

AN EXPLORATORY INVESTIGATION OF THE EFFECT OF
IMPOSING A HEARTBEAT SOUND ON KINDERGARTEN
AND FIRST GRADE STUDENTS

By

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PREFACE

This study was undertaken with the hope that it might provide additional evidence to support the imprinting theory and thus become another tool by which the education of boys and girls could be advanced. An extra dividend could also be attained by aiding classroom teachers and administrators. It is the writer's belief that any method that suggests a possible means of relief from anxiety and the resulting tension of students needs to be thoroughly investigated.

The writer has so many individuals to thank for their help that it is difficult to know where to begin. A few of those whom the writer would like to acknowledge are Sheldon Coleman of the Coleman Company, Inc., Wichita, Kansas, who made the equipment available for this study, Dennis Main of the Main Electronics Company who taught the writer to operate the complex equipment, the teachers who participated in the study and to Sister Eileen Christopherson of Sacred Heart College, for her valuable advice and suggestions.

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CHAPTER I

NATURE OF THE PROBLEM

Introduction and Rationale

Teachers deplore the restlessness of many boys and girls and are concerned with the problem of how to reduce that restlessness. A recognized writer in the field of psychology states that restlessness is many times the product of emotional tension produced by anxiety.¹ There have been numerous methods advocated to reduce tension, such as making the classroom comfortable, interesting, cheerful and stimulating. A number of people have advanced the idea of playing soft music in the classroom in order to reduce tension.² These methods have all been recognized as having been effective, at least partially, although some children have responded positively, others indifferently and some even negatively.³

Understanding of the causes of restlessness of boys and girls in the classroom covers at least three distinct but related psychological areas of study. These areas are: the psychology of anxiety; the psychology of the subconscious; and the psychology of imprinting. Some of the works by reputable authorities relative to these three psychological areas are reviewed in order to establish the basis for this study.

Some psychologists have related restlessness to emotional tension or emotionality as shown by the following:

One of the simplest expressions of emotionality is restless movements, movements which are not directed to a certain goal but are merely an expression of tension.⁴

Levitt expands upon the above concept of anxiety induced in this fashion:

Tension thus may have two meanings with reference to anxiety and stress. Less commonly, it refers to a condition of the musculature which accompanies anxiety, or which may be an anxiety residual. More often, tension means a vague feeling of disquiet, a restlessness, a diffuse, unidentified wanting to do something that is a consequence of anxiety occurring at a level below conscious awareness. In this sense, tension is an intervening variable, a state which links unconscious anxiety to manifest behavior.⁵

The quotation below under the heading "Fear and Anxiety" illustrates one writer's views and exemplifies how the terms fear and anxiety may be used as interchangeable words:

From an early age all children are more or less troubled by fear, and some are so afraid that their freedom of action is seriously impaired. Adults, too, are often afraid, and many of them struggle with apprehensions that are rooted in their childhood fears. No one who is alert to currents in his own life and to circumstances in the world in which he lives can be without fear.⁶

The preceding quotation uses the term "fear." In another part of the book, the distinction between fear and anxiety is given in this manner:

The main distinction that has been made between fear and anxiety (a distinction we will adhere to in this discussion) is that fear is a response to an objective danger while anxiety is wholly or in large part a response to a subjective danger.⁷

The preceding thoughts by psychologists and educators have produced the following assumptions. Any child who, a comparatively short time before, had been relatively secure in the home but who is now thrust among strange people, strange surroundings and dominated by an adult teacher--regardless of how benign or friendly--and asked to change his established way of life, is surely going to experience some

degree of anxiety. It is generally conceded that anxiety creates tension, and tension is relieved by physical activity.⁸ If the anxiety level could be reduced, less tension would be evidenced in the form of reduced noise in the classroom.

The concept of reduced tension through reduced anxiety has appeal to educators. A recently published study has produced an idea that suggests a method may have been found to reduce anxiety and the resulting tension. In order to explore one of the facets of mental disturbance, Salk has done research on the possibility that human beings may have been audioimprinted with the heartbeat sound prior to birth.⁹ To test his ideas he arranged to have four groups of children observed. The observations were made in order to record the time taken for each child to go to sleep. Each of the groups of children was observed for four nights while exposed to each of the following: (a) a heartbeat sound at seventy-two paired beats per minute, (b) a metronome sound at seventy-two beats per minute, (c) recorded lullabies, and (d) no sound added to the room. The sequence of exposure to the various sound conditions was varied. The average time taken to fall asleep using the metronome was 49.25 minutes. When recorded lullabies were used the average time taken to fall asleep was 48.69 minutes. The children required an average of 46.04 minutes to fall asleep when no sound was used. When the heartbeat sound was used the average time taken to fall asleep was 23.00 minutes.

The results of the tests with the heartbeat sound strengthened Salk's¹⁰ earlier contentions that a subconscious reaction to either the sound of the heartbeat or to the rhythm of the heartbeat sound produced a sense of security and the resulting release of tension. He contended

that the fetus was imprinted with the heartbeat sound prior to birth.¹¹

The evidence presented in favor of the ideas of imprinting caused the writer to raise a number of questions. Some of the questions were: Will children of kindergarten and first grade respond by having less anxiety as evidenced by less restlessness when exposed to the sound of the heartbeat? Could the use of a heartbeat sound in the classroom be a simple, economical way to reduce tension in the classroom of elementary grades? How could all the attributes of the classroom be maintained and still allow testing to determine if restlessness was reduced?

In addition to the previous citing, Jersild and Menninger concur in the statement that anxiety is evidenced by restless movement; children tend to express anxiety in a number of ways such as excessive talking, shuffling of feet, walking about and playing with articles.¹² These physical activities would be conducive to increased noise in the classroom. The rationale for the statement of the problem is based on the premise that if the heartbeat sound reduced anxiety then the reduced anxiety will be evidenced by the reduced noise in the classroom.

Statement of the Problem

The purpose of this study was to determine if the use of a heartbeat sound in the classroom of kindergarten and first grade children would produce a reduction in tension and anxiety as evidenced by a measurable reduction of noise level in these classroom groups.

Scope and Limitations of the Study

The scope of this study is limited due to the subjects used in the

tests. Some factors that would cause the subjects that composed the classes to be regarded as not representative of the general population were: Classes were composed of approximately one-fourth Mexican-American children and many of these were bilingual. A second factor was that other race mixtures were not in proportion to the general population. A third factor was that parents in this district, who were receiving welfare, comprised a minimum of one-third of the total population of the district, again not in proportion to the general population. The following statements cannot be statistically substantiated but they are given in order to clarify the general atmosphere of the school in which these tests were performed. This district tended toward violence, numerous cases of wife beating, child beating, drinking, fighting and gambling were revealed to the writer and in several cases, evidence of both wife and/or child beatings were witnessed. The facts revealed here tend to designate the classes where the tests were made as being atypical and not representative of the general population.

Other factors that limited the scope of this study were: (a) The groups were selected on the basis of availability, and, as one author has pointed out, a group must be randomly selected in order to extend generalizations to other groups.¹³ Since this was an exploratory study and classroom groups were not randomly selected, the results could not be generalized to other groups.

Additional limitations fall into two general areas. The first area deals with the students' reaction and interaction with the people and things about them. There was no way to anticipate or control physiological or psychological reactions of the students to conditions relative to their home life, or their reactions with other students

while coming to school or while playing on the playground prior to school. Furthermore, after the children had gone into the classroom there was no way to control the psychological interactions among students in the classroom. A number of instances indicated a considerable amount of race prejudice. All of the cited instances of interaction might cause students to possess more than the average or normal amount of anxiety and tension.

The second area of limitation deals with the fact that one cannot be certain that sound level, as defined in this study, is a positive indicator of tension. Authorities have maintained that tension is indicated by restlessness, squirming about, talking, playing with pencils, dropping things and numerous other allied activities which heighten noise or sound levels in a classroom.¹⁴ It was not meant to infer that there were no other activities but noise-making that are of tension-relieving nature. There are numerous tension-relieving activities that do not necessarily produce noise, i.e., thumbsucking, daydreaming, etc.; but unless the heartbeat sound produced the reaction of causing children to cope with their tensions in a manner conducive to noise making on one day and on alternate days to cope with their tensions in a quiet manner, no change in the difference of the recorded noise level of the classroom would result.

Had it been possible to fit each student with devices to record respiration rate, pulse rate and other criteria recognized as more positive indicators of tension, other results might have been obtained; however, had such activities been conducted investigation of the problem would have been removed from the classroom and would have been placed in semi-clinical or laboratory situation. The object of this

study was to record the noise produced by the subjects in the classrooms with the smallest amount of outside influence possible.

Significance of the Study

Other than the one investigation carried out by Salk, a review of the literature did not reveal any study relative to using the sound of the heartbeat in relation to relieving anxiety of children.¹⁵ Psychologists report that there is a degree of anxiety prevalent in all students.¹⁶ Psychologists would like to find methods of relieving that anxiety. Likewise, teachers and school administrators are concerned with methods of reducing anxiety and the resulting tension and restlessness that are attributes of anxiety. The results of this study may provide data on the feasibility of reducing tension through the manipulation of sounds related to the psychological concept of imprinting.

The traditional approach to classroom control and pupil discipline by teacher domination with actual or implied force is being replaced by a desire on the part of the teacher to produce a more tension-free atmosphere in the classroom. Any study bearing implications of benefits to both children and teachers needs to be researched. This study is a departure from the traditional approach because it adds a new element to the teacher-pupil situation. The fact that it is an attempt to find additional resources to aid education is significant in itself. If further research can substantiate results to the point that application could be generalized to more children and adults, the scope should be broadened and the significance would be increased. If replication or expansion of this study of imprinting is done with significantly favorable results then one step will have been taken toward substantiation

of the imprinting theory and toward helping boys and girls. In either event, whether or not imprinting is found to be a factor in helping children and schools, the ideas on imprinting have been proposed and these ideas should be carefully examined.

The Basic Hypothesis

As indicated in the statement of the problem, the focus of this study was on the overall sound or noise level produced by the classroom groups as recorded by instruments indicating the tension or anxiety of a class of kindergarten and two classes of first grade boys and girls. An auxiliary control for the purpose of determining that no harmful effects would be caused to any one of the individual subjects who comprised the classroom groups was a check sheet to be filled out by the teachers involved. The purpose of this check sheet was to direct the attention of the teachers to the conduct of individuals to ascertain if any sudden radical changes in conduct had taken place. If such change had occurred and was determined by either the teachers or the researcher to be detrimental to the individual, the entire research project would have been discontinued. The research statement then became: When the heartbeat sound is utilized in a classroom with kindergarten and/or first grade boys and girls, the noise or sound level produced by that group will be significantly reduced, as compared to the time when the heartbeat sound is not utilized.

The General Hypothesis

There will be a significant reduction of the noise level when the heartbeat sound is produced in the classroom as compared to the time

when the heartbeat sound is not produced in the classroom

The Specific Hypothesis

There will be a significant reduction of the mean decibel reading in the classroom when the heartbeat sound is produced as compared to the mean decibel readings when the heartbeat sound is not produced.

Definition of Terms

The term anxiety is defined as a peripheral apprehension, neither verbalized nor conceptualized but consisting of any apprehensive movements occurring to a student. It is a complex reaction or response to an unrecognized threat or danger. It is a transitory state or condition of any organism that varies in intensity and fluctuates over a period of time. Anxiety is an abstract term; at this time there is no operational definition. The operational definition must be in the terms of the manifestations of anxiety as proposed by such writers as Menninger¹⁷ and Levitt.¹⁸ These writers concur in their statements that anxiety produces tension which in turn is exhibited by a number of physical activities, i.e., squirming about, excessive talking, aimless walking about--almost any aimless movements can be manifestations of a low-level anxiety state.

The term noise as used in this study is any sound in the classroom. It is operationally defined as all sounds or noises recorded on the equipment.

Sound may have different meanings to different people. The term sound has been used in a limited way in this report to apply to those vibrations produced when the heart beats. The medical profession has

characterized the diastolic movement of the heart as producing a "lub" sound while the systolic movement of the heart produces a slightly louder and firmer "dub" sound. The cycle of a healthy heart then produces a paired beat or "lub-dub" sound. In order to maintain a difference in terminology between sound and noise, the term sound is used only in connection with the heartbeat. A further limitation on sound in this instance was that the heartbeat was recorded at seventy-two paired beats per minute and reproduced in the classroom with the loudest part, or "dub" sound at a maximum of ten decibels of sound.

Tension is a form of stress and, as used in this study, it is a product of anxiety. As illustrated in the definition of anxiety, tension is a link between anxiety and physical activity. To paraphrase Menninger, this physical activity is, many times, in the form of restlessness, aimless, and unproductive movement.¹⁹

Rationale of Media Used

Teachers' verbal or written assessments of the effects on children in the classroom, produced by the heartbeat sound were considered undesirable for several reasons. Some of the reasons are: First, teachers tend to become engrossed in their teaching and consequently might not remember to make an evaluation. Secondly, it is difficult for a teacher to remain completely objective in reporting results. The process could suffer from a halo-effect, or the opposite might occur depending upon acceptance or rejection of the process on the part of the teachers. The third factor was that, if a comprehensive objective rating scale had been developed for the teacher to use, a new and foreign element would have been introduced. This foreign element would

then be the different activity on the part of the teachers when ratings were to be made as opposed to days when ratings were not made.

The objections to having an unbiased observer evaluate the reaction of students on this study was that a new person would be added to the classroom group with the resulting interaction of the observer with individuals who composed the group. The presence of an outside observer would tend to change the general atmosphere of the classroom and thus cast suspicion upon any results that might be obtained.

Psychologists have stated that tension is evidenced by physical activity. Physical activity tends to produce noise. The noise level of the classroom was selected to be the dependent variable.²⁰ The noise-level variable presented the advantage of being accurately measurable by instruments, without introducing the possibility of human bias.

Summary

This study was produced as a result of the report which gave evidence that infants and children had exhibited indications of a reduction of tension when exposed to the heartbeat sound. The writer projected the results of this study to the field of education with the following question: Would it be possible to reduce the anxiety level of elementary boys and girls in the classroom by utilization of the heartbeat sound? In order to find if elementary children might be aided by the heartbeat sound, three classroom groups were selected to conduct a study. The groups consisted of one kindergarten and two first grade groups.

FOOTNOTES

¹Karl Menninger, Martin Mayman, and Paul Prugser, The Vital Balance: The Life Process in Mental Health and Illness. (New York, 1963), p. 134.

²Dorothy Schullian and Max Schoes, Music and Medicine. (New York, 1948), p. 361.

³Ibid., p. 365.

⁴Kurt Lewin, "Behavior and Development as a Function of the Total Situation," Manual of Child Psychology. Chap. 16, p. 815.

⁵Eugene E. Levitt, The Psychology of Anxiety. (New York, 1967), p. 13.

⁶Arthur T. Jersild, Child Psychology. (Englewood Cliffs, New Jersey, 1960), p. 255.

⁷Ibid., p. 270.

⁸Ibid., p. 277.

⁹Lee Salk, "Thoughts on the concept of imprinting and its place in early human development," The Canadian Psychiatric Association Journal, II (1966), pp. 740-746.

¹⁰Ibid.

¹¹Ibid.

¹²Jersild, p. 275. Menninger also agrees with Jersild p. 146.

¹³Fred N. Kerlinger, Foundations of Behavioral Research. (New York, 1965), p. 196.

¹⁴Menninger, Mayman and Prugser, p. 146.

¹⁵Salk, p. S295.

¹⁶Jersild, pp. 255-263.

¹⁷Menninger, Mayman and Prugser, p. 130.

¹⁸Levitt, p. 104.

¹⁹Menninger, Mayman and Prugser, pp. 134-142.

²⁰Levitt, p. 52.

CHAPTER II

REVIEW OF THE LITERATURE

This study was initiated with the objective of determining if the addition of a heartbeat sound to selected classrooms would reduce the anxiety level of the students in those classrooms. It was based upon the phenomenon of imprinting; however, there are two additional areas in psychology that pertain to this study. One is the psychological area that studies the subconscious mind; the other is the psychological area pertinent to anxiety.

This chapter cites some of the works reviewed as they relate to anxiety and other writings pertinent to the subconscious mind. In addition, this chapter cites the history and describes a relatively large portion of the published work on the phenomenon of imprinting.

Anxiety and Tension

Anxiety has been defined in numerous ways. A definition from Webster might be used: "A painful uneasiness of mind over an impending or anticipated ill,..."¹ or a psychologist's view might be used, for example:

Almost everyone agrees that anxiety is an unpleasant-feeling state, clearly distinguishable from other emotional states and having physiological concomitants. In addition to this common core of meaning, however, the term takes on other nuances and shadings of meaning, depending upon the particular theoretical orientation and operational criteria employed by individual researchers.²

The quotation illustrates that anxiety can have different meanings depending upon the "theoretical orientation and operational criteria employed by individual researchers." This study will use the definition of anxiety as given in the definition of terms in Chapter One.

That such a condition as anxiety does exist is recognized and the fact that it occupies a prominent role in the mental health of mankind is illustrated by the following quotation:

If anxiety could be controlled by biological or social means, fundamental alterations in the organization of our civilization would ensue and the probability of individual happiness would be greatly enhanced....Anxiety is the most pervasive psychological phenomenon of our time....³

Anxiety is an abstract concept; the only way an operational definition can be given is in terms of its attributes. Two writers have identified as many as three hundred different operational definitions, all based on varying attributes of anxiety.⁴ A recognized author gives the following viewpoint pertaining to an operational definition of anxiety. "The definition is essentially the instrument or technique that is used to measure anxiety in the experiment."⁵ It is not possible to measure anxiety, but it is possible to measure attributes of anxiety. The conditions of this study made it necessary to measure a secondary attribute of anxiety--the noise produced by restless movement.

Perhaps it should be stated here that psychologists have recognized two different levels of anxiety. One form which is called state anxiety, commonly described as a low level anxiety condition ascribed to all individuals at varying times. The second is trait anxiety and is a characteristic of the individual. This form of anxiety is frequently referred to as acute or chronic anxiety. The person who has the trait anxiety may be referred to as an anxious person--one who

usually expresses an unusual amount of fear over various things. One might view anxiety on a continuum--the low level or state anxiety being a characteristic of more or less normal individuals; the person who has a high level of anxiety falls at the other, or high, end of the continuum. The term "neurosis" is often used to indicate the condition of a person who, over a sustained period of time possesses a high level of anxiety, although the time and level are unspecified by psychologists. The continuum would become further elongated and at some point beyond the end of state anxiety the neurosis or neurotic state would appear. The quotation cited below indicates that this particular writer, R. W. White, recognizes that anxiety is found in different degrees of intensity:

One is certainly not justified in asserting that people without neurosis are free from residues of childhood anxiety and defense. No one can get through childhood without anxiety, and no one is likely to be wholly free from the patterns of defense that served him in his early crises. It is perhaps reasonable to suppose that when childhood anxieties are less severe, the defenses will be less primitive, less indiscriminate, less likely to interfere with important directions of new learning....Case studies of relatively healthy people show that problems of anxiety and defense are part of the universal stuff of development.⁶

The focus of this study was on anxiety, no attempt being made to define the levels. The attribute measured--noise produced in the classroom--might change in intensity but not necessarily in its origin.

The fact that such a condition as anxiety exists is recognized, but there must be definite identifiable characteristics in order to measure the condition. The next area of the review will attempt to point out a number of ways the mind may try to maintain its balance. As the physical body maintains a balance commonly called homeostasis, the individual also attempts to maintain a psychological homeostasis.

This equilibrium is maintained by forming defenses against anxiety by means of defense mechanisms.⁷ Levitt states that about two dozen defense mechanisms have been listed depending upon theorist orientation and background. His list gives eight different defense mechanisms: avoidance, denial, repression, projection, regression and fixation, somatization, counter behavior, and compulsivity.⁸ An adult or a child may unconsciously resort to one or more of the listed defense mechanisms in order to avoid encountering a situation which may have undesirable connotations for him. Almost any situation may present a problem causing one or more defense mechanisms to be used. Anxiety, frustration, and tension can be brought about in almost any area of life as illustrated here:

Man tries to survive, with minimal pain and maximal pleasure, including the pleasures of achievement, of pride, and of loyalty to principle. All this requires an infinitude of doing, of trying and failing, of trying and succeeding, of trying and partially succeeding and having to compromise. It involves going ahead, stepping aside, stepping back, perhaps even running away. It involves fights and embraces, bargains and donations, gestures and conversations, working and playing, reproaches, regards and retrenchments.... The series of "one damned thing after another" which is said to constitute life refers to those successive irritations, changes, traumata, and emergencies which have been successively met with varying degrees of success in the course of one's development.⁹

In order to obtain temporary relief from anxiety or tension, people resort to many behaviors. These are common recourses, not symptoms, not marks of psychopathology, and considered to be within the range of normal behavior. Defense mechanisms are one way of dealing with anxiety and tension. Under more primitive conditions, when faced with a condition that produced anxiety, a child might resort to the defense mechanisms of fighting, screaming or running. In the modern classroom, social norms restrain the child but do not necessarily

remove the anxiety. The child, when placed in a situation that produces anxiety, may resort to defense mechanisms known as coping behavior to obtain a form of relief. A coping mechanism is used transiently until tension has declined and then discontinued until needed again.

Levitt has the following remarks relative to easing tension and anxiety:

The draining off of tensions is, in theory, different from preventing an awareness of anxiety. The latter functions totally on the unconscious level, whereas the individual may be aware, to varying degrees, of the tension-relieving properties of coping behavior. In examining instances of actual behavior, however, the distinction is not always so clean....Coping behavior probably appears more frequently when it is directly involved with a defense mechanism and should not be considered as a separate entity in such cases. The number and variety of coping mechanisms is practically limitless, depending largely upon the form of behavior regarded as acceptable by a society or of a subculture. Human motivation is so complex that no one can say exactly when a behavior is used exclusively or even primarily for the reduction of tension. Many behaviors have more than a single purpose. Some, in common use, appear clearly to be coping mechanisms.¹⁰

Without consciously thinking about their actions, human beings may adopt a number of different coping behaviorisms. Levitt has listed a number of coping mechanisms. Evidence of some of these behaviorisms are commonly observable in many classrooms.

1. Reassurance of touch, rhythm and sound, pleasant sensations which perhaps unconsciously recall the comfortings of infancy.
2. Eating, and other oral behaviors like smoking and chewing gum.
3. Ingestion of alcoholic beverages and drugs.
4. Laughing, crying, and cursing.
5. Sleeping.
6. Talking out, discussing problems with a sympathetic listener, or even just excessive verbalization.

7. Pointless overactivity, such as walking up and down, scratching, finger-popping and hand rubbing.
8. Working off, as in direct physical exercise.
9. Retreating into fantasy and day dreaming, especially fantasies in which one's problems are solved or do not exist.¹¹

The nine coping behaviorisms listed above are observable attributes of possible anxiety. Various coping behaviorisms are utilized by most so-called "normal" people at different times in their lives but these behaviorisms are also used by those who are recognized as needing clinical help.

Menninger offers this definition of those who are admitted to a clinic in a low-level state of mental illness:

...general psychomotor retardation, with difficulty and slowness in doing familiar everyday acts, in recollection, in concentration and in responsiveness to order.¹²

Since this study pertains to anxiety, the quotation by Menninger suggests that if the level of anxiety rises enough, then, other symptoms and other terminologies may be introduced.

Anxiety and the resulting tension can be found in many degrees of strength. The very condition of a child's being in school can be conducive to the production of anxiety and tension. When a child is in a formal school, he immediately is subjected to a certain amount of restraint. The natural inclinations are curbed; he is urged or pressured to learn something. Formal learning denotes teacher-direction which may or may not be the inclination of the student at that time or place. The natural desire of any human is to do what he wants to do.¹³ Add to this desire the multitude of thoughts and imaginations of each child interacting with other children; the daily encounters in his home life; the strangeness of a relatively new environment; and the child's

interpretation of each situation (without the benefit of age and experience to aid him in his interpretations). These circumstances are conducive to anxiety and tension.

There have been numerous studies of children and their anxieties and fears. Some of the studies have divided groups of children into high and low anxiety groups by the use of various anxiety tests. The children have then been tested as to their problem solving abilities in relation to their anxiety rating levels.¹⁴ Some inquiries seem to provide the conclusion that some level of anxiety is conducive to learning, while greater levels of anxiety inhibit learning.¹⁵

One writer has used the term fear and anxiety synonymously to illustrate how a child might feel, for example:

Fears formulated in terms of imaginary dangers or apprehension concerning misfortunes that might occur, seldom express themselves in sudden starts, cries, or fleeing. Imaginary fears leave nothing to flee from, for the child who does both the fearing and the imagining cannot physically run away from himself.¹⁶

Authorities who have studied the characteristics of anxiety are in agreement on two points: (1) Children do have anxieties; however neither are those anxieties always recognized, nor is the source of the anxiety-causing phenomenon inevitably recognized.

Educators and psychologists are concerned about children--the way children learn and the factors that influence that learning behavior. In much the same way that some psychologists have addressed their efforts toward recognizing and alleviating the anxieties of children, others have applied their efforts in attempting to understand and explain the characteristics of imprinting.

Imprinting

Perhaps the phenomenon of imprinting in both human and lower animals has been vaguely recognized for a long time; but, as so often happens in research, the first reports of the attributes of imprinting were written by people studying the lower animals. For clarification purposes the term "following tendency" or "tendency to follow" has been used in a number of the cases cited. This means a tendency for either the fowl or mammals to follow after the first moving object that strikes its eyes after it is born.

In 1937 Lorentz recognized a tendency of certain species of fowl to react by following the first moving object that the young birds were exposed to after they were hatched.¹⁷ This following tendency had been reported by Spalding in relation to incubator hatched chicks,¹⁸ and by Heinroth in relation to Graylag geese. Heinroth's contention was that if the young geese, just hatched, were exposed to humans instead of the normal parent, the young geese would thereafter respond to humans in filial fashion in preference to adults of their own species.¹⁹ He maintained that he had owned geese which had exhibited the following tendency at birth and even until they were adult birds; moreover, they appeared to regard him or members of his family as their species, even refusing to mate or associate with other geese of their own species.

Lorentz called the phenomenon "imprinting", and designated certain aspects of the imprinting process as being different from associative learning. Lorentz gives these as distinguishing characteristics of the imprinting process: (1) Imprinting could occur only during a very definite period of the animal's life, a period during which the organism was assumed to be in a critical stage of development. (2) If

imprinting on an animal had occurred, the process was irreversible and became the preferred or only stimulus toward which the following response would be directed.²⁰ In a later book, referring to Graylag geese, a very strong statement appeared:

Once their [Graylag geese] instinctive social reactions are transposed to a human being, their behavior does not change in the least even if they are kept for years with other members of their own species and without human company.²¹

Lorentz assumed a natural condition of birth where the first moving object would be the parent and he explained the imprinting process as the way the young acquired a "consciousness of species," a social behavior that would not go beyond the species but would go beyond the parent. This "consciousness of species" had the advantage of maintaining the species and also preventing cross breeding. Thorp appears to concur with Lorentz on his ideas relative to "consciousness of species".²² There have been other studies using mammals, but the results appear to have been neither as extensive or as fruitful as those using fowl.^{23,24,25}

The imprinting process was thought to be unique in that the exposure to the object must come within a relatively short time after birth. Some subsequent studies indicated that the critical imprinting time was different for different species. In a study on tufted ducks, the critical exposure time for imprinting was found to be prior to the subject's twelfth hour of age.²⁶ In imprinting for the coot, eight hours after hatching appeared to be the critical period.²⁷ One study recorded strong following tendencies by chicks as old as six days, although these chicks had not been exposed to moving objects prior to this study.²⁸ Another experiment was reported which indicated that the time of imprinting was not as critical as some had originally thought.²⁹

Some have questioned the statement that imprinting is irreversible. One published study indicates that the tendency of the subjects to follow (called the following response) deteriorates after a period of time.³⁰ As more studies were conducted it became apparent that the critical imprinting period was not as precise as had been originally thought; a revised hypothesis was developed. The critical imprinting period was hypothesized to occur during the time of a low level of anxiety or before anxiety was heightened by an appreciable amount. One writer states his convictions about imprinting during a low anxiety period in this manner:

We have maintained that the importance of this period with respect to the organization of the following response is a function, not of some specifically performed "growth plan," but of the presence of a low-anxiety drive that provides the occasion for the conditioning of certain associated responses.³¹

In order to determine if the critical imprinting time might be changed, another approach was tried in the form of tranquilizers. Drugs such as chlorpromazine and meprobamate were used as tranquilizers on mallard ducklings ranging in age from twenty-four to thirty-two hours. Chlorpromazine served to increase imprinting effectiveness at an age when the imprinting procedure was considered largely ineffective. However, meprobamate did not secure comparable results to that of chlorpromazine. The explanation was that chlorpromazine, being an autonomic suppressant, worked effectively while meprobamate, being a central relaxant, did not secure the same results.³²

Other studies have shown that the moving object does not need to be alive in order to promote the following tendency. A research study was accomplished where a small box was mounted on wires to provide movement. This procedure caused chicks to follow after the box and for

some time after to continue to hover around it.³³ James conducted studies on the hypothesis that imprinting could be accomplished by the use of flickering light. He called this process retinal flicker. By a series of tests with flickering light, his hypothesis was supported.³⁴

Explanations for the phenomenon of imprinting have, for the most part, been ignored despite a considerable number of studies which have been directed toward establishment of the fact that imprinting is an existing phenomenon. In a compilation of studies, Gray gives his interpretations of the relationship between socialization and imprinting and suggests that this may account for its existence:

If one gathers under the rubric of acculturation those events which differ from culture to culture and from group to group, then the former may be reserved for the primary attachment of the young to its kind....I wish to submit that socialization, whereby an immutable bond is fastened between the young and its kind, is essentially the same in most or all species where a social complex is an attribute of survival. In infancy there are specific and distinct periods for social development, and the relevant environmental occurrences in these periods are critical for the individual's welfare.... The present evidence is explicit that the infant's first social response is directed toward learning its parents. This process, as it has been described in lower animals, is called imprinting.³⁵

All of the previously cited studies of imprinting were accomplished by the observations of either fowls or mammals.

Gray, after expressing his ideas on socialization and imprinting, went further and introduced the thought that human infants were also subject to imprinting.³⁶ He maintained that there were four distinct stages in the development of infants. The first stage was a pre-learning period, the stage in which the higher parts of the brain are immature and conditioning was not possible. The second stage was the social response stage where, Gray contended, imprinting takes place. The third stage was a period of infantile fear. Finally, the fourth

stage was an in-group learning period when the infant learns the non-parental individuals about it.³⁷ It should be noted that Gray has stated that he feels the smiling response in human infants is comparable to the phenomenon of the following response of the lower animals. Gray and Salk did not agree upon either the time of imprinting or the factors that caused imprinting, as illustrated here by Gray:

It is reasonable to place the critical period of imprinting in humans from about six weeks to about six months. It begins with the onset of learning ability, continues with the smiling response and ends with the fear of strangers.³⁸

As reinforcement for his ideas on the time of imprinting, Gray cited studies by Bakwin of children who had been in children's institutions from a short time after birth until some time after six months of age. Bakwin compared these children with children of similar circumstances who had not been placed in the institutions until after they were six months or more of age. Eight different studies were outlined demonstrating that the mental problems of children who had spent their first six months in an institution were significantly greater than:

(a) those children who had been either taken out of the institution on or before they were three months old; or (b) those children who had not entered the institution until after they were six months old.³⁹ In a related study, Goldford acknowledged the existence of the phenomenon of imprinting and contended that if children had not been imprinted by the end of six months of life, then damage had been done to the infant and there was no evidence to indicate that the damage could ever be undone.⁴⁰

Salk's work, published in 1960, indicated that a human infant may be imprinted with the heartbeat sound.⁴¹ Either the sound or the vibratory rhythm caused the infant to exhibit a more tranquil behavior.

His research sustained the hypothesis that infants exhibited less anxiety when exposed to the heartbeat sound than they did to other sounds. He maintained that not only is the infant imprinted by the heartbeat sound but that the mother tends to hold the child to the left of the midline of her body for the dual purpose of reinforcing the heartbeat to the infant and also to receive both the vibrations of the infant's heartbeat and her own reflected heartbeat.

A related study was published by Weiland, a study in which mothers were observed in a pediatric outpatient clinic or well-baby clinic. Within the framework of this study, both the side on which the baby was held and the length of time it was held was recorded. After allowances had been made for left-handedness on the part of the mothers, the observations indicated a decided preference for holding the infant on the left side of the mother's body. The probability of this resulting by chance was computed to be less than .001.⁴²

In a second set of observations, Weiland counted three-hundred consecutive shoppers, both men and women, who came from a grocery store.⁴³ Of these, one hundred forty-seven individuals carried packages on the right side while one hundred fifty-three individuals carried packages on the left side. An extension of these observations raised the combined observations to four hundred thirty-eight package-carrying individuals. When the calculations were completed, exactly half of the individuals carried packages on the left side and the other half carried the parcels on the right.

The fact that mothers held infants to the left of the mid-line of their body appears to have significance for the heartbeat reinforcement idea. Weiland explained the difference of the two observations in

this manner:

Since carrying a package probably induces little, if any, anxiety it should not evoke the behavior in question. Holding a child, especially holding one for the first time, would be expected to evoke considerable anxiety as well as behavior which is associated with anxiety reduction. Once this pattern is established and associated with tension reduction from feeding and other ministrations which satiate the infant, it would be further reinforced.⁴⁴

The history, the causative factors, and the explanations for the existence of imprinting as it is known today are summarized in the next statements. Imprinting has been recognized since the early part of this century. The socialization factor of imprinting has wide acceptance. A number of research studies have been made in relation to the lower animals but few studies have been made that apply to human beings. Those research studies that have related imprinting and human beings have several points of agreement: (1) Imprinting in human beings does exist. (2) To be imprinted the subject must be exposed comparatively early in life to the imprinting stimulus. (3) Once accomplished, imprinting is irreversible. (4) After imprinting, the subject evidences reduced anxiety behavior, not only at the immediate time, but also at future times when the subject is exposed to conditions which duplicate those existing at the time of imprinting.

The basic causes of imprinting in human beings are not completely agreed upon by all those who have studied this phenomenon. Gray has proposed the smiling response, while Salk has contended the heartbeat sound or vibration of the heartbeat sound, is the basic imprinting stimulus.⁴⁵ Some of the reasons for the acceptance of Salk's heartbeat imprinting stimulus for this study were based on these facts; (1) Salk was aware of Gray's study and evaluated this in the light of his own experiences.⁴⁶ (2) Salk used more empirically verifiable data on which

to base his conclusions. (3) The conclusion that the heartbeat sound is universally present while the smiling response might or might not be present is, for current purposes, too complex to dispute.

There are points of agreement and of disagreement relating to the time of imprinting in human beings. The point of agreement is that imprinting must be done early in the life of the subject and during a time of little anxiety. Salk maintains that imprinting has begun prior to birth and is reinforced by the mother after birth, contrariwise, Gray contends that imprinting takes place after birth and before the individual is six months of age.^{47,48} However, the time of imprinting seemingly occupies less importance than does the fact of and the cause of imprinting.

Salk's reasoning--his conclusions and the data he provided to support his theory of imprinting via the heartbeat sound or vibration caused by the heartbeat--appears to this writer to be valid. Some of the immediate, practical reasons for his interest in imprinting are given in his words:

In the first place more people are in hospitals for mental disturbances than for all other diseases combined. Secondly, our resources for the treatment of disturbed patients are seriously inadequate and there is no foreseeable remedy for this situation. Thirdly and most important, even if adequate resources were available in terms of the trained staff, our techniques are not sufficiently effective to bring the patient to an emotional state comparable to what we might expect had the problem been prevented.⁴⁹

In previous studies, the general consensus of opinion was that a subject could only be imprinted if that subject perceived movement; contrariwise, Salk's study proposed the theory that imprinting could be done by an intermittent, repetitive, auditory stimulus.⁵⁰ This stimulus accompanied the being from the moment of conception up to the

time of birth, even after parturition, when the mother was in close proximity; consequently, the stimulus in the form of the heartbeat continued to reinforce the young. In order to avoid misinterpretation, some of Salk's thoughts are reproduced here. However, the reference number of the original work has been changed to conform to this current study to make it easier to refer to the work cited by Salk:

In addition to being irreversible, the effects of imprinting continue beyond early life. In connection with this it has been demonstrated that aspects of adult behavior are influenced by an imprinted stimulus even though the pattern of responding to that stimulus may not have been developed at the time of imprinting. During the critical period, when imprinting occurs, it has been observed that the organism shows no conspicuous signs of anxiety.⁵¹ Moreover, when the organism is subsequently in the presence of the imprinted stimulus, it is relatively free from anxiety. It must also be stated that the end of the critical period during which imprinting can occur seems to be that time when the organism shows fear responsiveness.⁵²

In approaching the subject of imprinting in the human, having knowledge that imprinting can occur only during a critical period of time which apparently ends when the organism shows fear responsiveness and under conditions which do not provide reward in association with the stimulus, we recognize immediately that this time must be prior to birth since the birth procedure in the human is considered to be fear arousing⁵³ On the other hand, tactile, kinesthetic and auditory stimuli do exist in the prenatal environment and have the necessary characteristics for imprinting.

For the purposes of this paper, we shall put aside the question of tactile and kinesthetic imprinting, and focus only upon auditory imprinting except to mention that in utero and prior to the onset of fear, the developing fetus is receiving constant intermittent and repetitive tactile and kinesthetic stimulation from pressure changes due to maternal movement and breathing.⁵⁴

Assuming there are future studies that reinforce these findings, the implications of imprinting can have a profound influence upon mankind, as illustrated by the following:

To begin with, under natural conditions the imprinting stimuli serve to bring the developing organism into proximity with conditions that enhance its survival. There is not only direct protective value resulting from this at a time when the

developing organism is helpless, but it serves as the base for all later learning. Imprinting compels the organism to seek continued sensory stimulation by coming into contact with development of behavior patterns that have adaptive value, through associative learning.⁵⁵

If further research along the lines of Salk's work extends and strengthens his contentions, then one can conclude that his final implications as to the value of imprinting are too limited. Salk's conclusions deserve to be given in his words:

If imprinting exists at the human level which these experiments suggest, we might find such a concept valuable in explaining the disturbed behaviour that we cannot alter or that which seems incurable. In fact, we could utilize the process of imprinting to facilitate the acquisition of responses that serve to enhance adaptive behaviour in place of later stress and by so doing, develop persistent or irreversible responses which serve to prevent severe emotional disorders.⁵⁶

Noted authorities have recognized the nature and symptoms of anxiety. Salk has not proven the existence of audio imprinting, but it appears that he has advanced a well-documented case for it. It is hoped that additional research along these lines will help to clarify this very interesting subject.

A final illustration that there are those who recognize the therapeutic effects of both the sound and the vibrations of the heartbeat can be found in a recently published article. Since the article is a short report with no given author its full content will be given here:

Designers in Vienna, Austria, say they have come up with a new way to relax. At right is a plastic construction called "The Yellow Heart." Its size: 13 feet by 10½ feet.

Two people can get inside it at a time. When plugged in, "The Yellow Heart" throbs with its own slow rhythm. Its designers claim that this causes the people inside to calm down to its pace. "It's almost like entering another world!" said one visitor. A model was displayed in the "PLASTIC" exhibit at the Museum of Contemporary Crafts in New York City.⁵⁷

In the current study some authorities have been cited who have studied both anxiety and its symptoms and a major part of the published work relative to imprinting has been reviewed. There is another area, contiguous to both the study of anxiety and the study of imprinting; this area is the study of the mental function that is pertinent to the subconscious.

The Subconscious

Freud has contended that all of the individual's experiences are retained in the subconscious and with proper stimulation these experiences can be recalled.⁵⁸ Menninger has stated that the conscious and unconscious are comparable to the iceberg, with only a small part, the conscious, as a mental activity we know about and usually control, showing on the surface.⁵⁹ There are those who contend that any experience, thought or sensation once having passed through the mind is never lost but is recorded in the mind, as illustrated by the following:

A large part of the gray matter that covers the temporal lobe may be called interpretive cortex....Functionally it may be considered to belong to a different integrative level than the so-called experience sensory cortex and motor cortex because it deals with the records of experience which have already passed through the mind. When a gentle electrical current is applied to this area of cortex the patient may, for example, exclaim suddenly, "I hear my mother and brother talking." In that particular case, when the surgeon stopped and asked, the patient explained that they were in the living room at home and she seemed to be there with them, seeing and hearing the same things that she heard and saw in some past strip of time. And yet, at the same time, she was aware of the fact that she was in the operating room on the operating table.

Many different past experiences have been recalled thus by the electrode, sometimes from a recent, and sometimes from a far-distant past. For example, the recall may have summoned a time of listening to an orchestra, a time of hearing and seeing a man at the piano in a cafe, a time of lying in the delivery room at child-birth, and many other personal experiences.

These flashbacks from the past carry far more detail than any person could summon voluntarily. Sometimes, instead of this type of experimental recall, the patient makes a sudden reinterpretation of the present time and situation, a false interpretation. For example, he may say suddenly, 'I am afraid,' as though the environment were all at once threatening.⁶⁰

The explanations of anxiety, the research on imprinting, and the testimonials of surgeons relative to retained memory suggest that the mind is virtually boundless in its capacity and is capable of retaining the impressions needed for imprinting.

Summary

Evidence has been presented to substantiate the existence of anxiety as exhibited by elementary school children and to describe its various aspects. Imprinting evidence has been documented. The views of some psychologists have been reviewed and the experiences of surgeons have been given in an attempt to better understand the concept of imprinting as it relates to this study. Chapter Three will present a detailed account of the methodology used for this experiment.

FOOTNOTES

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CHAPTER III

DESIGN AND METHODOLOGY

The purpose of this chapter is to present a description of the basic plan of the study--the sample of students selected; the equipment used; and the method in which the data were collected.

Basic Plan of Study

This study was designed to test the hypothesis: A group of children in a classroom would respond to an imposed heartbeat sound by generating less noise than it would generate without the imposed heartbeat sound. Three groups of children were selected, one group comprising the morning kindergarten group, while the other two groups were drawn from first grade children. The circumstances under which these groups were selected were outlined in Chapter One under the subheading of scope and limitation of the study.

The heartbeat sound was recorded on a continuous loop tape and then projected into the classroom by electrical wires to four speakers where the maximum sound of the heartbeat was measured at ten decibels. The term maximum refers to the loudest part of the paired beat of the heartbeat sound as received by the microphone and transferred to the decibel recorder. In order to test the hypothesis it was necessary to measure and record in decibels the noise produced by each classroom group, both with and without an imposed heartbeat sound. Actually,

each classroom group was both an experimental and a control group. By recording the noise produced by each classroom group each day and by adding the heartbeat sound to the classroom on alternate days, it was possible to arrive at a mean noise level for each group. Nine recordings were made of each classroom group with the heartbeat sound included. Further, a corresponding number of recordings were made with no sound added to the room.

In order to maintain objectivity, a number of restrictions to this study were specified in advance. Each criterion, along with its rationale, is listed below.

(1) The volume of noise should be recorded at the same time each day for each classroom group. Two reasons for this specification were: (a) Children would be studying the same subject at the same hour. (b) The classroom atmosphere would tend to be more uniform from day to day because the children had been in the classroom for the same length of time each day.

(2) Children were exposed to the heartbeat sound three times for one hour each day prior to the beginning of the test in order to allow them to become accustomed to the heartbeat sound.

(3) Teachers were alerted when the recordings would be made. They were asked to adhere, as closely as they could, to a routine class schedule. This was done in order to eliminate, as much as possible, the variable caused by students' making more or less noise while engaged in different classroom study activities.

(4) If any of the children were to ask about the heartbeat sound, the teachers were to postpone discussion of this until after the experiment was finished. This was done in order to avoid giving the children

any suggestion that they might be expected to act differently when they heard the heartbeat sound.

(5) To aid teachers in being more objective in their opinions, a check sheet was provided them each day. (See Appendix) This check sheet was provided in order to focus the teachers' attention upon the individual's reactions rather than on the classroom group as a whole. The object in making the records of most and least hyperactive subjects was for the benefit of the subjects. If, in the opinion of either the teacher or of the researcher, the heartbeat sound was causing any student to exhibit symptoms of behavior not conducive to that student's welfare, i.e., nervousness, hyperactivity, etc., the experiment was to be discontinued.

(6) The check sheet was designed to allow each teacher to include any comments they wished. They were urged to include material relative to any factor that might indicate that the classroom group was unduly tense or excited on that particular day. If the teacher reported any circumstances that indicated that her classroom group was unusually tense or excited, the recording would be rejected and another day would be selected to supplant the one rejected.

(7) No recording would be made immediately preceding or following a holiday because of the possibility of the extra excitement students might feel at that time.

(8) Because some teachers are convinced that children are hyperactive when the barometric pressure is unusually high or low, it was decided that no sound recordings would be made if the barometric reading was more than one half inch of mercury above or below the norm as established by the local weather bureau.

(9) All of the classrooms were provided with either functional or facsimile equipment at all times. This was done in order to keep the appearance of the room the same at all times and thus not provide children any reason to feel that the classroom had been changed.

The electrical sound recording device, the tape recorder and the potentiometer for calibrating the sound level were comparatively heavy and bulky. To facilitate ease of handling, the equipment was mounted on a large library cart. In order to avoid a possible source of bias in conducting this study, the decision was made to set up the functional microphone in one classroom prior to the children's entrance into the school building. The first sound recordings were made in a first grade classroom between the hours of nine and ten in the morning prior to their recess period which began at eight minutes after ten o'clock. When this first group left the room for recess, the functional microphone and other equipment was transferred to the kindergarten classroom. Facsimile equipment replaced the functional equipment in the first grade classroom. During the second period the recordings were made of the kindergarten group. The kindergarten room was constructed so that it was necessary to pass through the classroom in order to get to the room where the equipment was kept while the recordings were being made. To avoid disturbing the students by entering and leaving the room, an electric timer was utilized to switch the equipment on and off at the prescribed time. The recording time for the kindergarten group started at twenty minutes after ten in the morning, and continued for one hour.

Sound data was recorded daily for the other first grade group beginning at fifteen minutes after one in the afternoon. During the noon hour the equipment was installed, connected, and checked to make sure

it was functioning satisfactorily. Again, the electric timing clock switched the equipment on and off at the prescribed time.

The Sample Used for the Study

It was not possible to randomly select groups or individuals that comprised the groups because of two factors. The first factor comprised an administrative problem--the time needed to administer the test. The time needed to install and test the equipment and to avoid the days before and after a holiday consumed a large part of one semester. The second factor concerns a matter of feasibility, involving the problems caused by the weight, size and expense of the testing equipment involved. This "feasibility" factor prevented either transportation or storage in another school while making additional experiments. Because of these two problem areas, selection of the groups was restricted to the available groups in that particular school. Statisticians have outlined criteria by which generalizations may be made relative to the total population. One such criterion states that individuals who make up the group to be tested must be randomly selected from the total population.¹ Because it was not possible to randomly select individuals who comprised this group, generalizations of the results of this study cannot be extended beyond the group tested. This study, therefore, must be termed simply an exploratory or pilot study.

Several general characteristics of the three classroom groups were:

- (1) The school was designated as a Title I school indicating that a relatively high percentage of the students were from a low socioeconomic background.

(2) The groups were composed of varying proportions of Mexican-American, Negro, Indian, Oriental, and White Caucasian extraction.

The rooms in which the experiments took place were typical of many classrooms. The two first grade rooms had individual floor areas of nine-hundred square feet each, while the kindergarten classroom occupied approximately twenty-five percent more area than a first grade room. Ceiling heights in all rooms measured eleven feet.

Some specific characteristics of each classroom group were the following:

(1) One first grade class was composed of twenty-three students--twelve boys and eleven girls. One boy was approximately one year older than the others because he was repeating the first grade.

(2) The other first grade class was composed of twenty-four students--twelve boys and twelve girls. One girl was approximately one year older than the others because she was repeating the first grade.

(3) The kindergarten group was composed of eighteen children, ten of whom were boys. There was one boy who was repeating kindergarten.

The Equipment

The equipment used in the experiment consisted of a number of items, some of major and some of minor importance. The fact that it was considered desirable to have the wires that went to the speakers in each room concealed, dictated that enough wire for each individual room be installed for the duration of the experiment. This made it necessary to use not only the addition of the extra wire, but also sixteen extra alligator clips and eight telephone jacks which could be

soldered to the wires and left in each room. By using the alligator clips and the telephone jacks it was possible to exchange the facsimile equipment with the functional equipment in a relatively short period of time. Other equipment used is described below. (1) Figure I, page 45 pictures the potentiometer. (2) Figure II, page 46, shows the sound recorder. (3) Figure III, page 47, presents a composite picture of the major equipment with the exception of the electrical speakers.

- Speakers: Eight, ten inch (four speakers were never transferred from one classroom)
- Replica Speakers: Four
- Microphone: One, nondirectional, with thirteen meters of lead cord.
- Replica Microphones: Two, with the necessary lead cord.
- Potentiometer: One, used for activating and receiving electrical impulses from the microphone, also used as a decibel meter.
- Decibel Recorder: One, used in connection with the potentiometer to scribe on a moving tape so that the sound impulses being brought in from the classroom could be constantly recorded.
- A Tape Recorder: One, used in connection with a continuous loop tape on which the heartbeat sound had been recorded.
- A Mixer Connection: One, used between the electrical output of the tape recorder and the speakers in order to balance the sound from each speaker.

Electrical Timer: One, used to turn the electric current on and off at the prescribed time, also used to avoid having to go through classrooms.

Use of the Equipment

Prior to the study, wires were suspended at equal length from the center of each classroom ceiling with a loop in each one to support the microphone. A permanent hook was attached to both the functional microphone and the replicas, thereby facilitating greater speed in exchanging the microphone from room to room. Speakers were mounted on each wall in each room. Wires were concealed and led to the equipment cart where the microphone wire was attached to the potentiometer and the speaker wires were plugged into the mixer. After the electrical fixtures had been connected, a test was made. When the equipment was determined to be working satisfactorily, the microphone was removed from the ceiling position and used as a probe to determine if there were any areas in the room that were getting appreciable greater or lesser amounts of sound than were other areas. When these areas were found, the angle of the speakers was adjusted and the mixer was increased or decreased to adjust the volume of the speakers closest to that area. The speakers were all adjusted for a balanced sound. As furniture was moved from time to time in the classroom, it was necessary to repeat the test probe and balance the sound in the rooms.

The Method of Collecting Data

The data collected consisted of the volume of noise or sound, measured in decibels, produced by three different classroom groups.

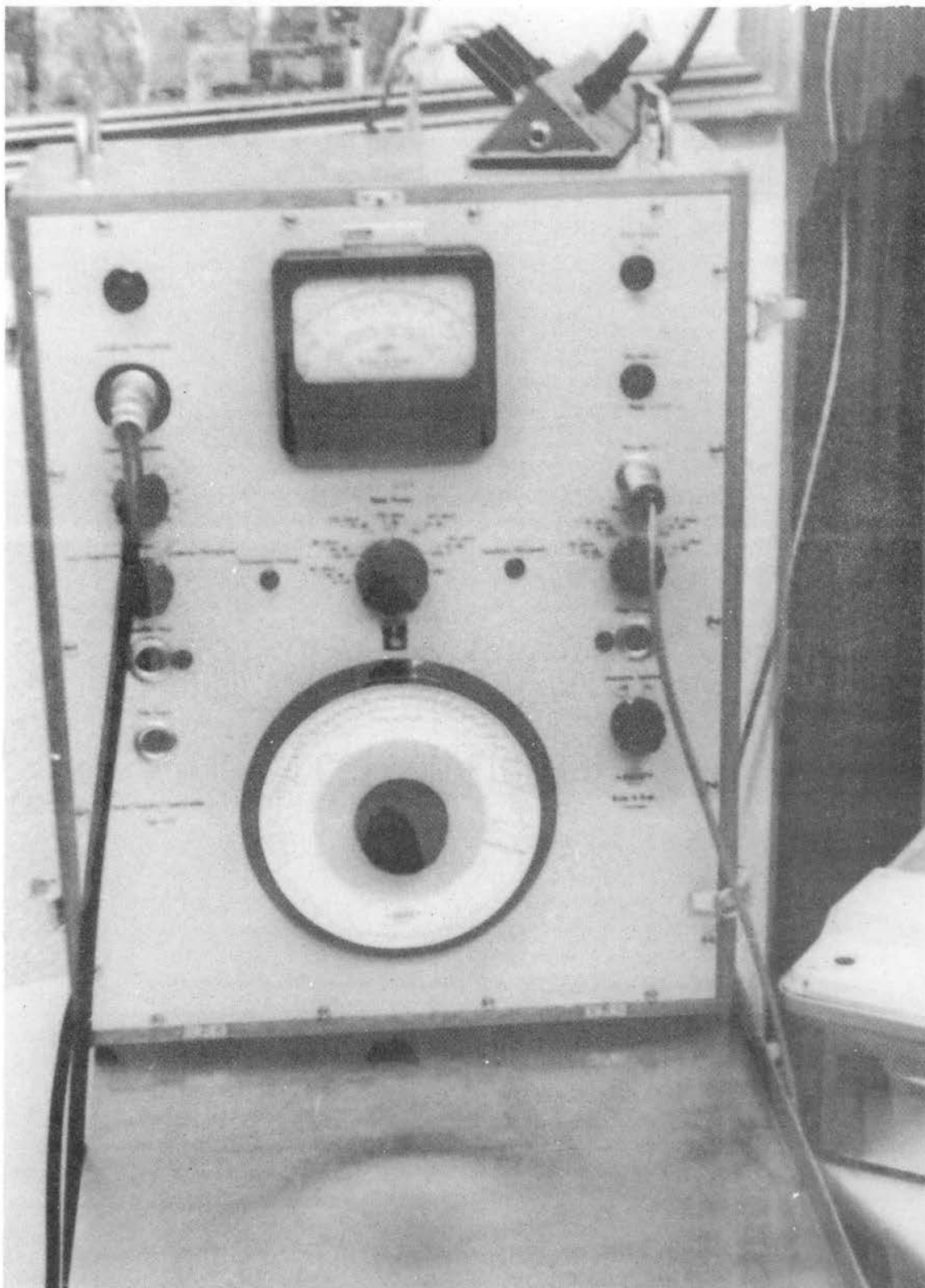


Figure 1. The Potentiometer

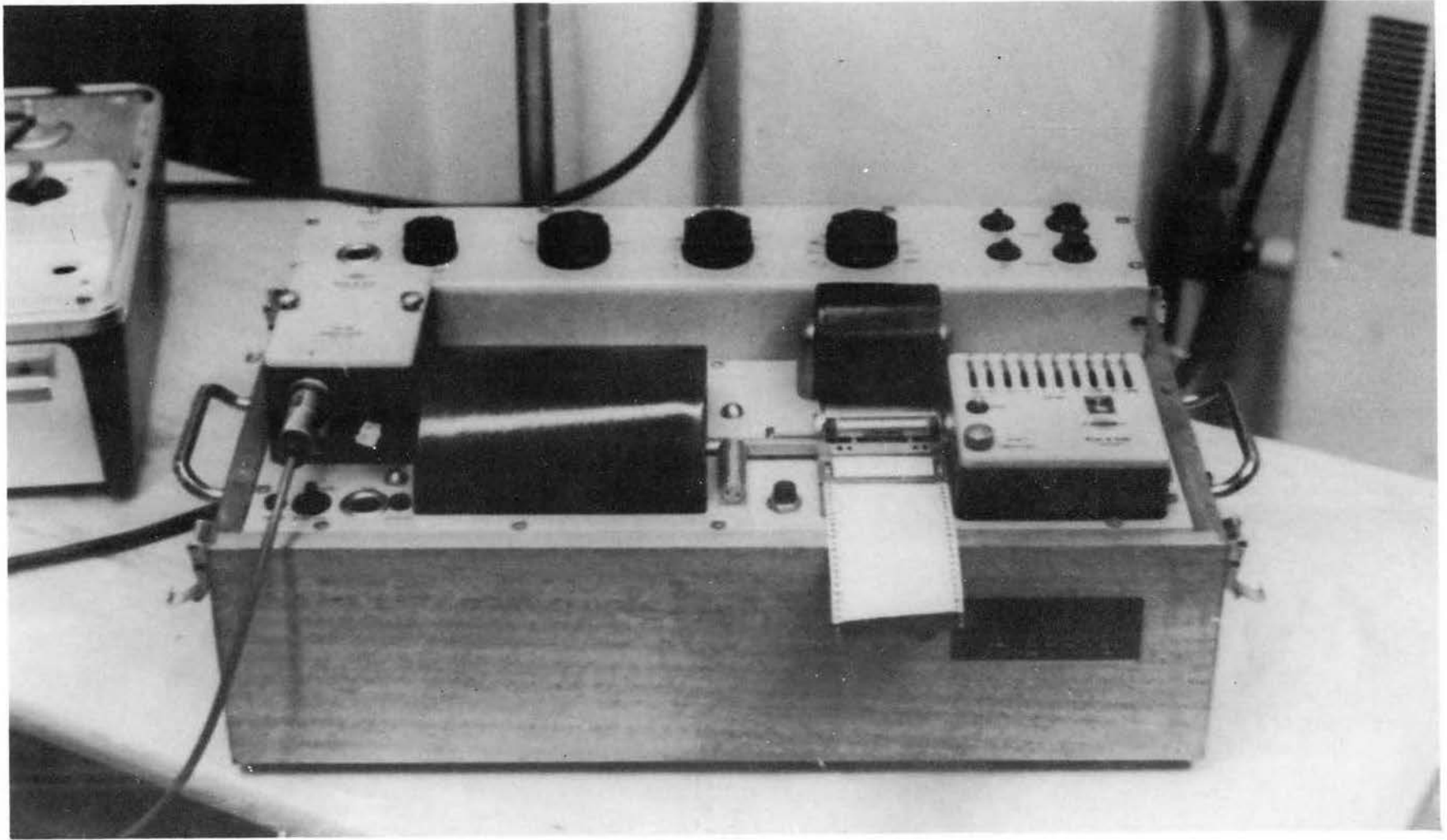


Figure 2. The Sound Recorder

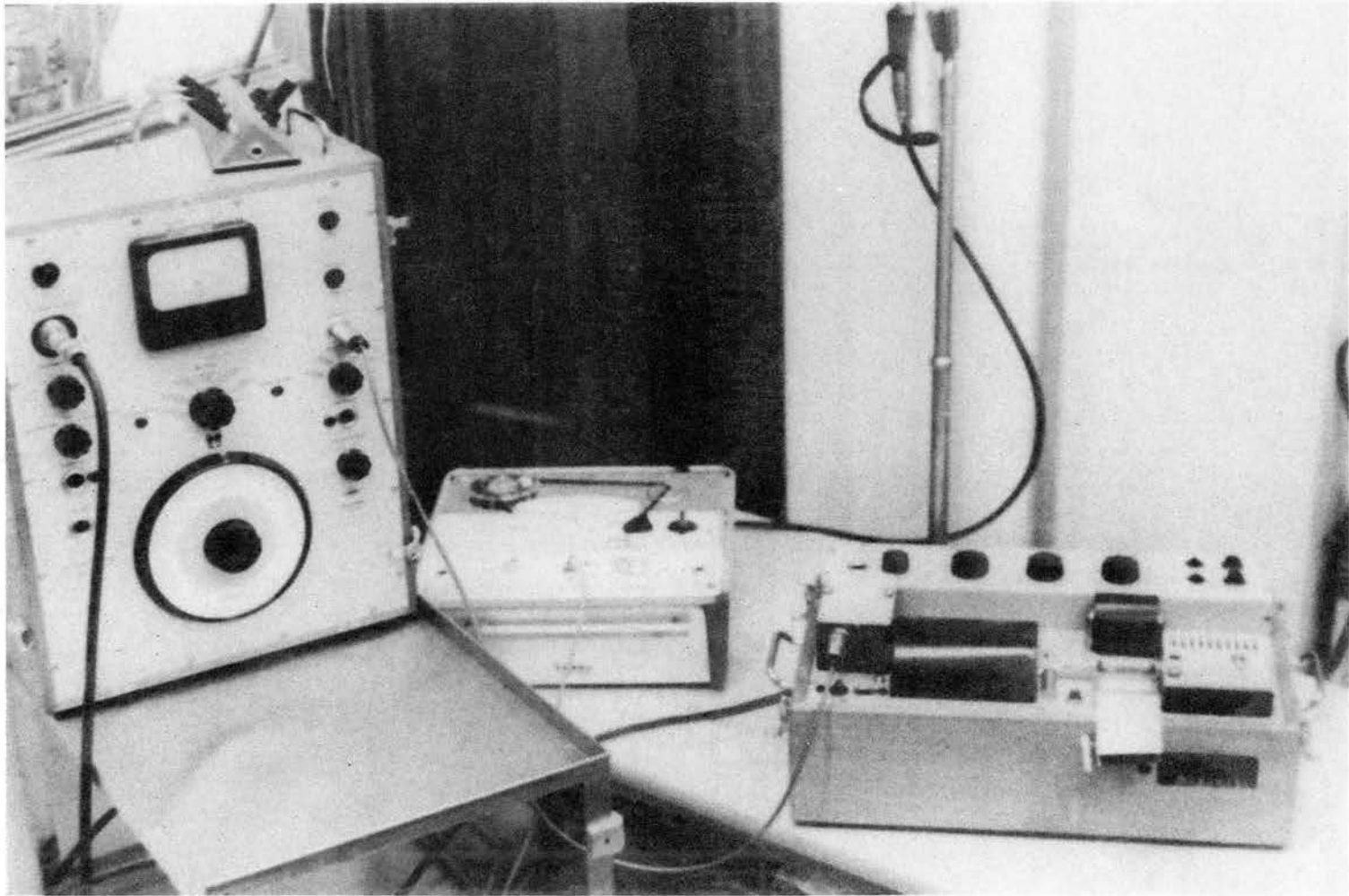


Figure 3. A Composite Picture of the Equipment

The recording was made on a waxed tape accurately calibrated in decibels of sound. The tape was regulated to travel under the scribing stylus at the rate of .03 centimeters per second. Each recording covered a time of sixty minutes.

Summary

The intent of the writer has been to explain the reasons for categorizing the study as exploratory in nature. Furthermore, the methods used to conduct the study have been described, including pertinent facts relative to the samples used, the type of equipment employed, and the explanation of the installation process. Chapter Four will incorporate the presentation and analysis of data obtained in the study.

FOOTNOTES

¹Fred N. Kerlinger, Foundations of Behavioral Research. (New York, 1965), p. 196.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The primary objective of this chapter is to present a summary of the data collected and the analysis of that data. A secondary objective is to state the reasons for selection of the data used. For clarificational purposes, the form of the original data and the rationale that simplified the data are presented in the beginning of this chapter.

The Original Data

The data obtained for this study were obtained from three classroom groups of first grade and kindergarten boys and girls. There were two classes of first grade and one class of kindergarten. The classroom groups were selected from an elementary school in the midwest. The data were collected through the use of a microphone. The microphone was suspended from the center of each classroom, a wire attached to the microphone conducting the impulses to a recorder outside of the classrooms. The recordings of the sounds produced by the classroom groups were made daily in each classroom at a set time for one hour. Because of the possibility that the heartbeat sound being injected into the rooms on alternate days might cause an unusual effect at the beginning of the test periods, it was decided that data would be more meaningful if the first ten minutes of the recorded sound were not utilized in obtaining data. As a result of this decision, the sound samples

utilized the last fifty minutes of each daily recording.

The sound was recorded by a stylus on a moving tape in the sound recorder. The stylus was sensitive; each noise generated in the classroom produced a recorded decibel reading on the tape. This constant movement of the stylus produced, instead of clear lines, a solid band of scribed lines. For clarification purposes, a tape has been reproduced in the appendix. In order to obtain more accurate figures and to avoid possible duplication due to the close proximity of each peak point, a selective sample of time intervals was taken from each tape recording. This was accomplished by constructing a transparent grid with lines spaced every two and one-half millimeters. The grid was indexed and placed over the tape, then the first spike or noise peak to the right of each grid line was read and tabulated. This procedure yielded a total of forty readings for each tape obtained from each of the three classroom groups. The samples constituted a total of fifty-four recorded sound tapes from the three groups--an overall total of eighteen recorded sound tapes from each classroom group. These sound tapes included nine each of the recordings with the imposed heartbeat sound and nine without the heartbeat sound.

Treatment of Data

The technique used for analyzing the data for the groups was the t test of significance for difference of means of related samples. The data were recorded in decibel units. The .05 level of significance was previously selected for this study since it is a commonly accepted

TABLE I
NOISE LEVEL AS RECORDED BY INSTRUMENT WITH AN
WITHOUT THE HEARTBEAT SOUND

	Mean	Range	S. D.	No. in Sample	t Score	P Value
<u>Kdg.</u>						
H. B.*	31.58	26	5.19	360	1.89	.05
No H. B.	32.35	30	6.05	360		
<u>Group A</u>						
H. B.	27.73	28	4.49	360	10.35	<.0005
No H. B.	31.44	30	5.16	360		
<u>Group B</u>						
H. B.	29.01	21	4.52	360	7.57	<.0005
No H. B.	31.70	30	5.04	360		
<u>Total Group</u>						
H. B.	29.62	28	4.98	1080	9.45	<.0005
No H. B.	31.72	30	5.52	1080		

*H. B. = Heartbeat

level for studies such as this.

Two analyses of difference were made. First, a t test of significance was used for analyzing the mean of the differences of the individual groups. The pertinent data are presented in Table I on page

fifty-two. The second analysis of data was a t test of significance used for the mean of the difference of the total groups. A total scores tabulation is also presented in Table I.

All raw data were punched on data processing cards. The data were then analyzed by an IBM 360 Mod 55 computer. The null hypothesis of no significant difference between the classroom group having the heart-beat sound added and the same classroom group without the heartbeat sound was tested. A one-tailed test was employed, with the null hypothesis being rejected only if the probability of chance occurrence was equal to or less than the .05 confidence level.

Analysis of Data

The mean score for the classroom noise level when the heartbeat sound was used in classroom groups was significantly lower than the mean score for the individual classroom groups without the heartbeat sound. A computed t value larger than plus 1.645 was required to reject the null hypothesis at the .05 confidence level. To reject the null hypothesis at the .01 confidence level, the computed t value was required to be larger than 2.326. The computed t value of 3.291 was required to reject the null hypothesis at the .0005 confidence level. The computer produced a t statistic of plus 1.8945 for the kindergarten group. A t statistic of plus 10.3405 was produced for the group A--first grade group. A t statistic of plus 7.5740 was produced from the group B--first grade group. All of the individual groups were computed on 359 degrees of freedom. For the total group, with 1079 degrees of freedom, a t statistic of plus 9.4456 was produced by the computer. The rejection level for both the classroom groups and the total groups

at the .05 level of confidence is given in Table I, page fifty-two.

No attempt was made to evaluate objectively the reactions of the teachers to the heartbeat sound. Their personal statements indicated that after a short time they were not aware of the heartbeat sound. Furthermore, a check sheet, shown in Appendix, was employed to provide some means of determining the teacher's subjective assessment of tension level of each classroom group. If a teacher had recorded information that indicated the children were unusually disturbed on a given day, the recording for that day would not have been used. Another day would have been substituted to accumulate the pertinent data.

Summary

This chapter has briefly reviewed the study and the classroom groups that were selected for use in the study. It has given both the technique employed to analyze the data, and a brief description of the groups from which the data were obtained. The null hypothesis was reviewed and levels of rejection at three confidence levels were cited.

The study produced statistics that allowed rejection of the null hypothesis at the .05 level of confidence for one individual group. It produced statistics that allowed a confidence level of rejection of .0005 for two individual groups. A computerized total for the three groups produced a t statistic that allowed rejection of the null hypothesis at the .0005 level of confidence. A summary of the entire study with concomitant implications and recommendations will be presented in the final chapter.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Within the framework of this final chapter the writer's purpose is fourfold: (1) To present a brief summary of the study pursued. (2) To state conclusions derived. (3) To cite implications underlying the outcomes of the research project. (4) To propose recommendations which merit further study.

Summary

This writer was intrigued by published articles regarding imprinting, for example, the study relating to infants and children in which the anxiety levels had been reduced by using a heartbeat sound.¹ Studies also intimated that imprinting, once established, was irreversible--a position which raised the question: Could children of school age be aided by the addition of a heartbeat sound to the classroom? The fact that children of kindergarten and first grade were closer to the age of initial imprinting than were upper grade children prompted the selection of the three groups used in the present study.

In order to avoid variables that would be introduced by attempting to match all the factors existent in the classroom of children, it was decided to use the same groups as the experimental and the control groups. Further, an attempt was made to allow for changes in the temperament of the classroom groups by alternating the days on which

the dependent variable was introduced.

The results of this study provided evidence that these three groups of children produced less noise in the classroom when they were exposed to the heartbeat sound as opposed to days when they were not exposed to the heartbeat sound. The fact that the groups were not randomly selected prevents generalizations usually attributed to a larger population, nevertheless, some valuable conclusions and implications can be derived from this study.

Conclusions

One of the conclusions which may be drawn from the outcome of this study is the demonstration of support to the feasibility of the phenomenon of imprinting as proposed by Salk. A second conclusion leads to the assertion that similar studies need to be undertaken and expanded. Studies might be expanded along numerous lines: (1) Larger groups randomly selected might be tested. (2) The environment surrounding representative groups of upper elementary children as well as that of secondary students might be controlled to study the reaction of the older students to the mechanized introduction of the heartbeat sound. If previous studies, together with the present one, lead to the conclusion that the ideas on imprinting have merit, then, the studies could be expanded to include the complete cycle of man from infancy to old age. Studies could cover both the ill and the healthy of all ages.

Implications

Implications, like the conclusions, when applied to this study must be tempered by the restriction placed upon them by the lack of

application to other groups. It is only possible to imply, as stated in the conclusions, that this study has added some support to the imprinting theory. However, if implications are projected to possibilities that this phenomenon will be further supported, then implications as to its application become relatively boundless. The fields of both medicine and psychology might be benefited were it possible to relieve anxiety by the use of either the heartbeat sound or the vibrations caused by the heartbeat. Skinner has pinpointed the problem by declaring that "psychosomatic disorders have been traced to chronic responses in fear, anxiety and depression".²

The teaching field offers almost limitless implications of benefits; however, only a few will be offered here. Modern concepts of teaching stress the fact that each student is an individual with his own different personality. If anxiety can be lessened, to even a small extent, by the application of the heartbeat sound, then that part of the student's concentration could be both lengthened and intensified; perhaps he would benefit by becoming both more knowledgeable and capable of penetrating more deeply into analytical problems.

Many teachers have students who cause discipline problems. It seems safe to assert that at least some of these problems are either caused or aggravated by anxiety. Therefore, if anxiety could be reduced, then some disciplinary problems could either be reduced or eliminated.

The accrued rewards to both students and teachers by the recognition and substantiation of the value of heartbeat imprinting could far surpass the time and labor necessary for a rather large number of research studies relative to imprinting. Moreover, there is evidence in

this study, as well as in past studies, that imply additional benefits relative to many fields.

Recommendations

Additional research should be made in several areas utilizing both the heartbeat sound and the effects of the vibration of the heartbeat to determine the effects. Work needs to be done in which other attributes of anxiety are studied in relation to heartbeat imprinting. Perhaps specific problem solving ability of individuals and/or groups might be studied using the heartbeat sound theory as a core idea in the study.

The area of the severely disturbed child in special classes offers a fruitful field in which a number of studies might be made. A few of the attributes of anxiety that might be measured are heart and respiration rate, attention span or reaction lag time.

One final recommendation is offered here. The pictures and the list enumerating the equipment would tend to cause some potential researchers to reject this equipment on the basis of economy. If a researcher wished to perform experiments that measured noise level as this study has done, a more economical method might be employed. A study such as the current investigation could be performed without large expenditures by substituting a tape recorder and a relatively inexpensive decibel meter for the sound level recorder. The input of sound could be indexed, and a commercial establishment could be employed to read out and record the noise level in decibels from the tape. Perhaps some accuracy might be sacrificed with this procedure, but by careful attention to the sound indexing, meaningful results should be

obtained. It would still be necessary to acquire the nondirectional microphone, a mixer, and the proper number of speakers.

To strengthen the field of education teachers and students need all the assistance they can get. If this investigation has opened an avenue to advance the learning climate for teachers and students, even in a small way, then both a personal and a professional objective has been realized.

FOOTNOTES

¹L. Salk, "Mothers' Heartbeat as an Imprinting Stimulus." Transactions of the New York Academy of Sciences, May, 1962, pp. 753-763.

²B. F. Skinner, Science and Human Behavior, (New York, 1953), p. 191.

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APPENDIX

DATA SHEET FOR PROJECT "HEARTBEAT"

Room # _____ Date _____

Teacher _____ Grade _____

Number of students in Class _____ Temperature _____

Starting Time _____ Weather condition _____

Atmospheric Pressure _____ Cloudy _____
Partly cloudy _____
Clear _____

Teacher:

Will you list below the two students who you feel are the most hyperactive students in your class at this hour? By hyperactive is meant exceptionally restless body movement and inability to concentrate on one thing for a normal period of time.

1. _____

2. _____

Please list below the two students who show evidence of being the least hyperactive in your class at this hour.

1. _____

2. _____

Please give your personal reaction to the sound of the heartbeat.

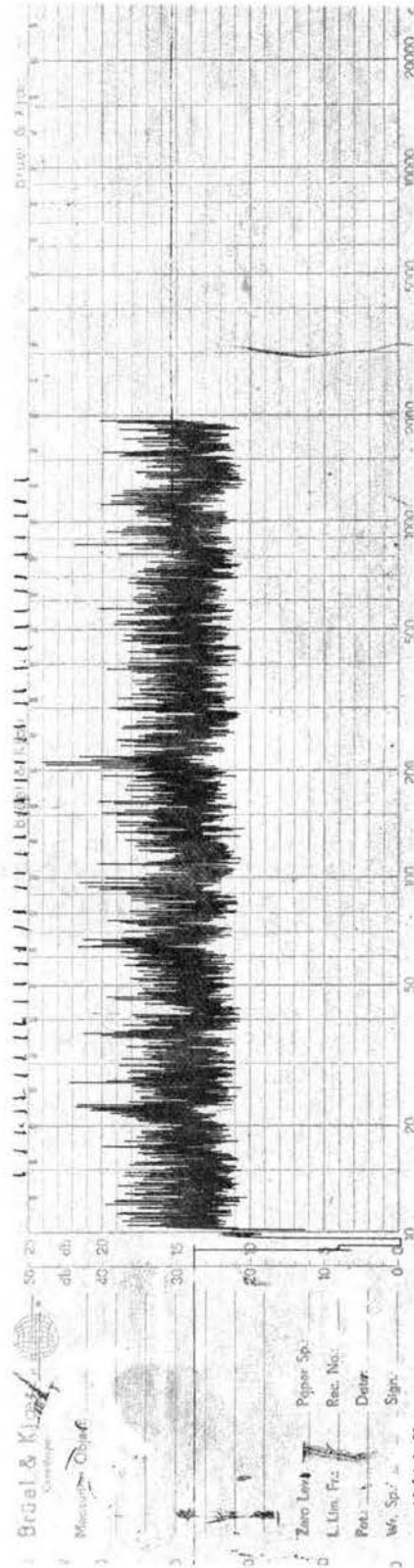
- | | |
|------------------|--------------------|
| 1. Annoyed _____ | 3. Irritated _____ |
| 2. Soothed _____ | 4. Other _____ |

Please classify the general student attitude in your classroom when the heartbeat sound is being used, as compared to the comparable time of day when it is not being used.

In your opinion were the two most hyperactive students different today? Yes _____ No _____

Were the two least hyperactive students different today?

Yes _____ No _____



Sample of Recording on Tape.

VITA

3

James W. Preuett

Candidate for the Degree of

Doctor of Education

Thesis: AN EXPLORATORY INVESTIGATION OF THE EFFECT OF IMPOSING A HEARTBEAT SOUND ON KINDERGARTEN AND FIRST GRADE STUDENTS

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