. 1.

[9]George J. Angerbauer, Electronics for Modern Communications (Englewood Cliffs, N.J., 1974), p. 417.

[10]Harold E. Ennes, AM-FM Broadcasting Equipment, Operations, and Maintenance (Indianapolis, 1974), p. 23.

CHAPTER II

REVIEW OF THE LITERATURE

Early Developments of Stereo

On August 30, 1881, the German Imperial Patent Office granted a patent to the Parisian engineer, Clement Ader, covering "Improvements of Telephone Equipments for Theatres." This patent gave full details for a method of direct transmission of operas, plays, and other productions from the stage to the telephone subscriber.[1]

> The transmitters are distributed in two groups on the stage, a left and a right one. The subscriber (listener) has likewise two receivers, one of them connected to the right group of microphones and the other to the left. Thus, the listener is able to follow the variations in intensity and intonation corresponding to the movements of the actors on the stage.[2]

This was the first attempt at stereo broadcasting via telephone lines. The listener had to use two receivers, a cumbersome method later to be repeated in various methods of broadcast transmissions.

In 1925, the first American stereo broadcast experiment was conducted. F. M. Doolittle describes what took place:

> Considering the fidelity with which the present broadcasting apparatus transmits the frequencies employed in music, it may not appear reasonable to expect that any marked improvement is either necessary or possible. Certain factors besides tone values must, however, be taken into consideration. The phonograph and the radio loudspeaker have educated the ear to believe that a close approximation to true tone values is really all that can be expected, and hence the listener does not expect an exact reproduction. Reproduction in the strict sense, would of course, mean a rendition so nearly identical with the original one that

> one would be unable to tell, without bringing into play other faculties than that of hearing, whether or not he is present at and listening to the original performance. A close approximation to such reproduction is possible with the method here described.[3]

Doolittle was describing what took place at WPAJ, New Haven, Conn. WPAJ operated on an assigned frequency of 227 meters (1320 kHz). An additional wavelength assignment of 270 meters (1110 Hz) was secured so that binaural transmission might be possible.[4] A binaural sound transmission is one in which two microphones, used to pick up the original sound, are connected to independent corresponding transmitters which in turn send the signal to independent corresponding receivers used by the listener.[5]

Duplicate transmitters and two standard broadcast microphones were installed, one to each channel, with a seven-inch separation between their centers.[6] An important concern for today's stereo systems was met with this system. Ordinary reception was not impaired since the same program was heard on each frequency.

> If binaural listening equipment was used, the naturalness of reproduction was reported startling. Headphones were found to be essential, since loudspeakers mixed up the sound from the two separate channels and impaired the effect.[7]

Doolittle said a number of experimenters were instructed on binaural equipment installation. Listeners were enthusiastic over the new method of broadcasting.[8]

Few radio stations conducted experimental broadcasts at this time. Radio was young and not many people could afford the two receivers necessary for stereo broadcasts. The pioneering work of WPAJ was all but forgotten. Stereophonic broadcasting was idle for many years.

Frequency Modulation Adoption

The FCC allocated 13 channels to frequency modulated stations in 1939.[9] Major E. H. Armstrong was credited with the development of FM. By 1951, more than 600 frequency modulated transmitters were operating in the United States of America.[10]

Forms of Stereo Broadcast Experiments

There were many attempts at stereo broadcasting. Here is a brief history:

AM-AM This system was discussed earlier in the WPAJ experiment.

AM-FM Two stations are required; one amplitude modulated, one frequency modulated, and two receivers.

FM-FM Two stations and two receivers are required.

TV-AM or TV-FM The television carries one side of the audio while the radio carries the other. The most annoying part of this type of stereocasting is that if television alone is desired, the sound heard is only one half of the program unless the listener goes to the bother of setting up an AM or FM receiver.[11]

FM Stereo Adoption

Finally, in 1959, FM Stereo broadcasting was adopted by the use of multiplexing.

> Multiplexing originated as a way of sending several telephone messages over the same pair of wires without interference . . . Radio multiplexing is the practice of transmitting simultaneously from one transmitter, and then at one receiver, separating the messages so that each can be heard without interference from the other or others.[12]

The process used to select the FM Stereo system was similar to the situation where five systems are opting for AM Stereo today.

"By the spring of 1959, a total of 17 systems for FM multiplexing had been suggested."[13] On June 1, 1960, the FCC adopted the system proposed by General Electric and Zenith as the standard for the field.

RCA Studies

In the late 50s, RCA laboratories studied several AM systems. RCA noted that, although many systems were capable of good performance, the receiver design was complicated by necessity of recovering the (unmodulated) carrier for use in the demodulation process. They concluded that synchronous consumer AM receivers "were impractical, which was certainly true with the technology available at the time."[14]

The RCA method of AM Stereocasting was disclosed October 23, 1958. During demonstration early in 1959, Dr. J. Hillier said at the David Sarnoff Research Center in Princetown, New Jersey:

> Until now there has been no stereo system that operates entirely on the AM range. This has left a gap in pattern of stereophonic reproduction since the bulk . . . is on the AM band.[15]

AM Stereo Present

AM Stereo once again was in the testing field. In an effort to regain the listener rating shares lost during recent years, the AM broadcast industry sought to provide the same high quality stereo broadcast enjoyed currently by the FM listener. AM radio has long been considered a low quality broadcast medium, perhaps an image accepted in error.

> . . . AM stations are capable of, and some indeed are broadcasting a full fidelity signal. So, since degradation at the transmitting does not have to be the 'weak link', this leads us to an examination of the receiver.[16]

If AM Stereo is adopted, all AM stations would benefit because the quality of AM receivers manufactured today would be improved for greater reception demands.[17]

"The conducted audio performance tests on some typical monophonic receivers currently on the market . . . leave much to be desired in terms of audio quality."[18] In comparison to the transmitted signal, AM radio listeners simply are unable to receive a high fidelity sound when listening to AM. High fidelity was the ability of the receiver to accurately reproduce the sound transmitted with minimal distortion.

In the late 50s, during RCA tests, technology was not advanced enough to make AM Stereo practical. Now, with the modern integrated circuit technology, stereo carrier recovery is no longer complicated.

The FCC studied five proposed AM Stereo systems for possible adoption. These systems were developed by the Harris Corporation, Motorola, Magnavox Corporation, Belar Laboratories, and Kahn Communications. "Though consumers will need new AM receivers for stereo reception, each of the proposed systems is compatible with the mono receivers in use today."[19]

Harris System

To simplify this study, only the Harris system was used for research.

> The Harris system employs quadrature modulation with a reduced L-R [left channel minus right channel] component, which is equivalent to L and R modulation of two carriers separated in phase by 30°.
>
> All five systems, including the Harris, process the audio through a matrix for transmission and reception.
>
> Each system's stereo generator (similar to those used in FM) combined the two audio channels to give L+R [left channel plus right channel] and also subtracted them to obtain L-R signals. The stereo information is transmitted

as L+R and L-R information.

The AM Stereo receivers then demodulate the carrier and derive the L+R and L-R signals. Once again, the signals are passed through an audio matrix to obtain independent left and right channel signals.

Except for the Belar system, all of the proposed AM Stereo systems incorporate a low-frequency stereo-identification tone. The frequency of the tone varies from system to system . . . the tone is placed on the L-R channel signal and is designed to turn on a stereo indicator in the receiver and to possibly activate an automatic stereo/mono switching system.

The ID tone could also be used to carry low-speed digital data, such as station identification, which could appear on a numeric display in the receiver.

. . . to preserve audio separation, each system employs time-delay networks in the L+R and/or L-R paths. A finite time delay exists between the r-f [radio frequency] section and the modulator section of a standard broadcast transmitter. A delay network establishes the correct time relationship between the transmitted L+R and L-R signals for channel separation.

. . . several receiver manufacturers, including Pioneer and Sansui, have already recommended to the FCC adoption of the Harris AM Stereo system because of its technical advantages.[20]

AM Stereo Advantages

AM Stereo was to usher in a better quality of broadcast than is in general available with AM. "The new receivers may have virtually flat audio response out to 10,000 Hz, compared with current AM receivers whose response is often down 20 DB at 5000 Hz."[21]

AM Limitations

Receivers designed for AM signals also respond to a large variety of unwanted signals known collectively as interference. The AM Stereo systems cannot compensate for these basic problems of the AM Systems. These interferences can be classified into two main categories:

1. Man-made interference, comprising signals radiated by electrical equipment such as electric motors,

> neon signs, and switches. Man-made interference is particularly troublesome in large built-up areas such as cities because of the large amount of electrical equipment present and because of the difficulty of providing receivers with aerials which are clear of interfering fields.
>
> 2. Natural interference, such as signals generated by lightning flashes.[22]

If the amplitude of the transmitter signal is increased, the amplitude of the noise also increases.[23]

AM Stereo Decision

After hearing conflicting testimony from its various staffs, the FCC at its April 8, 1980 meeting, voted 4-2 to direct the Broadcast Bureau to resubmit a final recommendation to approve the Magnavox AM Stereo system. Larry Middlecamp, chairman of the committee responsible for this recommendation, described how they came up with this recommendation.

> A matrix of eleven performance factors (such as signal quality, degradation of monaural performance, etc.) was generated, and each of the five proposed systems were scored across the matrix. Weights were then attached to the various performance factors and an overall score was then derived. Market research professionals would call this a rank order, unidimensional scaling technique which reduces a great deal of complex information to a rather simplistic score.[24]

Apparently, broadcasters' input from testing was not of great concern to the Commission. "There was no mention of who tested the systems, and what they felt were the relative merits of each system."[25] The Office of Science and Technology, part of the executive office of President Carter which conducted the tests, evidently made its evaluations based on its own analysis and not the broadcasters'.

Many broadcasters and manufacturers have expressed displeasure with the decision. It seems the final decision may be changed.

FCC Commissioners Quello and Lee said, ". . . they would change their vote regarding the Magnavox choice if they felt that the broadcasters as a group didn't agree."[26] Possibly the Commission will reevaluate its decision and approve all five systems and let the marketplace decide the outcome. "No one thinks that the matter will slide through without some opposition. Petitions to reconsider are almost a certainty and that will take time as well."[27] The earliest possible estimate for AM Stereo to be on the marketplace is July 1981. With possible appeals and court rulings, it may be years before AM Stereo reaches the marketplace.

On August 1, 1980, the FCC reversed its decision favoring the Magnavox system and reopened the study of AM Stereo. A "Notice of Inquiry" was announced and the questions of which system and when the final decision would be made is pending.

Listener Preference Research

The literature review basically has been on a technical level. There has been no scientific study on listeners' preference for AM Stereo as compared to listening to AM or FM Stereo. This thesis is an attempt to test listener preference for AM Stereo.

ENDNOTES

[1]John Sunier, The Story of Stereo: 1881- (New York, 1960), p. 27.

[2]Ibid., pp. 24, 27.

[3]Ibid., p. 30.

[4]Ibid.

[5]Ibid., p. 16.

[6]Ibid., p. 30.

[7]Ibid.

[8]Ibid., p. 31.

[9]B. S. Camies, Principles of Frequency Modulation (London, England, 1959), p. 2

[10]Sunier, pp. 114, 116.

[11]Ibid., p. 116.

[12]Ibid., p. 119.

[13]Ibid., p. 116.

[14]Joseph D'Angelo, "The Dawn of AM Stereo," p. 37.

[15]Sunier, p. 134.

[16]D'Angelo, p. 37

[17]Chris Payne, Vice President, Assistant Engineer of National Association of Broadcasters, personal interview on AM Stereo, Washington, D.C., October 15, 1979.

[18]D'Angelo, p. 38.

[19]Ibid.

[20]Joseph D'Angelo, "AM Stereo Soon On the Air?", Popular Electronics (December, 1978), pp. 59, 60, 64.

[21]Ibid., p. 64

[22]Camies, pp. 1, 2.

[23]George J. Angerbauer, p. 400.

[24]"AM Stereo Decision for Magnavox," Broadcast Equipment Exchange (April, 1980), p. 1.

[25]Ibid., p. 23

[26]"AM Stereo Decision Up In the Air," Broadcast Equipment Exchange (May, 1980), p. 6.

[27]Deane Parkhurst, "AM Stereo Arrives!", Broadcast Communications (May, 1980), p. 52.

[28]Ibid.

CHAPTER III

METHODOLOGY AND DESIGN

Although AM Stereo Broadcasting was researched by the National AM Stereo Radio Committee and the FCC, no scientifically conducted studies for human preferences of AM, AM Stereo, and FM Stereo Broadcasts had been conducted. The subjects' preference for the three types of Broadcasts was researched through this exploratory study.

Equipment Used

Three stations were used in this study: KSPI-AM and KOSU-FM in Stillwater, Oklahoma, and CKLW in Windsor, Ontario. All three transmitting facilities met minimum required broadcast specifications. KSPI-AM was the source for the AM Broadcast. KOSU-FM was the source for the FM Stereo Broadcast. CKLW, which had selected the Harris system for stereo experiments, was the source for the AM Stereo Broadcast. An identical message was recorded from each station. In order to test listener preferences for each of the three Broadcasts, a musical selection, "If Loving You Is Wrong" by Barbara Mandrell,[1] was transmitted over each of the stations.

Since there were no AM Stereo radio receivers available for the general public's use at the time of this study, the Broadcasts were recorded directly from the broadcast monitors at the radio stations.

The broadcast monitor is a receiver specifically tuned to the station's transmitted carrier frequency. The receiver provides an accurate reproduction of the transmitted audio signal or broadcast. The use of broadcast monitors helped alleviate the differentiations caused by different qualities of radio receivers. The recording of the AM Stereo Broadcast was provided by the Harris Corporation. The prototype of the Harris AM Stereo monitor and AM Stereo transmitter were used to create the AM Stereo Broadcast.

The tape machine used for reproducing the Broadcasts transmitted by the three different stations was an Otari model MX 5050-2S reel-to-reel recorder. The frequency response was 30 Hz - 18,000 Hz with ± 2DB. The flutter and wow specification was .06 percent and the distortion was less than 1 percent.[2] The tape used for recording was Scotch 206. The recording speed was 7-1/2 inches-per-second.

For receiving the Broadcasts reproduced by the Otari, Sennheiser HD 400 headphones were used. The frequency range of the headphones was 20 Hz to 18,000 Hz.[3]

Types of Broadcasts

Each person heard a 25-second recording of number 1, the FM Stereo Broadcast; number 2, the AM Stereo Broadcast; and number 3, the AM Broadcast. To arrive at the 25-second presentation of each Broadcast, ten persons were asked before the study was conducted: "If you had to compare the three radio broadcasts, notify me when you have heard enough of each Broadcast or tell me when to stop the Broadcast so that you can make an accurate evaluation and comparison of each." The average length of time calculated from the responses of

the ten persons was 25-seconds. This seemed ample time for the respondents to make their judgments.

The participants in the study were not told the identities of each Broadcast. They were only told that what they listened to represented three different radio stations. Thus, preconceived notions by the participants about quality of monophonic and stereophonic broadcasts would not influence their judgment of the three Broadcasts presented. Since AM Stereo is a new concept, telling the participants about it may have caused confusion, misunderstanding, and/or response bias.

This study looked into the perceived judgments of participants on the quality of three different Broadcasts. The author recognized that other factors of listener choice come into play, such as listening habits and types of format. The communication process is very complicated and many factors influence an individual's listening habits to broadcast media. Purpose of this study was to isolate certain factors. These factors were AM, FM Stereo, and AM Stereo Broadcasts. In other words, because AM Stereo results in a better quality of Broadcast, will people be more likely to listen to AM stations, particularly if they are AM Stereo stations?

This study recorded participants' judgments of the quality of the different Broadcasts. Thus, it was assumed that if people liked one Broadcast more than another, they were more likely to listen to that Broadcast. The author also recognized that, because a person says (s)he liked a Broadcast does not necessarily mean that (s)he will change his/her listening habits because of the new Broadcast. However, if a person liked what (s)he heard, (s)he may be more likely to

choose that medium.

Selection of Respondents

Undergraduate students enrolled at Oklahoma State University in Stillwater, Oklahoma are required to take English 1323 sometime during their undergraduate studies. The author chose ten sections at random from the 113 sections which represented a population of 2,213 students in the Spring of 1980. One hundred students (50 males and 50 females) were actually tested.

Laboratory Experiment

A laboratory experiment was used for this research since it was important that the variance of all or nearly all of the possible influential independent variables not pertinent to the immediate problem of the investigation is kept at a minimum.[4] Besides the possibility of relative complete control, other strengths of the laboratory experiment are the possibility of manipulating one or more independent variables and the replication of laboratory experiments. Weaknesses of the laboratory experiment are the probable lack of strength of independent variables, the artificiality of the experimental research situation, the chance of false interpretation and the lack of external validity.[5]

Using a laboratory experiment was considered best by the author because differences in Broadcasts were being measured. Changing the environment at each presentation would cause accoustical variances which could influence the perception of the reproductive qualities of the presentation. Thus, different room accoustics would become

a factor in the experimentation which could have led to variances in Broadcasts. By keeping the room and listening equipment constant, the variables studied were not influenced by extraneous factors such as different room noises.

Measuring Instrument

Osgood developed the semantic differential to measure the connotative meanings of concepts as points in what he has called "semantic space."

> An actual semantic differential consists of a number of scales, each of which is a bi-polar adjective pair, chosen from a large number of such scales for a particular research purpose, together with the concepts to be rated with the scales. The scales or bi-polar adjectives, are seven-point rating scales, the underlying nature of which has been determined empirically. That is, each scale measures one, sometimes two, of the basic dimensions of factors that Osgood and his colleagues have found to be behind the scales: Evaluative, Potency, Activity. These factors may be called clusters of adjectives.[6]

The Evaluative meaning factor measures a person's attitude toward the three different Broadcasts (s)he heard. The Activity factor referred to the motion of the dynamics of the Broadcasts heard by the listener. The Potency factor referred to the power or strength associated with the Broadcasts heard. Thus, the synonyms for Evaluative are "Attitude" and "Value"; for Activity, "Dynamic"' and for Potency, "Strength."

The scales used included the following:

Evaluative Scales

Pleasant - Unpleasant
Clear - Hazy

Activity Scales

Sharp - Dull
Empty - Full

Potency Scales

Strong - Weak
Deep - Shallow

The judgments of what each person thought of the three Broadcasts were placed on seven-point scales. Each person then was asked to place a check closest to the adjectives that best described the Broadcast (s)he just heard. Each of the 100 subjects was presented with 25-seconds of Broadcast from each of the three broadcast types, FM Stereo, AM Stereo, and AM. The subjects were asked to rate each broadcast type on the six scales. For example, on a pleasant - unpleasant scale, if they felt that the Broadcast being judged was very closely related to pleasant, then they should place a checkmark as follows:

Pleasant X _ _ _ _ _ _ Unpleasant

The author assigned a number value to each space. The author then recorded the scores and calculated the probable evaluation (judgments) scores for each combination of evaluations. A very pleasant rating:

Pleasant X _ _ _ _ _ _ Unpleasant

was given a score of 7. An unpleasant rating:

Pleasant _ _ _ _ _ _ X Unpleasant

was given a score of 1.

Questions

If people had the option of listening to AM Stereo Broadcasts

will there be any observed difference in regard to listener preference among AM, AM Stereo, and FM Stereo Broadcasts?

1. Will there be any difference in the mean probable judgments of the AM and the AM Stereo Broadcasts?

2. Will there be any difference in the mean probable judgments of the AM and the FM Stereo Broadcasts?

3. Will there be any difference in the mean probable judgments of the AM Stereo and the FM Stereo Broadcasts?

4. Will there be any difference in the mean probable evaluations (judgments) of the Broadcasts by the males and the mean probable evaluations of the Broadcasts by the females?

Analysis

A total of 900 semantic differential scores comprised data for analysis of the main and interactive effects of three independent variables: Broadcasts, Meaning Dimensions and Sex. One variable -- Broadcasts -- was "built-in" through correlation and factor analysis of responses to the 18 combinations of variables, e.g., (2 categories of Sex X 3 categories of Meaning Dimensions X 3 categories of Broadcasts = 18). As it turned out, ratings clustered into three groups which clearly differentiated the Meanings for FM-Stereo, AM-Stereo and AM Broadcasts. These comprised the "built-in" variable.

Major analyses, then, sought to determine significant differences in Meaning observed between: 1) the types of Broadcasts, 2) the Meaning Dimensions, and 3) the two Sexes. Further, the investigator looked for interaction among the variables. For example, if the FM-Stereo Broadcast were assigned to a higher Meaning intensity, say,

than was AM-Stereo, was this due to a significantly higher rating by Females than Males? Or, perhaps FM-Stereo was perceived as more Dynamic than Potent, while AM-Stereo was seen as equally Dynamic and Potent. Since respondents rated several levels of a Broadcast on three levels of Meaning, a Type VI variance analysis was appropriate to determine the main and interactive effects of this particular mixed design.[7]

ENDNOTES

[1]Barbara Mandrell, "If Loving You Is Wrong," Moods, (ABC Records, Inc., Los Angeles), 1978.

[2]Daniel F. Schroeder, M.S., Chief Engineer, KOSU-FM, personal interview on quality of audio instruments (Stillwater, Oklahoma, November 20, 1979).

[3]Ibid.

[4]Fred N. Kerlinger, Foundations of Behavioral Research (New York, 1973), p. 398.

[5]Ibid., pp. 399-400.

[6]Ibid., pp. 568-569.

[7]E. F. Lindquist, Design and Analysis of Experiments in Psychology and Education (Cambridge, 1953), pp. 292-297. Type VI is a combination of a factorial and treatments-by-subjects designs. It shows the differences between the levels of one factor, as well as the effects of repeated measures on levels of two factors working independently and in concert. In this study, Sex was the one factor that gave repeated measures on two factors: Broadcasts and Meaning Dimensions.

CHAPTER IV

FINDINGS

Types of Broadcast Preferences

Principal components analysis with varimax rotation extracted four factors of Broadcast-Scale combinations from the 18 X 18 correlation matrix (three Broadcasts by six Scales: two Scales for each of the Evaluative, Activity and Potency Meaning Dimensions). The four factors explained approximately 71 percent of the variation in meaning scores.

Table III shows the correlations (factor loadings) of each Broadcast-Scale combination with its respective factor.[1] As it turned out, the original correlation matrix was reproduced sufficiently by four factors which nearly duplicated the three Broadcasts. That is, by scanning the underlined factor loadings in Table III, the reader can see a clear separation of factors along the Broadcasts.

Factor 1 easily can be labeled "AM Stereo" since scales on this Broadcast are correlated highest on that factor. Likewise, Factor 2 clearly is an "AM" factor. Factor 3 constitutes the "FM Stereo" factor with the exception of the Pleasant-Unpleasant and Full-Empty scales. Even on the Full-Empty scale, the loading is nearly as high on Factor 3 as on the relatively weak Factor 4.

TABLE III

FACTOR LOADINGS OF 18 BROADCAST-SCALE COMBINATIONS ON FOUR PRINCIPAL COMPONENTS

Broadcast-Scale Combinations	I	II	III	IV
FMS Pleasant-Unpleasant	.065	.056	.292	.821
FMS Clear-Hazy	.101	.071	.812	.037
FMS Sharp-Dull	.050	.052	.800	.125
FMS Full-Empty	.206	.038	.545	.625
FMS Strong-Weak	.124	.011	.658	.354
FMS Deep-Shallow	.319	.093	.760	.052
AMS Pleasant-Unpleasant	.678	.001	.049	.498
AMS Clear-Hazy	.758	.054	.190	.151
AMS Sharp-Dull	.835	.153	.128	.029
AMS Full-Empty	.834	.113	.059	.324
AMS Strong-Weak	.792	.209	.074	.156
AMS Deep-Shallow	.821	.159	.241	.050
AM Pleasant-Unpleasant	.173	.737	.096	.217
AM Clear-Hazy	.040	.855	.106	.218
AM Sharp-Dull	.146	.834	.131	.135
AM Full-Empty	.074	.880	.082	.044
AM Strong-Weak	.118	.830	.119	.185
AM Deep-Shallow	.111	.730	.008	.091
Variance Explained (percent)	22.2	22.8	15.9	9.8

For practical purposes, it can be said that the 18 Broadcast-Scale combinations can be explained by three common factors: AM Stereo, AM, and FM Stereo. These factors explained 22.2, 22.8, and 15.9 percent of the variation in meaning scores, respectively, for a total of 60.9 percent. Factor 4 explained only 9.8 percent and was discarded in the analysis.

To clarify, if each of the 18 Broadcast-Scale combinations had received the same relative rating by all 100 respondents, then one factor, not three or four, would have explained all the variation in responses - and that single factor would have included all the Broadcast-Scale combinations. In that case, one could only conclude that no sub-group of Broadcast-Scale combinations was viewed any more similarly than any other group.

To clarify the factor structure, one can take the first factor in which all six AM Stereo scales have the highest loadings. This means the AM Stereo Broadcast held similar meanings for the 100 respondents and those meanings were different from those held for the AM and FM Stereo Broadcasts.

Referring to Table III, for example, one can see that the AM Stereo Broadcast loadings on Factor 1 are high compared with loadings on the AM and FM Stereo Broadcast factors. In other words, the similarity in meaning that respondents held for the AM Stereo Broadcast was much higher than that between, say, the AM Stereo AM Broadcasts.

Differences in Preferences of Broadcasts

Simplifying even further, the patterns of meaning responses to

the three Broadcasts differed. This, however, is not related necessarily to the intensity of response to the Broadcasts. With this in mind, the author retained the three Broadcasts for the Type VI analysis of variance, which incorporated the two additional variables: Sex and Meaning Dimensions (Evaluative, Activity and Potency). Thus, the analysis paradigm comprised a 2 X 3 X 3 = 18 - fold crossbreak of average meaning intensities as shown in Table IV.

Analysis of meaning differences in Table IV basically answered the research questions posed in this study. Treated individually, the questions and relevant findings are as follows:

> Did the type of Broadcast explain the amount of variation in respondents' meaning scores? In other words, did the average meanings for AM Stereo, AM and FM Stereo Broadcasts differ beyond chance expectations? If so, how much of the total variation was explained by the three Broadcasts?

Disregarding Sex and individual Evaluative, Activity and Potency Meaning Dimensions in Table IV, the average meanings for the FM Stereo, AM Stereo and AM Broadcasts were 5.57, 5.02 and 4.26 respectively. These average, over-all meaning intensities would be expected to exceed chance expectation at least 999 times in 1000 similar experiments ($F = 28.02$, $df = 2/196$, $p < .001$). Ex post facto, difference-between-the-means tests indicated significant differences in meaning intensity followed the order of the absolute mean scores; i.e., FM Stereo, AM Stereo and AM.

Over-all meaning intensity was 5.03, interpreted as "slightly" favorable. FM Stereo's 5.57 average fell between "slightly" and "quite" favorable, while AM's 4.26 represented just above a "neutral" rating. AM Stereo's 5.03 was "slightly" favorable.

TABLE IV

AVERAGE MEANINGS ASSIGNED TO THE 18 COMBINATIONS OF BROADCASTS, MEANING DIMENSIONS AND SEX

	Broadcasts by Meaning Dimensions									
	FM Stereo			AM Stereo			AM			
Sex	Eval.	Act.	Pot.	Eval.	Act.	Pot.	Eval.	Act.	Pot.	Mean Totals
Female	5.98	5.67	5.36	5.34	5.19	5.01	4.97	4.58	4.73	5.20
Male	5.82	5.43	5.14	5.34	4.69	4.53	4.49	4.14	4.15	4.86
Mean Totals	5.90	5.55	5.25	5.34	4.94	4.77	4.73	4.36	4.44	

Did the various meaning dimensions (Evaluative, Activity, and Potency) explain the amount of variation in meaning intensity? If so, how much?

Taking the three Broadcasts, combined, respondents saw them differently in terms of meaning dimensions ($F = 24.44$, $df = 2/196$, $p < .001$).

The Evaluative Meaning, or over-all Attitude, toward the Broadcasts was 5.32 (between "slightly" and "quite" favorable). Average meaning intensities on the Activity and Potency Dimensions were 4.95 and 4.82, respectively, which leaned heavily toward "slightly" favorable.

Difference-between-means tests showed no difference between Activity and Potency Meaning intensities. However, Evaluative Meaning, or over-all attitude toward the Broadcasts, significantly exceeded Activity and Potency (critical difference = .147).

Did Sex explain the amount of variation in meaning? If so, how much?

Female respondents registered a significantly more positive meaning score than did Male ($F = 4.99$, $df = 1/98$, $p < .05$). A little more than a "slightly" favorable average rating of the three Broadcasts was assigned by Females (5.20), while Males held a little less than "slightly" favorable meaning (4.86). However, the difference in Sexes explained only 4.8 percent of the variation among the average meanings of the 100 respondents ($Eta^2 = 4.8$ percent). This means that 95 percent of the variation among the respondents probably was due to something other than their Sex.

Did the variation in meaning among the three types of Broadcasts depend on any particular Meaning Dimension more than another? Or on one Sex more than another?

As stated, the FM Stereo Broadcast elicited the highest positive meaning from respondents, over-all. In essence, the above research

question asks if this higher rating was due to its perceived Value (Evaluative Dimension) more than to its Activity (Dynamism) or Potency (Strength). Further, was the relative meaning assigned to one Broadcast, compared to another, due to Males more than Females? In other words, the question is whether Broadcasts interacted with Meaning Dimensions or Sex to raise or lower Meaning intensities.

Variance analysis showed no such interactions. For example, as shown in Table V, all the differences between the average meanings for Broadcasts "ran" in the same direction and showed insignificant differences in most cases.

TABLE V

AVERAGE MEANING INTENSITY SCORES FOR EACH BROADCAST MEANING DIMENSION COMBINATION

Meaning Dimensions	Broadcasts			Mean Totals
	FM Stereo	AM Stereo	AM	
Evaluative	5.90	5.34	4.73	5.32
Activity	5.55	4.94	4.36	4.95
Potency	5.25	4.77	4.44	4.82
Mean Totals	5.57	5.02	4.51	5.03

In Table V, a difference in Meaning Dimensions of .54 or higher was significant at the .05 level of probability. In the Evaluative row, for example, the difference between the average FM Stereo and AM Stereo Meaning intensity would occur by chance less than five times in 100 (5.90 minus 5.34 = .56). The difference between AM Stereo and AM also shows a significant difference (5.34 minus 4.73 = .61). The same trend of significant differences holds true for the Activity Dimension. The only exception was in the Potency row. On this Dimension, respondents saw no difference in the Potency of FM Stereo and AM Stereo or AM Stereo and AM. They did perceive FM Stereo as more Potent than AM. However, this differential variation was not strong enough to show an over-all interaction and should be considered simply a tendency. This suggestion has support from the fact the variation of average Meaning Dimension intensities among the three Broadcasts explained far less than one percent of the variation in scores on the two variables.

Accounting for Sex, the picture remained much the same as it was with Meaning Dimensions. That is Meaning intensity for the three Broadcasts was not related to Sex, as shown in Table VI. In fact less than one percent of variation in meaning was explained by interaction of Sex and Broadcasts.

At the .05 level of probability, a difference of .147 between any pair of row or column means was required (n = 150, df = 196). All possible pairs of means exceeded the critical value and the means fell in the same rank-order.

Put another way, the rank-order of Meaning intensities by Males and Females was the same for each of the three Broadcasts. Females

held a significantly more positive Meaning for each Broadcast - and across all Broadcasts: 5.67 minus 5.46 = .21; 5.18 minus 4.85 = .33; and 4.76 minus 4.26 = .50.

TABLE VI

AVERAGE MEANING INTENSITY SCORES FOR EACH SEX-BROADCAST COMBINATION

	Broadcasts			
Sex	FM Stereo	AM Stereo	AM	Mean Totals
Female	5.67	5.18	4.76	5.20
Male	5.46	4.85	4.26	4.86
Mean Totals	5.57	5.02	4.51	5.03

Did the variation in intensities among assigned Meaning Dimensions depend significantly on respondents' Sex? If so, how much?

Sex was not a factor in the relative intensity of Dimensions of Meaning assigned to the three Broadcasts, combined, as shown in Table VII. At the .05 level of probability, a pair of non-marginal average Meaning intensities in Table VII would have to differ more than .12(n = 150, df - 196). All nine possible row and column pairs exceeded that critical difference - and they differed in the same direction. Again, less than one percent of total variation in meaning was due to Sex-Meaning Dimension interaction.

TABLE VII

AVERAGE MEANING INTENSITY SCORES FOR EACH SEX-MEANING DIMENSION COMBINATION

	Meaning Dimensions			
Sex	Evaluative	Activity	Potency	Mean Totals
Female	5.43	5.15	5.03	5.20
Male	5.22	4.75	4.61	4.86
Mean Totals	5.33	4.95	4.82	5.03

In other words, the relative Meaning intensities of, say, Sex, held across the three Meaning Dimensions. This is illustrated simply by the fact that the significantly higher and more positive Meaning held by Females was borne out on the Evaluative AND Activity AND Potency Dimensions: 5.43 minus 5.22 = .21; 5.15 minus 4.75 = .40; and 5.03 minus 4.61 = .42, respectively.

A study of Table VII shows that the magnitude of Evaluative Meaning or over-all attitude toward the Broadcasts most obvious by both Sexes. Perception Activity and Potency differed less than did perception of Value vs. Activity and Value vs. Potency.

Homogeneity of Descriptive Scales

Analysis thus far has considered only the average Meaning scores. Respondents assigned the highest intensity to the Evaluative Dimension with second and third highest registered on the Activity and Potency Dimensions, respectively.

However, each Dimension was "defined" by two bi-polar adjective scales: Evaluative (Pleasant-Unpleasant and Clear-Hazy); Activity (Sharp-Dull and Full-Empty); and Potency (Strong-Weak and Deep-Shallow). Each scale then, should have elicited a similar meaning intensity on each of the three Broadcasts. If this were the case, one could say that either of the two bi-polar scales could be used to describe a particular meaning respondents held for any of three Broadcasts. In other words, "pleasantness" or "clearness" equally would describe respondent's Evaluation of the Broadcasts.

On the other hand, if differences were found between the intensities assigned to the two scales in any one Meaning Dimension, one would have to qualify the over-all findings outlined thus far. For example, the fact that the over-all Value placed on the three Broadcasts was more positive than that assigned the Activity or Potency Dimensions might be due to one bi-polar scale more than to another. This might be the case for one Broadcast more than another.

In essence, then, the following is an analysis of findings pertaining to the relative intensities of Meanings assigned via bi-polar adjectives and the interaction of those adjectives with one or more of the three Broadcasts. Factorial analysis of variance between average intensity scores in Table VIII showed significant differences in Meanings as described by adjective pairs ($F = 41.33$, $df = 5/1782$, $p < .001$), and between Meaning intensities assigned to Broadcasts ($F = 107.12$, $df = 2/1782$, $p < .001$). Interaction of Broadcasts and Scales was not significant. Absence of interaction means that the relative intensities elicited by the six adjective pairs was the "same" on all three Broadcasts. This is illustrated graphically by

the fact that the rank order of average meanings in each row of Table VIII follows the rank-order of the mean-total-row. The hierarchy of means, from high to low, is FM Stereo, AM Stereo and AM in all six rows of adjective pairs, as well as in the mean-total-row. There were some differences, however, worthy of mention in later discussion.

TABLE VIII

AVERAGE MEANINGS FOR THREE BROADCASTS ON SIX BI-POLAR ADJECTIVE PAIRS

	Treatments			
Ajective Pairs	FM Stereo	AM Stereo	AM	Mean Totals
Pleasant-Unpleasant(E)	6.23	5.65	5.20	5.71
Clear-Hazy(E)	5.51	5.02	4.25	4.93
Sharp-Dull(A)	5.31	4.99	4.27	4.86
Full-Empty(A)	5.79	4.90	4.45	5.05
Strong-Weak(P)	5.64	5.01	4.46	5.04
Deep-Shallow(P)	4.87	4.54	4.41	4.61
Mean Totals	5.57	5.02	4.51	5.03 GT

Since it already has been established that significant differences exist between the Meaning Dimensions in the rank-order of Evaluative, Activity and Potency and between the Broadcasts in order of FM Stereo, AM Stereo and AM, the author looked for any significant differences

between the two adjective pairs that comported to each Dimension. A critical difference of .284 in Table VIII was needed for an average difference between two scales to be significant at the .05 level of probability.

Evaluative Meaning

On this criterion, right-hand marginal means in Table VIII show a significant difference between the Pleasant-Unpleasant and Clear-Hazy scales of the Evaluative Dimension (5.71 minus 4.93 = .78). Since the critical difference for column means was .49, the Pleasant-Unpleasant adjective pair drew the more positive Meaning for all three Broadcasts (FM Stereo 6.23 minus 5.51 = .72; AM Stereo 5.65 munus 5.02 = .63; and AM 5.02 minus 4.25 = .77). So, each Broadcast was perceived as more Pleasant than Clear by respondents on the average.

Activity Meaning

On this Dimension, respondents saw the Broadcasts as "equally" Full and Sharp over-all (Full-Empty 5.05 minus Sharp-Dull 4.86 = .19). Also, the column cell criterion of .49 was not met on any of the three Broadcasts, although there was a strong tendency for FM Stereo to be perceived as more Full than Sharp (5.79 minus 5.31 = .48).

Potency Meaning

Broadcasts over-all, were viewed more Strong than Deep (5.04 minus 4.61 = .43), but this was due to the relatively higher "strength" assigned to the FM and AM Stereo Broadcasts. AM was perceived as

"equally" strong and deep.

Summary

Respondents' over-all Attitude (Evaluation), as well as their perceptions of how Strong (Potent) and Dynamic (Active) a Broadcast was perceived, was dependent on its type. The FM Stereo Broadcast was rated higher than were AM Stereo and AM on all three Meaning Dimensions. AM was seen as significantly less Valuable and Dynamic than either FM Stereo or AM Stereo. AM did "hold its own" with AM Stereo on one count, in that respondents saw it equally Potent with AM Stereo.

Regarding the Meaning Dimensions, themselves, and disregarding the type of Broadcast, respondents' over-all Attitude (Evaluation) significantly was more positive than were their ratings on Activity and Potency -- the latter two seen as equal in intensity. Females, incidentally, gave each Broadcast significantly higher ratings on all three Meaning Dimensions.

As to individual measurement scales, all three Broadcasts were rated more Pleasant than Clear. FM Stereo and AM Stereo tended to be seen as having more Strength than Depth. Further, respondents were inclined toward rating FM Stereo as having more Fullness than Sharpness.

ENDNOTES

[1]Each Broadcast-Scale combination was assigned to the factor on which it was loaded (correlated) the highest. This is shown in the underlined entries.

CHAPTER V

SUMMARY AND RECOMMENDATIONS

Summary

One hundred Oklahoma State University English 1323 students were chosen at random from a total population of 2,213 to participate in a laboratory experiment seeking listener's relative preference for FM Stereo, AM Stereo and AM Broadcasts. Osgood's Semantic Differential scales were used to measure the connotative meanings of the Broadcasts to each participant in the study. The Evaluative, Activity, and Potency meaning factors were used to measure each person's Attitude, Motion or Dynamics, and Power or Strength toward each Broadcast he or she heard. The author conducted a Type VI analysis of variance to determine the main effects of each Broadcast working separately and the interactive effects of Sex, Broadcast, and Meaning Dimensions.

On the whole, the 100 Oklahoma State University English 1323 students preferred the FM Stereo over AM Stereo and AM Broadcasts. They also preferred AM Stereo over AM Broadcasts. Sex made no difference in intensity of Meaning assigned to Broadcasts.

The audience's over-all attitude (Evaluation) toward Broadcasts was more positive than was its Meaning on the Activity (Dynamism) or Potency (Strength) Dimension. Further, listeners saw the Broadcasts

as "equally" Active and Potent (tending to be less Potent). However, FM Stereo and AM Stereo were not so sharply distinguished on Potency. Neither were AM Stereo and AM Broadcasts. FM Stereo, however, clearly was more Potent than AM.

Regarding Broadcasts themselves, FM Stereo drew the most positive response, followed by AM Stereo and AM, respectively. This was the case for both Males and Females, with Females perceiving each Broadcast more favorably than did Males.

On the "definitive powers" of adjective pairs, the Broadcasts were perceived as significantly more Pleasant than Clear on the Evaluative Dimension, but rated as "equally" Full and Sharp on the Activity Dimension. As for Potency, FM Stereo and AM Stereo were assigned more "strength" than "depth," while AM was seen as "equal" on those qualifiers.

In summary, FM Stereo, AM Stereo, and AM were seen by both Sexes as more Valuable than Active and more Active than Potent, although Potency tended less to distinguish FM Stereo and AM Stereo and AM Stereo and AM. FM Stereo was the most favorably perceived Broadcast best described as Pleasant, "equally" Full and Sharp, and Strong, in that order. Second most favorable Broadcast was AM Stereo, best profiled the same way as was FM Stereo. Least favorable was AM, characterized best as Pleasant, but to a lesser extent, "equally" Strong and Deep and "equally" Full and Sharp.

Conclusions and Recommendations

Presumably, subjects had no presentiment as to what the author was seeking. After testing, they were surprised and many times

confused to learn about AM Stereo. When told of AM Stereo, many times the subjects would say ". . . of course the FM was the best."

Over the years, most people have accepted AM radio as inferior to FM radio. This was due to the inferior quality of receivers. It will be very difficult for broadcasters to "educate" people about the better quality of AM Stereo. Many people will bring preconceived ideas about the quality of AM and be reluctant to change their perceptions of the Broadcast. Combining this with what the author's research revealed means broadcasters of AM Stereo, perhaps, will have a difficult time persuading listeners to "come back" to AM listening.

Other areas will have to be considered by AM broadcasters. "Broadcasters will have to reconsider their existing formats and give serious thought to whether their current format will work in a stereo environment."[1] Whether the AM broadcasters will go stereo or not, better receivers are likely to enter the market. AM broadcasters will have to deliver a better broadcast.

Most literature the author reviewed implied that if AM Stereo became available to the general public, then all things being equal, FM Stereo would no longer have an advantage over AM stations. Within this study's limitations, findings in this study refutted this claim. By making all things "equal" (the messages, the equipment, the testing) and presenting FM Stereo, AM Stereo, and AM Broadcasts, the 100 respondents, as a whole, preferred: 1) FM Stereo, 2) AM Stereo, and 3) AM. FM Stereo retained its dominance.

As a result of this study, the author saw several areas worthy of further study. A serious look at the eventual quality of AM Stereo receivers is one area. The whole process of allowing AM Stereo

on the market will be to no avail if the quality of the receivers remains inferior to FM Stereo receivers.

A randomized sample from a larger population is recommended. Due to the time, expense, and logistics involved, the author had to settle for a smaller population and intact groups.

The testing of all five systems (Harris Corporation, Motorola, Magnavox Corporation, Belar Laboratories, Kahn Communications) would be of value. Which of the five systems do listeners consider having the "best" broadcast? Which of the five systems has the "worst" broadcast?

Which speakers present the best quality of broadcast for the money? It is not only important to have a quality receiver but the speakers also should have the capability to accurately reproduce a broadcast.

What differences are caused in perceptions by listeners when a source is labeled FM, AM and/or stereo? The author is curious as to the extent labeling causes perceptions to be altered. Will the labeling of a broadcast "FM" cause the respondent to rate the broadcast higher than if the same broadcast is labeled "AM"? Does the meaning of "stereo" to a listener cause him/her to evaluate a broadcast differently?

ENDNOTES

[1]"AM Stereo: Ready Set; Waiting on the Go," Broadcast Management Engineering (October, 1979), p. 41.

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APPENDIXES

APPENDIX A

INSTRUCTIONS FOR EVALUATING THE BROADCASTS AND THE QUESTIONNAIRE

This study is for a research paper in mass communication. You will hear examples of broadcasts recorded from three different radio stations.

The purpose of this study is to measure the meanings of broadcasts to you by having you judge these broadcasts against a series of descriptive scales. In taking this test, please make your judgments on the basis of what these broadcasts mean to you. On each of the following pages you will find a different set of scales to be used in judging the different broadcasts. Please rate the broadcasts on each of these scales following the playing of each.

If, for example, on a pleasant - unpleasant scale, you felt that the broadcast being judged was very closely related to pleasant, you should place your checkmark as follows:

Pleasant X _ _ _ _ _ _ Unpleasant

If you feel the broadcast is quite closely related to one or the other side of the scale, you should place your check as follows, in the case it being quite closely related to pleasant:

Pleasant _ X _ _ _ _ _ Unpleasant

If the broadcast seems slightly more related to pleasant than unpleasant, you should check as follows:

Pleasant _ _ X _ _ _ _ Unpleasant

If the broadcast was no more related to pleasant than to unpleasant, then mark the middle or neutral space.

Special Note: If you consider the broadcast to be neutral on the scale (both sides of the scale equally associated with the broadcast or if the scale is completely irrelevant, unrelated to the broadcast) then check the middle space.

Do NOT look back and forth through the judgments. Make each judgment separate and independent. Check the scales at a high speed. It's your first impressions we want.

(TURN THE PAGE)

PLEASE ANSWER THE FIRST QUESTION

I am Male _____

Female _____

STOP! You are now ready to hear the first broadcast "A". Notify Mr. Beeby you are ready.

After hearing broadcast "A" check the appropriate spaces below.

Pleasant _ _ _ _ _ _ _ Unpleasant

Hazy _ _ _ _ _ _ _ Clear

Dull _ _ _ _ _ _ _ Sharp

Full _ _ _ _ _ _ _ Empty

Strong _ _ _ _ _ _ _ Weak

Shallow _ _ _ _ _ _ _ Deep

(TURN THE PAGE)

You are now ready to hear the second broadcast "B". Notify Mr. Beeby you are ready.

After hearing broadcast "B" check the appropriate spaces below.

Pleasant _____ Unpleasant

Hazy _____ Clear

Dull _____ Sharp

Full _____ Empty

Strong _____ Weak

Shallow _____ Deep

(TURN THE PAGE)

You are now ready to hear the third broadcast "C". Notify Mr. Beeby you are ready.

After hearing broadcast "C" check the appropriate spaces below.

Pleasant	_ _ _ _ _ _ _	Unpleasant
Hazy	_ _ _ _ _ _ _	Clear
Dull	_ _ _ _ _ _ _	Sharp
Full	_ _ _ _ _ _ _	Empty
Strong	_ _ _ _ _ _ _	Weak
Shallow	_ _ _ _ _ _ _	Deep

That concludes the presentation of the three broadcasts. Thank you for your participation. If you have any comments about the broadcasts you heard, please state them below.

APPENDIX B

ANOVA TABLE

ANOVA TABLE

Source	df	ss	ms	F	p
Total	899	3068.629	3.413		
Between Subjects	99	550.46233	5.56		N.S.
Between Sexes	1	26.69456	26.694	4.99	p<.05
Between Subjects Error	98	523.76777	5.344		
Within - Subjects	800	2518.16667	3.148		
Between - Broadcast	2	167.57567	83.788	28.02	p<.01
Between - Meaning Dimensions	2	40.96233	20.481	24.44	p<.01
Interaction - Sex and Broadcast	2	3.22211	1.611	.539	N.S.
Interaction - Sex and Meaning Dimensions	2	1.97545	.988	1.179	N.S.
Interaction - Sound and Meaning Dimensions	4	4.911	1.288	.31	N.S.
Interaction - Sex and Broadcast and Meaning Dimensions	4	2.81788	.704	.178	N.S.
Total Within - Subjects Error	784	2296.70223	2.929		
Error 1: Broadcast and Broadcast and Sex	196	586.16	2.99		
Error 2: Meaning Dimension and Sex - Meaning Dimensions	196	164.23	.838		
Error 3: Evaluation - Broadcast and Meaning Dimension-Broadcast-Sex	392	1546.31	3.944		

VITA

CRAIG CASSIDAY BEEBY

Candidate for the Degree of

Master of Science

Thesis: LISTENER PREFERENCE FOR AMPLITUDE MODULATION STEREOPHONIC RADIO BROADCASTS AS COMPARED TO AMPLITUDE MODULATION AND FREQUENCY MODULATION STEREOPHONIC RADIO BROADCASTS

Major Field: Mass Communication

Biographical:

Personal Data: Born in Enid, Oklahoma, July 16, 1954, the son of Mr. and Mrs. James F. Beeby.

Education: Graduated from high school in Marshall, Oklahoma, in May, 1972; received Bachelor of Science degree in Radio-TV-Film from Oklahoma State University, in May, 1976; completed requirements for Master of Science degree from Oklahoma State University in December, 1980.

Professional Experience: Announcer radio station KOSU-FM in Stillwater, Oklahoma, 1974-75; VTR Production Specialist, School of Veterinary Medicine at Oklahoma State University, 1975; Account Executive for radio station KVRO in Stillwater, 1976; Sports Director, Producer, Account Executive, Copy-writer for radio station KRPT in Anadarko, Oklahoma, 1976-77; Graduate Assistant Production and Announcing KOSU-FM, 1977; Adjunct Instructor, Department of Radio-TV-Film, Oklahoma State University, 1978-present; Operations Director KOSU-FM, 1978-present; Acting Manager KOSU-FM, 1980-present.