A COMPARATIVE STUDY OF NOISE LEVELS AND THEIR RELATIONSHIP TO PHYSIOLOGICAL PARAMETERS IN THE NEWBORN

A THESIS

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We hereby recommend that the thesis prepared under our supervision by Alice Myers entitled "A Comparative Study of Noise Levels and Their Relationship to Physiological Parameters in the Newborn"

be accepted as fulfilling this part of the requirements for the Degree of Master of Science.

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To Lady, who accompanied me at the typewriter

ALICE MYERS

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CHAPTER I

INTRODUCTION

"Unnecessary noise is the most cruel absence of care which can be influenced on either sick or well." Such was the observation of Florence Nightingale in 1829 (Wakeley 1974, p. 59). Noise during Florence Nightingale's era came from the hospital staff, visitors, and external hospital sources such as street noises. These sources are yet present and productive in today's modern hospital. There are, however, new sources with which the patients of Florence Nightingale's day did not have to contend. Most of these new sources of noise are the products of mechanical devices characteristic of today's hospitals. Some hospital areas are more likely than others in the utilization of noise-producing devices. Two such areas are the intensive care and coronary care units. Within these areas one may find cardiac monitors, respirators, and incubators. These and other similar machines serve as the origin of two noise sources. First, these machines themselves produce noise, and secondly, the additional staff that is required to operate and maintain these devices augments the level of noise.

One area where the noise level may be of some consequence is the nursery where the newborn is adjusting to a new and imposing environment. Another treatment area where noise levels are of greater concern is the intensive care nursery where acutely ill and premature newborns might be more sensitive to and affected by fluctuations in the noise levels. Measurements of respective noise levels in these two patient environments provide an opportunity to analyze and compare the role of noise in patient care.

Statement of Problem

Even though noise has been a concern in nursing as far back as 1829, the role of noise is not thoroughly understood. This study was intended to make a contribution to the knowledge and understanding of the effect of noise on the newborn and the role of noise in patient care. In general, the point of this research was to address the question: "Does a relationship exist between noise levels and physiological parameters in the newborn?

Statement of Purpose

In order to ascertain the effect of noise in a systematic and scientific manner, such a broad question must be reduced to more narrow objectives that can be approached through empirical processes. Specifically, the purpose of this research was to achieve the following:

1. To measure noise levels by objective and standardized techniques
2. To determine the limits of decibel fluctuations in noise levels and the time of day when fluctuations occur
3. To compare noise levels in an intensive care nursey and a routine care nursery
4. To determine whether or not a relationship exists between noise levels and infant's heart and respiratory rates

Background and Significance

Noise is considered to be a harmful pollutant. Any number of studies have demonstrated that exposure to high decibel noise over a prolonged period can cause deafness (Kryter 1966, p. 454). But what is considered to be high decibel? The sound of a person's breathing received a meter reading of approximately 10 decibels (dB) while an ordinary conversation between two persons would commonly measure to be approximately 60 dB. The roar of a motorcycle is 110, while a jet delivers 155 decibels (Golub 1969, p. 42). Studies have demonstrated that noise about 70 decibels will constrict the blood vessels, cause muscles to tense, and cause dilation of the pupils (Rosen 1970, p. 42). While these and other studies identified physiological characteristics associated with noise fluctuations, Haslan et al. (1970, p. 720) have dealt less clearly with the actual effects of noise on the hospitalized patient.

Falk and Wood (1973, p. 774) were among the first to investigate noise levels in the context of patient care when they studied hospital noise levels and their relationship to potential health hazards. They investigated noise levels of infant incubators, recovery rooms, and acute care units. The average noise level was noted to be 57.7 decibels in an infant incubator while in the recovery room, the average was noted to be 65.5 decibels at the patient's head. Average noise levels, when measured over a twenty-four hour period in the recovery room and acute care areas, were observed to be 57.2 and 73.3 decibels, respectively. Falk and Wood (1973, p. 778) did not, however, demonstrate any relationship between noise levels and potential health hazards. They did discuss the effect that noise may have on the cardiovascular, pituitary-adrenal axis, and auditory systems.

Some studies have specifically investigated noise levels and their effect on the newborn. Noise levels in an infant's oxygen tent were found to average 72 - 74 decibels while outside the tent, decibels ranged from 62 - 64 (League 1970, p. 978). Vidyasagar, Joseph, and Hamilton (1976, p. 115) studied and compared noise levels in the neonate intensive care unit and "normal" newborn nursery. Noise levels of 10 to 20 decibels higher than the "normal" nursery were noted in the neonate intensive care nursery. Various equipment and an increase in staff members were identified as the causes of higher noise levels, but the effects upon the newborn were not studied. Only a small portion of research relates the effect of noise on the newborn's physical condition. Falk (1974, p. 444) did study the effect of noise and its relationship to inner ear damage of the adult and newborn guinea pig. In an earlier study Falk (1972, p. 6) identified that ototoxic drugs seem to maximize the effect of noise upon the newborn.

These studies suggest that noise may play a negative role in the patient care environment. But the conditions under which noise becomes a factor in the physical recovery process and the limits of its effect are as yet ambiguous. This study is designed to assist in clarification of the role of noise in the patient care environment by focusing upon the relationship between noise levels and certain physical indicators in the routine care nursery and the intensive care nursery.

Hypotheses

Hypotheses for this study are as follows:

1. There is no difference between noise levels of various nursing shifts

2. There is no difference in noise levels of intensive care nursery and routine care nursery

3. There is no difference in the relationship between increased noise levels and heart and respiratory rates in the newborn

4. There is no difference in the above relationships found in the intensive care nursery and the routine care nursery

Definitions

For the purpose of this study the following definitions were formulated:

Noise - is the decibel (dB) level of frequency vibration that falls within the audible range of the human ear. The audible range is from a high frequency of 140 decibels to a low of 10 decibels (Peterson 1972, p. 4)

Routine Care Nursery - is a nursing area which contains newborns who have passed the critical stabilization period and who are considered healthy without complications. From this nursery newborns are taken to their mothers several times a day

Intensive Care Nursery - is defined as a highly specialized nursing area which offers close observations and specialized equipment to premature and ill newborns

Limitations

Given the limited number of infants in a newborn intensive care unit, the population of this study was quite limited. The role of chance is greatly enhanced where only a limited number of observations are available.

The "Hawthorne Effect" must be included as a limitation. The staff awareness of a research presence with noise-measuring equipment will probably produce a conscious or unconscious effort on the part of the staff to minimize the noise level. The newborn, however, due to lack of maturity, will not be subject to this same Hawthorne effect.

Delimitations

In order to approximate a controlled research environment and to thereby eliminate the effects of extraneous variables, certain restrictions were observed in selecting the newborns used as subjects of observation. Only those newborns included in the patient population of the two research sites which met the following criteria were employed for observational purposes:

1. Absence of a hearing problem
2. An uncomplicated vaginal delivery
3. Twelve (12) hours old or older
4. Negro or Caucasian race
5. A gestational age of 34 weeks or more

Summary

Due to the increased interest of noise as a pollutant in hospitals today, noise levels were investigated in a routine care and intensive care nursery. Measurements of respective noise levels in these two patient environments provided an opportunity to analyze and compare the role of noise in patient care.

Chapter II reviews literature relevant to noise. The main emphasis is on the physiological changes related to noise and to noise and its effect on the hospitalized patient.

The methodology for the research is presented in Chapter III. Subheadings are clearly defined and include a complete, precise description of each. Analysis of data is presented in Chapter IV. The results and interpretations of the findings and statistics chosen for use in the study are presented. The final chapter of the thesis," Summary, Conclusions, Implications, and Recommendations," explores the possibilities that can be determined from the study. This chapter explores significant elements derived from the results of the study.

CHAPTER II

REVIEW OF LITERATURE

Environmental noise pollution, which began with the industrial revolution, is now virtually an omnipresent problem. Almost no place is free from noise that might be considered excessive. Exposure occurs when at recreation, at home, at work, and unfortunately, at the hospital.

Excessive noise produces such recognized physiological changes in the endocrine, cardiovascular, and auditory systems. Both the state of consciousness and the state of sleep are influenced by noise. These facts have been documented by various research studies.

Henkin and Knigge (1963, p. 713) reported that the pituitary adrenal axis has an extremely low threshhold for stimulation by noise--as low as 68 decibels. Noise is considered a nonspecific stress similar to burns and other trauma that releases ACTH from the pituitary. Like other stressful stimuli, noise causes a biphasic pattern of ACTH release. In the laboratory, rat corticosterone secretion levels were double after thirty minutes and tripled after one hour of exposure to 130 decibels. The high secretion levels were maintained over an eight-hour period. After twelve hours, the corticosterone secretion levels returned to control level, but again increased after twenty-four hours (Henkin and Knigge 1963, p. 714).

Studies of endocrine changes in humans are few. Arguelles' study (1970, p. 43) shows that normal human subjects exposed to an intensity of 90 decibels for thirty minutes exhibited increased activity of corticoadrenal function. Arguelles also noted the effect that noise has on the adrenal medulla. In the same study he documented an increased urinary excretion of epinephrine and norephinephrine after exposure to sound levels of 90 decibels for thirty minutes. Persons exposed were normal human subjects, patients with essential hypertension, and patients recovered from myocardial infarction. All three types of patients demonstrated an increased excretion of epinephrine and norepinephrine in the urine (Arguelles 1970, p. 53).

A well established noise effect on the human cardiovascular system is vasoconstriction. Jansen (1962, p. 209) found that a short or a prolonged noise causes vasoconstriction of precapillary blood vessels which persists for the duration of the noise and sometimes longer. Jansen's study (1962, p. 210) documented that vasoconstriction lasts for the duration of a five-minute exposure for an additional twentyfive minutes after termination of the noise. Jansen (1962, p. 215) also demonstrated that vasoconstrictive response does not adapt to repeated noise stimuli. That is to say, vasoconstriction does not lessen with repeated exposure to noise.

McCann (1948, p. 129) reported that audiogenic stimulation produces hypertension in laboratory animals, but Arguelles (1970, p. 45) noted no change in blood pressure in patients who had recovered from an acute myocardial infarction and in normal human subjects. In Arguelles' study, patients with essential hypertension were exposed to sound at a 90 decibel level for thirty minutes. During this exposure period, the patients demonstrated an increase in systolic and diastolic blood pressure (Arguelles 1970, p. 54).

In addition to vasoconstriction effects in the periphery, noise produces similar changes in the ear and the placenta. Falk (1972, p. 10) found that noise-induced hearing loss in human beings was due to noise-induced vasoconstriction of the spiral vessels which provide the oxygen supply to the organ of Corti. Gerber (1970, p. 86) noted abnormalities of fetal development and a decrease in the litter size of rats exposed to chronic noise. According to Gerber's research, the noise caused a decrease in placental blood flow. The relative hypoxemia altered normal fetal development.

The effect of noise on the auditory system has been investigated thoroughly. According to Bredberg (1968, p. 236), the human ear is more sensitive to high frequency sound than to low frequency sound because of the resounding characteristics of the external auditory canal. Noise-induced hearing loss occurs when there is damage to the hair cells of the organ of Corti. Usually the ability to hear high frequency vibrations is lost first. If the noise exposure is continuous, the other frequencies are lost.

Falk (1972, p. 5) described the damaging effects of combining noise and ototoxic aminoglycosidic antibiotics on guinea pigs. A large amount of hair-cell damage to the organ of Corti was reported when guinea pigs were exposed to Kanamycin and noise levels of 58 decibels simultaneously. The hair-cell damage was less when exposed to Kanamycin alone and to noise level intensities along.

Kryter (1966, p. 454) identified that deafness could occur if a person is exposed to a noise frequency between 150 Hz and 300 Hz. Kryter felt that the noise intensity level would need to be greater than 92 decibels and that the exposure would be at least 500 minutes to result in deafness. Falk and Wood (1973, p. 779) noted that noise in incubators was measured at 150 to 300 Hz. Also, they reported the highest measured intensity was 89 decibels. According to Kryter's criteria, hearing loss would not, therefore, occur to newborns in the incubators. It should be noted that Kryter's studies were based on adults, and do not strictly apply to infants for whom damage risk criteria have not been established.

Although studies have documented that noise is capable of awakening a sleeper or preventing one from sleeping, the effect of noise on sleep is not well understood. William (1970, p. 278) found that noise levels with intensities no higher than 35 decibels can induce full awakening during REM sleep that occurs at the end of the night. Gädeke (1969, p. 166) studied the "wakening-noise threshhold" of infants. Infants were exposed to noise levels of 50 to 80 decibels. Noise levels of 70 to 75 decibels with an exposure of three minutes led to obvious sleep disturbance or caused awakening in two-thirds of the children. Thiessen (1970, p. 272) studied the response of three subjects to "truck-passage noise." He found noise levels of 50 decibels to have a 25 percent probability of awakening the subjects or changing the stage of sleep. Thiessen's findings (1970, p. 273) also indicated that at 70 decibels, the most probable reaction was to awake the patient while the next most probable reaction was to shift the level of sleep (Thiessen 1970, p. 273).

Most of these physiological changes do not adapt to repeated noise exposure. Falk and Wood (1973, p. 776) felt if the physiological changes became extreme, noise could become a health hazard.

Nursing research has investigated the adverse effect of noise on various types of patients in the hospital. Minckley's study (1968, p. 250) of noise levels in the recovery room found that noise did enhance the pain perception of post-operative patients. Although the highest noise levels observed in the recovery room were only in the 60 - 70 decibel range, such noises were apparently of sufficient intensity to be stressful to the patient. Recommendations from this study influenced architectural and accoustical changes in hospitals, particularly in the recovery room.

On a surgical nursing unit, Haslam (1970, p. 722) found that the daytime noise levels ranged from 35 to 73 decibels, while a similar range was noted during the night shift. Patients interviewed to determine the source of annoying noise most frequently identified staff conversations, visitors, and other patients as the primary sources. Also mentioned as annoying were sounds of patients in pain or distress and noise from mechanical sources. Wakeley (1974, p. 59) of London identified similar types of complaints. Questionnaires from patients identified three categories of noise disturbance. These sources were those of equipment, staff, and patients and their visitors.

While noise and its annoyances were being investigates, Shapiro and Beland (1972, p. 1238) were investigating noise levels in the operating room. They noted that noise levels taken midway between the patient and the surgeon were above the 90 decibel level, which is the maximum permissible noise exposure level for an eight-hour period as established by the United State Federal Occupational Safety and Health Act (U.S. Congress 1972, p. 22158). Although these decibel levels in the operating room were not continuous, these findings were alarming to the researchers. They recommended to hospital administration that more attention should be given to the design of the operating room in terms of auditory effects (Shapiro and Beland 1972, p. 1238).

The scientific literature on the range of noise, the places it is most likely to occur, and its effect on the patient's well being are sufficiently sketchy to justify further inquiries into the occurrence of noise and its influence in the hospital environment.

CHAPTER III

PROCEDURE FOR COLLECTION AND TREATMENT OF DATA

Introduction

According to Fox (1970, p. 192) a study can be classified as a "correlational survey" when one

> . . . collects data on more than one variable from one group of respondents with the intent of estimating the magnitude of the relationship between the variables.

This study meets all the criteria set forth by this definition. More than one variable is included. The major force is to determine both the strength and direction of the relationship between the variables analyzed. Whereas a descriptive study merely seeks to describe reality among one dimensional line, a correlational study deals with relationships between variables and is of assistance in establishing cause-effect relationships.

Setting

The sites chosen for this research were a routine care nursery and a newborn intensive care unit. These sites were chosen because of the importance of the environment to the newborn. If noise does influence the parameters of the patient, this effect would probably manifest itself in the newborn.

A routine care nursery which has 60 bassinets in a 320-bed teaching community hospital was selected for this study. This hospital was selected because of the availability. This Central Texas hospital meets the medical care needs of 100,000 population. The newborn nursery is composed of five separate units: three routine care nurseries, an admitting unit, and a premature nursery. For the purpose of this study, the premature and admitting nurseries were not included. Each of the three routine care nurseries consisted of 12 bassinets. Each bassinet was spaced one foot apart. The staff for the nursery consisted of a ratio of one nurse's aide to eight newborns. The head nurse is a registered nurse while the other charge nurses are licensed vocational nurses.

Critically ill newborns in the surrounding area are transferred to a newborn intensive care nursery located in a large medical center in a nearby city. This nursery is utilized by the surrounding hospitals as a referral center.

The nursery is one large unit which is divided into two areas --intensive care area and special care area. The acutely ill newborns are placed first in the intensive care area. As the newborn improves, he is moved to the special care area. The unit as a whole is equipped with much electrical and emergency equipment. This equipment includes isolette infant incubators, radiant warmers, infant Sentry apnea monitors, cardiac monitors, baby-Byrd ventilators. The beepers on all monitoring equipment have been turned down by order of the unit's neonatologists. Alarms were not altered and continue to sound when drastic changes occur.

The ICU nursery has equipment and staff for fifteen newborns. The staff on each shift consists of seven to eight members which are classified as registered nurses, licensed vocational nurses, and nurse aide technicians which are specially trained by the hospital.

The participating agencies were asked to sign agency permission for conducting the study. A copy of the agency permission appears in Appendix A. Although no consent was sought from the nursing staff, it was hoped that their cooperation would be obtained by explanations before the initiation of the data gathering stage.

Population

Nine newborns from each of the two nurseries were selected to participate in the study. These newborns were chosen according to the following criteria: (1) absences of a hearing problem; (2) an uncomplicated vaginal delivery; (3) twelve hours old or older; (4) Negro or Caucasian race; and (5) a gestational age of thirty-four weeks or more.

The newborn's hearing was evaluated by the arousal test. This method is considered to be the best method to assess the gross hearing ability of a newborn. To perform this test, the infant must be in a light sleep. The examiner will determine the level of the newborn sleep by touching his eyelid gently with a finger. If the eyelids flicker, or there is other small movement of the body, the newborn is ready to be tested. A small bell which was two inches in diameter was held ten inches from the newborn's ear. The loud, high frequency noise was delivered for two seconds. According to Reddell and Calvert (1964, p. 284) a high frequency sound of 90 dB intensity level is necessary for the purpose of screening newborns. The testing instrument (the bell) was selected for intensity and high frequency sound levels of 90 decibels as prescribed by Reddell. If hearing is within a normal range, the infant will be aroused from sleep. The only acceptable proof of his arousal is if he opens his eyes and stirs his body. Either response occurring separately is not acceptable. Newborns with a positive response were included in the study. Newborns with a negative response were omitted from the study and were referred for further auditory testing.

Gestational age, type of delivery, newborn's age, and race were documented by the hospital records.

In order to alleviate fears and frustrations of the newborn's parents, special care was devoted to explaining the non-threatening and no-risk nature of this research. The oral description of the study included the purpose and procedures. In order to enhance acceptance by the parents, the study was explained in layman terminology. The oral description as given to the parents is presented in Appendix A. Following such explanation, if either parent objected to the involvement of their newborn, that infant was not used in the research. Individual consent letters with parent's approvals were obtained. The Texas Woman's University Form B, the oral description form, was utilized to obtain informed consent from both parents. Form B appears in Appendix A. In every case, complete anonymity was guaranteed the parents. No names were used in the study as each participant was identified by number.

A General Radio-1565-B Sound Level Meter was used to measure noise levels. A sound meter of this type is used most frequently in noise survey and legal contract (Alexander 1977). The reliability and validity of the instrument was established by reference to the producing companies' specifications for this instrument. The exact specifications of this instrument are presented in Appendix B.

The microphone of the sound meter was placed as close to the head of the newborn as possible within a few inches. Such placement allowed sound levels to be recorded as experienced by the newborn. Meter readings were made every hour. The meter was left on fifteen seconds and the highest reading was recorded.

Data Collection

Sound level data and observation of the heart and respiratory rate were collected over two entire twenty-four hour periods. These measurements and observations were taken every hour. The number of staff members persent and the type of equipment that were operational were also included at each noise level reading. If a newborn who was selected for the study was discharged or expired, that infant was dropped out of the study.

Data were collected in the ensuing manner. First, an observation of the newborn activity was noted. Wolff's criteria (1966, p. 14) to determine the state of the infant were adopted. These criteria included the following:

1. Regular sleep - the infant is at full rest. His muscle tone is low. Most parts are completely still
2. Irregular sleep - the infant's eyelids are closed. Grimaces and other facial expressions are frequent
3. Drowsiness - the infant is relatively inactive. The eyes open and close intermittently; they have a dull, glazed appearance. The eyelids appear to be heavy
4. Alert inactivity - the infant is relatively inactive; the face is relaxed and does not grimace; the eyes are open
5. Waking activity - the infant engages in diffuse motor activity involving the whole body. The eyes are open, but not alert
6. Crying - this state is characterized by crying vocalizations associated with responses, diffuse motor activity
7. Indeterminate state - the infant's state did not meet the criteria of any of the above

Following the observation of the infant, the sound meter was employed to obtain a noise level reading. Then, the heart rate was obtained, and lastly, the respiratory rate was obtained by the investigator. The heart rate was determined by auscultation of the apical pulse. Observations and count of the respiration were also measured by the investigator. The type of personnel in the nursery were also recorded. A data collection sheet for each newborn was utilized to record meter readings, number, and type of persons in the nursery, state of infant, heart and respiratory rates, and the type of operational equipment in use during the observation period. Data collection sheet is presented in Appendix C.

Treatment of Data

The null hypothesis was tested by computations of a Gamma coefficient correlation and the application of a chi-square to determine statistical significance, and a t-test was utilized to determine the significance of decibel levels mean. All computations were obtained by utilization of the Statistical Package for the Social Sciences (SPSS) on a Honeywell 636 computer.

Summary

Sound levels were measured in an intensive care nursery and routine care nursery. Nine newborns from the intensive care nursery, and nine newborns from the routine care nursery were selected to participate in the study. Physical parameters, heart and respiratory rates, number of personnel, and the operational equipment were measured for a twenty-four hour period. The investigator collected the data and then transferred the data to computer cards. A statistician was employed to assist with the computation and utilization of the computer.

A gamma coefficient was applied to test the significance of the relationships of the variables. Then a chi-square was utilized to test the significance of the relationship. A student t-test was utilized to determine the significance of decibel level means. The following chapter describes the statistical analysis of the obtained data.

CHAPTER IV

ANALYSIS OF DATA

Introduction

Noise levels were collected every hour over a twenty-four hour period in the intensive care nursery and the routine care nursery. The first data that are presented are the noise levels of each shift. These noise levels are then compared within the three nursing shifts of the intensive care nursery and the routine care nursery. Next, each nursery is compared by shift. The second phase of analysis concerns noise levels and their relationship to the two selected physical parameters of the newborn. The first such parameter is respiratory rate, and the second is the heart rate.

Noise Level Fluctuation in the Patient Care Environment

Comparison Between Shifts Within Nurseries

The measurement of sound levels in the two patient care units produce a total of 375 dB observations. Two hundred and one of these observations were made in the intensive care nursery (ICN). A total of nine newborns in the ICN were used as participants. Another 174 observations were collected on nine newborns from the routine care nursery (RCN).

In order to obtain a profile of each of the three shifts, all observations for each hour of the shift were averaged. These data are presented in Table 1 for the intensive care nursery and the routine care nursery. To prevent the overlapping of shift hours, each nursing shift weredesignated to have eight hours only. They are arranged in the following manner: 7 a.m. to 2 p.m., 3 p.m. to 10 p.m., and 11 p.m. to 6 a.m. In the routine care nursery the decibel observations ranged from a high of 76.8 dB (at 8 a.m.) to a low of 51.8 dB (at 7 p.m.) which produced a range of 26 decibels. However, in the intensive care nursery, the highest sound reading was 68.5, and the lowest reading was 58.2 decibels, yielding a range of 10.3 decibels which is approximately 15 decibels less than was the case for the routine care nursery.

The decibel means for the three different shifts can be compared and contrasted more easily by employing the computed hourly means to produce a graph where the decibel averages appear on the ordinate axis with time periods on the abscissa. In order to facilitate comparisons between

Table 1

Hourly Decibel Means for Three Nursing Shifts in the Routine Care Nursery and the Intensive Care Nursery

7 a.m. to 2 p.m. shift

	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm
Routine	66.2	76.8	----	66.2	59.1	71.1	----	68.5
Intensive	59.2	63.4	61.4	63.7	62.2	60.7	62.7	68.5

3 p.m. to 10 p.m. shift

	3 pm	4 pm	5 pm	6	7 pm	8 pm	9 pm	10 pm
Routine	57.5	61.7	----		51.8	55.8	----	62.5
Intensive	64.3	62.5	62.8		63.0	66.5	62.3	63.3

11 p.m. to 6 a.m. shift

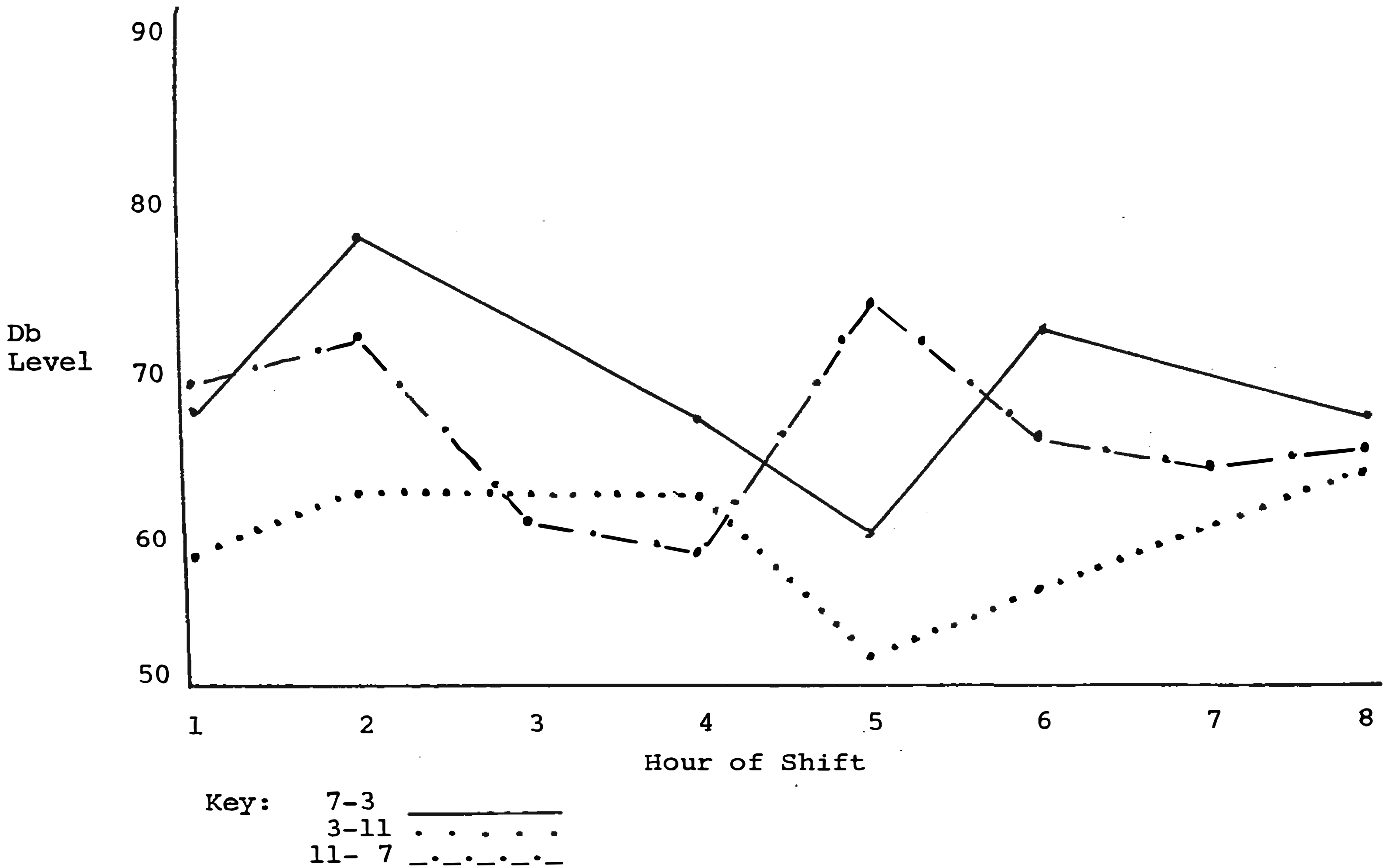
	11 pm	12 am	1 am	2 am	3 am	4 am	5 am	6 am
Routine	68.1	71.1	60.6	58.8	73.1	65.0	62.8	64.4
Intensive	60.1	61.2	58.7	58.4	61.1	61.8	64.2	58.2

the shifts, the observations are structured so that the first hour of each shift, regardless of actual chronological time, is charted at the same point on the graph. Figure 1 presents these data for the routine care nursery, and Figure 2 presents these data for the intensive care nursery.

The data in Figure 1 illustrate that the noise level did fluctuate considerably within the scope of an eight-hour period. The most notable similarities are between the 7-3 shift and the 11-7 shift where the patterns of elevations and subsidance are roughly parallel. During both of these shifts, there occurred a noticeable increase in noise levels between the initial readings and the subsequent readings for the second hour. Then, in both shifts there occurred a substantial decline in noise levels. From that point there appears to have been another decline in the noise levels that brought the end of the work periods. When comparing these two shifts one should note that after the initial elevations of decibel levels, the peaks and low periods generally occurred about an hour earlier during the 11-7 shift than was the case for the 7-3 shift.

The patterns of noise increase and decrease are not so sustained during the 3-11 shift, and the increases and decreases that do occur do not fall in the same general time periods as in the other two shifts. Also, the noise levels are generally lower during the 3-11 shift.

Figure 1. Decibel Level Means by Shift in the Routine Care Nursery



To determine whether or not these observed differences in decibel readings are statistically significant, student's t-test was computed. A paired comparison of the three shifts of the routine care nursery is presented in Table 2.

Table 2

Comparison of the Three Shifts of the Routine Care Nursery

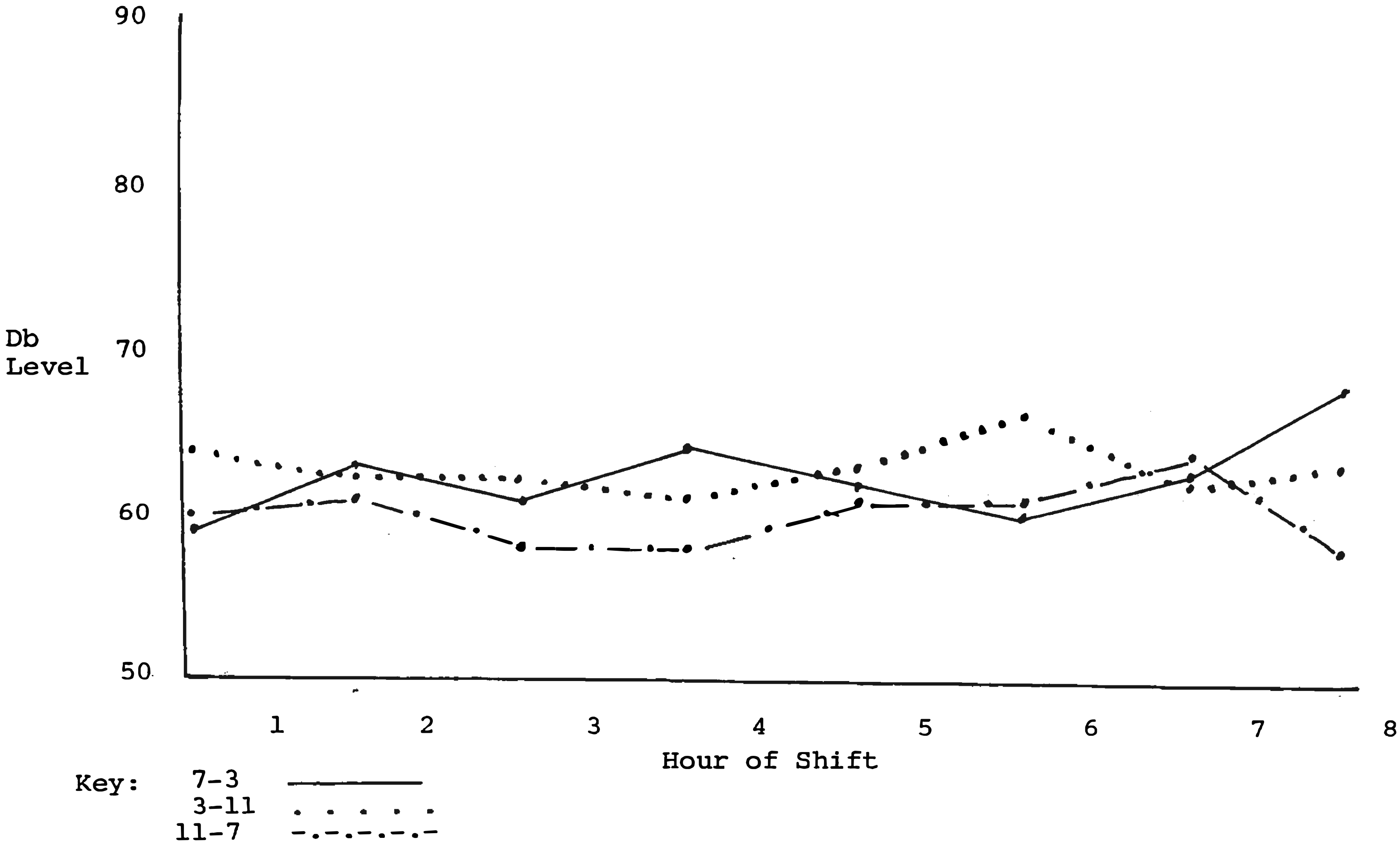
Shift	N-Readings	Mean	Df	t-value	P
7am - 3 pm	54	67.0	106	4.16	.05
3pm -11 pm	54	58.4			
7am - 3 pm	54	67.0	118	0.82	N.S.*
11pm- 7 am	66	65.6			
3pm -11 pm	54	58.4	118	3.97	.05
11pm- 7 am	66	65.6			

*N.S. = not significant

As shown in Table 2, the differences in decibel levels between the 7-3 and the 3-11 shift and the difference between the 3-11 and 11-7 shifts were significant. The 7-3 and 11-7 shifts were far below the t-value necessary for significance. These results are consistent with the earlier analysis of Figure 1 which noted the similarity of the 7-3 and the 11-7 shifts.

These same data for the intensive care nursery are presented in Figure 2. Comparison of the three shifts in the intensive care nursery does not readily identify any general trends or similarities. Whereas two of the shifts from the routine care nursery were remarkably similar, no such similarities exist in this patient care environment. Although similarities may be observed between given shifts at one hour, in the next hour, the data are likely to be quite dissimilar.

Figure 2. Decibel Level Means by Shift in the Intensive Care Nursery



The most noticeable feature of Figure 2 is the rather limited decibel range within which the observations occur. In the routine care nursery, the decibel readings differed sharply from one hour to another and covered a substantial noise range. But that is not the case with the intensive care nursery where most decibel observations were well within a 15-point decibel range. This may identify one of the important differences between the nurseries. Again, student's t-test was computed to determine the statistical significance of the noise level differences. A paired comparison of the three shifts of the intensive care nursery is presented in Table 3.

Table 3

Comparison of the Three Shifts of the Intensive Care Nursery

Shift	N-Readings	Mean	Df	t-value	P
7am - 3pm 3pm -11 pm	65 67	62.8 63.3	130	.52	N.S.*
7am - 3pm 11pm- 7am	65 69	62.8 60.4	132	2.27	.05
3pm -11pm 11pm- 7am	67 69	63.3 60.4	134	2.85	.05

*N.S. = not significant

Table 3 presents data which produce two significant t-values and another below the critical level.

Comparison of Noise Levels By Shifts Between Nurseries

In addition to the comparison of decibel readings between the shifts of the given nurseries, the data were used to compare and contrast noise levels between the routine care nursery and the intensive care nursery. In Figure 3, the decibel readings are charted for a full twenty-four hour period beginning at 7 am, proceding through the intermediate 3-11 pm shift, and concluding with the 11pm-7am shift for each nursery.

These data reenforce the interpretations drawn from analysis of Figures 1 and 2 which noted that there was a much wider range of noise level in the routine care nursery than in the intensive care nursery. In addition, this figure exhibits that the variations persist for the entire twenty-four hour period. Apart from this, few meaningful conclusions can be reached on the basis of the data in Figure 3.

In order to establish whether or not the observations for the two separate patient care environments were statistically significant, student's t-test was computed for these data. The comparison of the decibel means of the two nurseries is presented in Table 4.

Figure 3. Comparison of Decibel Levels Between a Routine Care Nursery and Intensive Care Nursery for a 24-Hour Period

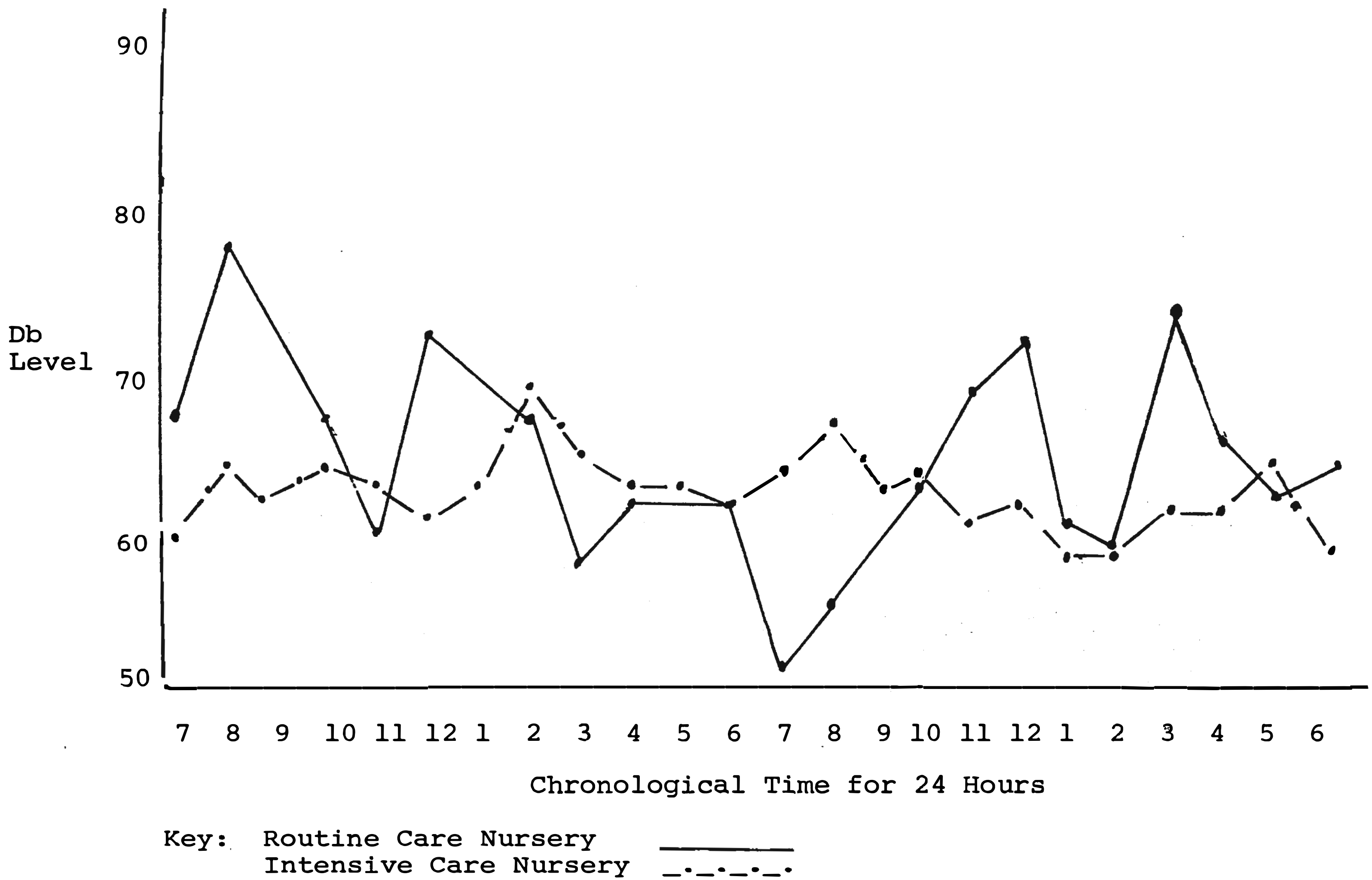


Table 4

Comparison of Decibel Readings of Intensive Care Nursery and Routine Care Nursery

Shift	N-Readings	Mean	df	t-value	P
Intensive Care	201	62.1			
Routine Care	174	63.8	373	1.95	.05

The student's t-test identified that the decibel readings were significant at the .05 with 373 degrees of freedom.

Relationship of Decibel Fluctuation on Selected Physiological Parameters

Given the fluctuation of noise levels both between shifts and between hospital nurseries, it is possible to ascertain whether or not that fluctuation affects the newborn. Two physiological parameters were chosen for examination in relationship to noise fluctuation. These parameters are respiration and heart rates.

Respiratory Rates

The measurements of respiratory rates in the two nurseries produced 374 observations. The respiratory rates ranged from 10 to 83 breaths per minute. In the routine care nursery 174 observations were recorded. The highest respiration rate was 68 breaths per minute, while the lowest rate was 24 breaths per minute. In the intensive care nursery 201 observations were made while the range was from 10 to 83 breaths per minute.

For the purpose of analysis a typology was developed which divided respiratory rates into specific categories. In the routine care nursery, the respiratory rate categories were grouped into intervals of ten. These data for the routine care nursery are presented in Table 5.

Table 5

Frequency Distribution of Respirations in the Routine Care Nursery

Category	Respiration Rate	Frequency	Percent
Very low	20-29	15	9.0
Low	30-39	85	49.0
Mod. Low	40-49	58	33.0
Mod. High		9	5.0
High	60-69	7	
		N=174	100.0

According to Vaughan (1975, p. 331), the usual respiration for a full term newborn is between 30-40 breaths a minute. It should be noted that 42.5 percent of the subjects were above this criteria, while 48.9 percent fell into Vaughan's norm, and 8.6 percent fell below the norm.

In the intensive care nursery the respiratory rates were placed into six categories instead of five, as were employed in the routine care nursery. This extra category was needed because of the wider variations in the respirations readings in the intensive care nursery. The additional category was added at the bottom of the range in order to accommodate the lower respiratory rates observed in this patient area. In addition, the upper level of the last category was expanded from 69 to 83 to accommodate the higher readings from that nursery. The respiratory rates and frequency of the intensive care nursery are presented in Table 6.

Table 6

Frequency Distribution of Respirations in the Intensive Care Nursery

Category	Respiration Rate	Frequency	Percent
Very low	10-19	6	3.0
Low	20-29	55	27.0
Mod. low	30-39	55	27.0
Mod. high	40-49	60	30.0
High	50-59	13	7.0
Very high	60-83	12	6.0
		N=201	100.0

According to Vaughan (1975, p. 331), premature newborns' respiration rates were higher than 40 per minute and fluctuate more frequently. The data in Table 6 are in agreement with Vaughan's statement. This table indicates that 57.8 percent of respiratory rate observations fell below 40 breaths per minute while 42.4 percent of this group was above the norm.

Heart Rates

The measurement of heart rates in both nurseries generated a total of 374 observations ranging from 110 to 210 beats per minute. In the routine care nursery the highest reading was 172 beats a minute, while the lowest reading was 112 beats a minute. These observations produce a 60 point difference. In the intensive care nursery the highest reading was 210, while the lowest reading was 122 beats per minute. This yields a range of 88 beats per minute which is substantially greater than the range in the routine care nursery.

A six-category typology was developed for analysis of heart rates. Again, a ten-point interval was used in this scheme except for open-ended categories at both extremes. Table 7 presents these data.

Table 7

Frequency Distribution of Heart Rate in Routine Care Nursery

Category	Heart Rate	Frequency	Percent
Very low	108-129	45	26.0
Low	130-139	65	37.0
Mod. low	140-149	40	23.0
Mod. high	150-159	9	5.0
High	160-169	13	8.0
Very high	170-210	2	1.0
		N=174	100.0

The usual heart rates for the full-term newborn may range from 70 beats per minute at rest to 180 during activity (Vaughan 1975, p. 332). All of the heart rates observed from the routine care nursery were well within this normal range. The "very high" category extends to 210 in order to encompass the data for the intensive care nursery. However, except for the routine care nursery, the heart rates did not exceed 180. As can be seen from Table 7, these data are not evenly distributed within the six categories. The frequency and percentage columns show that the observations are heavily skewed toward the lower end of the range, with 86.3 percent of the observations below 150 heart beats per minute, and only 14.8 percent above that rate.

Basically, the same six categories are used in the presentation of the comparable data for the intensive care nursery with the exception that the range of the lowest category was extended from 108 to 83 to include the lowest heart rate. These data are presented in Table 8.

Table 8

Frequency Distribution of Heart Rates in the Intensive Care Nursery

Category	Heart Rate	Frequency	Percent
Very low	83-129	3	2.0
Low	130-139	16	8.0
Mod. low	140-149	49	24.0
Mod. high	150-159	51	25.0
High	160-169	68	34.0
Very high	170-210	14	7.0
		N=201	100.0

A premature's resting heart rate is 140-150 per minute, but may drop to bradycardia, falling to 32 per minute (Vaughan 1975, p. 333). The data in Table 8 are more evenly distributed among the center categories with lower frequencies in the extreme categories. Only 9.5 percent of the observations fall into the lower range, with 83.6 percent grouped into the range between 140-169.

Noise

A similar typology was created for noise measurements, and these data are presented in Table 9.

Table 9

Frequency Distribution of Decibel Readings in the Routine Care Nursery

Category	Decibel Readings	Frequency	Percent
Very low	40-49	15	9.0
Low	50-59	42	24.0
Mod. low	60-69	70	40.0
Mod. high	70-79	35	20.0
High	80-89	8	5.0
Very high	90-98	4	2.0
		N=174	100.0

The largest percentage of decibel readings appeared at the moderately low category of 60-69. Recalling that 70 decibels will cause vasoconstriction, it is interesting to note that only 27 percent of the decibel readings occurred at or above 70 decibels.

While six categories of decibel readings were utilized in the routine care nursery, only four categories were necessary for the intensive care nursery. The lack of extreme decibel readings necessitated altering the grouping intervals. Due to these changes, the very low and very high categories do not appear as compared to Table 9 typology. The low grouping has an interval of 20 instead of the usual 10 because of the low frequency of decibel readings. Table 10 presents the groupings and frequency distribution of the intensive care nursery.

Table 10

Frequency Distribution of Decibel Readings in the Intensive Care Nursery

Category	Decibel Readings	Frequency	Percent
Low	40-59	77	38.0
Mod. low	60-69	104	52.0
Mod. high	70-79	19	9.5
High	80-89	1	0.5
		N=201	100.0

The largest percent of decibel readings occurred at 60-69 decibel readings. However, 89 percent of the decibel readings occurred below the 70 decibel rate, while only 10 percent occurred above the vasoconstricting threshhold.

Correlation Analysis: Noise and Respiration Rate

To determine the relationships of decibel readings and respirations, these variables for the routine care nursery were cross-tabulated and a correlation coefficient computed as a measurement of relationship. These data are presented in Table 11. In this and all subsequent cross-tabulation tables, all data are reported in percentage form.

Table 11

Decibel Readings and Respirations in the Routine Care Nursery

Resp. Rates	Decibel Readings Very Low	Low	Mod. Low	Mod. High	High	Very High
Very low	13.0	12.0	7.0	6.0		25.0
Low	54.0	62.0	54.0	31.0	25.0	
Mod. low	33.0	26.2	32.0	49.0	25.0	25.0
Mod. high			4.0	5.0	50.0	
High			3.0	9.0		50.0
Total	100.0	100.0	100.0	100.0	100.0	100.0

N=174
Gamma = 0.39
chi-square = 73.8

In Table 11 there is a relationship between the variables, and this relationship is direct in nature. The pattern for respiration to increase as the decibel level increased is illustrated by the tendency of the data in the above table to fall along the diagnonal from the upper corner of the table to the lower right corner. The gamma coefficient of .39 is indicative of a moderate to moderately low level of relationship. The chi-square value is significant at the .05 probability level using 20 degrees of freedom. This indicates that the relationship in the above table is not likely due to chance, and is indicative of a real correlation between decibels and respiratory rates.

Next, the decibels and respiratory rates were cross-tabulated for the intensive care nursery. These data are presented in Table 12.

Table 12

Decibel Readings and Respiration for the Intensive Care Nursery

	Decibel Readings			
Resp. Rates	Low	Mod. Low	Mod. High	High
Very Low	2.0	3.0		
Low	18.0	32.0	42.0	
Mod. low	38.0	21.0	21.0	
Mod. high	30.0	31.0	26.0	
High	7.0	8.0		
Very high	5.0	5.0	11.0	100.0
	100.0	100.0	100.0	100.0

N=201
Gamma =-0.07
chi square = 28.49

In Table 12 the relationship is insufficient to justify any conclusion of a cause-effect relationship between the variables. The gamma coefficient of -0.07 is reflective of that insufficient level of relationship. The chi-square of the variables is significant at the .05 probability level with 15 degrees of freedom. This indicates that the results in Table 12 are not likely to be due to chance, and the lack of a relationship between the variables in the intensive care nursery is an accurate assessment of the degree of relationship between variables in that environment.

Correlation Analysis: Noise and Heart Rate

To determine the relationship between decibel readings and the apical pulse rate, these variables were cross-tabulated and a correlation coefficient computed to assess the strength and direction of the relationship. These data for the routine care nursery are presented in Table 13.

Table 13

Decibel Readings and Heart Rates in the Routine Care Nursery

Resp. Rates	Decibel Readings: Very low	Low	Mod. Low	Mod. High	High	Very High
Very low	47.0	36.0	20.0	20.0		50.0
Low	33.0	41.0	41.0	37.0	12.0	
Mod. low	20.0	14.0	29.0	28.0	12.0	
Mod. high		7.0	3.0	9.0	13.0	
High		2.0	6.0	6.0	63.0	25.0
Very high			1.0			25.0
	100.0	100.0	100.0	100.0	100.0	100.0

N=174
Gamma = 0.33
chi-square = 77.63

There is a relationship between the variables in Table 13, and the relationship is direct in nature. This cross-tabulation agains presents a pattern that falls approximately along a diagonal. This demonstrates that as the decibel readings increased, the heart rate also increased. The gamma coefficient of .33 is indicative of moderate to moderately low level of relationship. The chi-square of the decibel readings and heart rate is significant at the .05 level using 25 degrees of freedom.

These data for the intensive care nursery are presented in Table 14.

Table 14

Decibel Readings and Heart Rate in the Intensive Care Nursery

Heart Rate	Decibel Readings: Low	Mod. Low	Mod. High	High
Very low		2.0		
Low	9.0	7.0	10.0	
Mod. low	22.0	28.0	16.0	
Mod. High	22.0	27.0	32.0	9
High	39.0	31.0	32.0	
Very high	8.0	5.0	10.0	100
	100.0	100.0	100.0	100

N = 201
Gamma = -0.05
Chi-square = 20.63

In Table 14 these data are almost randomly distributed within the table as is suggested by the meager gamma coefficient of -0.05. That coefficient indicates minimal association between variables and also indicates that the small amount of correlation present is of an inverse nature. But, even with a chi-square value which is significant at the .05 probability level, the strength of relationship is insufficient to serve as the basis of a cause-effect conclusion.

Summary

The means of hourly decibel readings for a twenty-four hour period were computed in a routine care nursery and an intensive care nursery. First, the hourly decibel means for the three nursing shifts of each nursery were compared and contrasted. In the routine care nursery, the 7-3 and the 11-7 shift had comparable decibel readings with noticeable increases and decreases in noise levels. The 3-11 shift maintained a consistent decibel level within a 15-decibel range. After these descriptive measures, a t-test was computed to determine the statistical significance of the means. When the shifts were paired, a significant difference was found between the 7-3 and the 3-11 shift, and between the 3-11 and 11-7 shift. The t-test for 7-3 and 11-7 shift was far below the value necessary for significance which means these shifts are highly similar.

In the intensive care nursery, the three nursing shifts did not produce any general trends or similarities. When these paired shifts were compared, the t-test showed a significant difference between the 7-3 shift and the 11-7 shift, and between the 3-11 shift and the 11-7 shift. The decibel readings found in the 7-3 shift and the 3-11 shift were not significant.

The decibel means were also compared between the nurseries. Comparisons indicated a substantial fluctuation of noise levels in the routine care nursery while a decibel range of 15 was observed in the intensive care nursery. The substantial fluctuation of noise levels in the routine care nursery continued throughout the full twenty-four hour period. In the intensive care nursery, there was relative stability of noise levels.

From these data the first null hypothesis which states there is no difference between noise levels of various nursing shifts, was rejected. The statistical data also did not support the second null hypothesis which states there is no difference in noise levels of the intensive care nursery and the routine care nursery. This indicates that noise levels were 15 decibels higher in the routine care nursery.

In the second phase of analysis, the relationship of sound levels and selected physiological parameters were presented. Correlation coefficients were determined on decibel readings with heart rates and respiratory rates. In the routine care nursery the gamma coefficient indicated a positive correlation of decibel readings and respiratory rates, as well as a positive relationship of decibel readings and heart rates. The chi-square values were significant at the .05 probability level for both cases. This indicates that the results are not likely due to chance and is indicative of a real correlation between decibels and respiratory rates.

In the intensive care nursery the gamma coefficient between decibel readings and respiration was insufficient to justify any conclusion of a cause-effect relationship between the variables. There was also a minimal association between decibel readings and heart rates. Chi-square for both groups of variables was significant at the .05 level which indicates that the results are not likely due to chance, and the lack of a relationship between the variables is an accurate assessment of the variables.

The data indicate a positive cause-effect relationship between increased decibel readings and respiration rates and between increased decibel readings and heart rates in the routine care nursery. Thus, the third null hypothesis which states there is no difference in the relationship between increased noise levels and heart and respiratory rates was also rejected.

The insufficient level of cause-effect relationship between decibel readings and respiration and heart rate found in the intensive care nursery does not provide data sufficient to reject the fourth null hypothesis which states there is no differences in the above relationships found in the intensive care nursery and the routine care nursery.

CHAPTER V

SUMMARY, CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

Summary

Noise has been a concern of hospital staff even back to "Florence Nightingale's Day." Today some hospital areas are more likely than others to produce noise due to the presence of cardiac monitors, respirators, and incubators. Two areas where noise levels may be of some consequence are the routine care nursery and the intensive care nursery where the newborn is adjusting to a new and imposing environment.

The problem of this study was: Does a relationship exist between noise levels and physiological parameters in the newborn? Specifically, the more specific purposes are as follows:

1. To measure noise levels by objective and standardized technique
2. To determine the limits of decibel fluctuations in noise levels and the time of day when fluctuations occur
3. To compare noise levels in an intensive care nursery and a routine care nursery

4. To determine whether or not a relationship exists between noise levels and heart and respiratory rates

Two Central Texas hospitals were utilized as sites for this research. One hospital was a large medical center while the other was a community teaching hospital. Nine newborns from an intensive care nursery and nine newborns from a routine care nursery were selected as subjects of observation. Sound levels, heart and respiratory rates, number of personnel present, and the operational equipment were observed every hour for a twenty-four hour period.

The hourly decibel means of the three nursing shifts of each nursery were compared and contrasted. In the routine care nursery, the shifts from 7 - 3 and 11 - 7 had comparable decibel readings, while the 3 - 11 shift maintained a consistent decibel level. The t-test for 7 - 3 and 11 - 7 shift was below the value necessary for significance. In the intensive care nursery, the three nursing shifts did not produce any general trends.

Correlation coefficients were computed on decibel readings with heart rates and respiratory rates. In the routine care nursery the gamma coefficient indicated a positive correlation between decibel readings and respiration rate. There was a positive relationship between decibel readings and heart rates. The chi-square values were significant at the .05 probability level for both cases. In the intensive care nursery, the gamma coefficient between decibel readings and respiration rates was insufficient to justify any conclusion of a cause-effect relationship between the variables. A minimal association was identified between decibel readings and heart rates. Chi-square for both cases was significant at the .05 level of probability.

Conclusions

Based on the findings of this study, the following conclusions are drawn:

1. Some differences in noise levels were noted both within and between shifts in both patient care units
2. The greatest differences in noise levels were observed in the routine care nursery where the 7 - 3 shift and the 11 - 7 shift were characterized by significantly higher noise levels than the 3 - 11 shift
3. Although the total range of noise levels for the intensive care nursery was noticeably smaller, the 7 - 3 shift and the 3 - 11 shift produced slightly higher noise levels

4. There was a statistically significant relationship between noise levels and heart and respiratory rates in the routine care nursery
5. In the intensive care nursery there was no cause-effect relationship between noise levels and physiological parameters

Implications

Although a comparison between shifts produced some differences, close examination of data revealed as much or more noise variation within the shift as between shifts. Time periods are not the primary determinant of noise levels. Rather, the primary determinants of noise are operable on each shift. This would seem to place the burden of responsibility for noise control clearly on the nursing personnel on each shift. Nursing personnel should be more aware of their role in controlling noise levels. Careful planning of nursing care should be encouraged to minimize unnecessary noise.

The data showing a significant relationship between increased noise levels and increased heart and respiratory rates in the routine care nursery produced the most important finding of this research. It identified that newborns do have physical reactions to increased noise levels. These reactions appear to occur at noise levels not normally considered to be abnormally high. This suggests that nursing personnel should be concerned not only about brief and substantial high noise levels, but also about the more normal and constant noise levels. Nursing personnel should be aware of the role of the noise in the hospital. This could be accomplished by inservice education programs as well as being included in the curriculum of schools of nursing.

As noted in Chapter II, it has at times been assumed that the presence of modern medical devices in patient care environments would increase noise levels. Comparisons of intensive care nursery with the routine care nursery exhibited that consistently the noise levels were higher in the routine care nursery and lower in the nursery where there were more mechanical devices. Probably, the low noise level in the intensive care nursery was related to the isolation of the patient. In the routine care nursery the activity of one newborn could more easily affect the environment of the other newborns. While measuring noise levels in the routine care nursery, it was noted that many of the high readings were the result of either the subject of the measurement or other subjects crying during the observation of the decibel readings. Whereas most concerns within the noise levels in the patient environment have looked upon the patient as the object of noise, this study suggests that patients themselves may be one of the major sources of noise in some types of hospital units.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Noise levels should be studied in other areas of the hospital to determine what noise levels exist in other areas
2. Noise levels should be studied with patients of various ages to determine if noise levels affect physiological parameters
3. A duplication of this study should be done utilizing a more precise instrument, i.e., EKG monitor for heart rates
4. A duplication of this study should be done to determine the relationship of noise levels and the number of staff members present
5. Noise levels and their relationship to other physical parameters such as sleep arousal should be investigated with precise recording instruments
6. Nursing personnel should be informed of the role of noise in the hospital setting

7. Changes in acoustical structures of intensive care nurseries and routine care nurseries should be investigated to determine if satisfactory to soften noise

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APPENDIX A

PERMISSION FOR THE STUDY

TEXAS WOMAN'S UNIVERSITY
DALLAS, TEXAS 75235

COLLEGE OF NURSING

March 30, 1977

Ms. Alice Meyers

Dear Ms. Meyers:

The Dallas Center Sub-Committee for Human Research has approved your proposal for "A Comparative Study of Noise Levels and Their Relationship to Physiological Parameters in the Newborn."

Following acquisition of agency approval you may now proceed with your data collection as planned.

Sincerely,

Geri Goosen

Geri Goosen, R.N., M.S.
Assistant Professor
Chairman of Human Research Committee
Dallas Center

cc: Dr. Phyllis Bridges
Graduate Dean

GG:js

OFFICE OF THE ASSOCIATE DEAN
TEXAS WOMAN'S UNIVERSITY
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DALLAS, TEXAS 75235

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HOUSTON, TEXAS 77025

TEXAS WOMAN'S UNIVERSITY

DENTON, TEXAS 76204

THE GRADUATE SCHOOL
P.O. BOX 22479, TWU STATION

May 20, 1977

Ms. Alice Faye Myers
7209 Brentwood Circle
Waco, Texas 76710

Dear Ms. Myers:

I have received and approved the Prospectus for your research project.

Best wishes to you in the research and writing of your project.

Sincerely yours,

Phyllis Bridges

Phyllis Bridges
Dean of the Graduate School

PB:ks

cc: Dr. Counts
Dr. Chinn

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING
DENTON, TEXAS

DALLAS CENTER
1810 Inwood Road
Dallas, Texas 75235

HOUSTON CENTER
1130 M.D. Anderson Blvd.
Houston, Texas 77025

AGENCY PERMISSION FOR CONDUCTING STUDY*

THE Scott and White Memorial Hospital

GRANTS TO Alice J. Myers

a student enrolled in a program of nursing leading to a Master's Degree at Texas Woman's University, the privilege of its facilities in order to study the following problem:

A Comparative Study of Noise Level and Its Relationships to Physiological Parameters in the Newborn

The conditions mutually agreed upon are as follows:

1. The agency (may) ~~(may not)~~ be identified in the final report.
2. The names of consultative or administrative personnel in the agency (may) ~~(may not)~~ be identified in the final report.
3. The agency (wants) ~~(does not want)~~ a conference with the student when the report is completed.
4. The agency is (willing) ~~(unwilling) to~~ allow the completed report to be circulated through interlibrary loan.
5. Other:____________________________

Date 4/20/77.

Lillian E. Archelles
Signature of Agency Personnel

Alice J. Myers
Signature of Student

Mona M. Counts R.N., PhD.
Signature of Faculty Advisor

*Fill out and sign three copies to be distributed as follows: Original -- Student; first copy -- agency; second copy -- T.W.U. College of Nursing.

TEXAS WOMAN'S UNIVERSITY
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AGENCY PERMISSION FOR CONDUCTING STUDY*

THE ______________________________

GRANTS TO Alice J. Myers

a student enrolled in a program of nursing leading to a Master's Degree at Texas Woman's University, the privilege of its facilities in order to study the following problem:

A Comparative Study of Noise Levels and Its Relationship to Physiological Parameters in the Newborn

The conditions mutually agreed upon are as follows:

1. The agency (may) (may not) be identified in the final report.
2. The names of consultative or administrative personnel in the agency (may) (may not) be identified in the final report.
3. The agency (wants) (does not want) a conference with the student when the report is completed.
4. The agency is (willing) (unwilling) to allow the completed report to be circulated through interlibrary loan.
5. Other: ______________________________

Date 3-25-77

Wetona Mayfield RN
Signature of Agency Personnel

Alice J. Myers
Signature of student

Mona M. Counts R.N. PhD
Signature of Faculty Advisor

*Fill out and sign three copies to be distributed as follows: Original -- Student; first copy -- agency; second copy -- T.W.U. College of Nursing.

I am Alice Myers, a registered nurse. To complete my work on a Master's Degree in Nursing at Texas Woman's University, I am involved with a research study at this time. My study involves measuring sound levels in the nursery. At the same time, heart and respiratory rates will be taken on the baby. This study could help us improve care that is given to babies in the nursery. Your baby has been selected to participate in this study with your permission. Yours or the baby's name will not be identified at all. May I have your permission? Can I clarify anything for you?

TEXAS WOMAN'S UNIVERSITY
COLLEGE OF NURSING

Consent to Act as a Subject for Research and Investigation:

I have received an oral description of this study, including a fair explanation of the procedures and their purpose, any associated discomforts or risks, and a description of the possible benefits. An offer has been made to me to answer all questions about the study. I understand that my name will not be used in any release of the data and that I am free to withdraw at any time.

Signature _______________ Date

Witness _______________ Date

Certification by Person Explaining the Study:

This is to certify that I have fully informed and explained to the above named person a description of the listed elements of informed consent.

Signature _______________ Date

Position _______________

Witness _______________ Date

APPENDIX B

SPECIFICATIONS OF THE TOOL

APPENDIX B - SPECIFICATIONS FOR THE TOOL

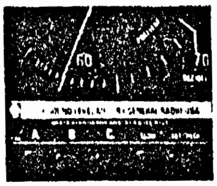
GR 1565-B and GR 1563 SOUND-LEVEL METERS

- 40- to 140-dB range
- meet ANSI and IEC standards
- rugged ceramic microphones
- FET and integrated-circuit design combine performance with reliability
- convenient pocket proportions – small and light

1565-B Sound-Level Meter
Type 2

1563 Sound-Level Meter
Type 3

The best of both worlds The 1565-B is a full-fledged standard sound-level meter – it conforms to both national and international standards, meets all criteria necessary for the noise provisions of the Occupational Safety and Health Act, and includes most of the features usually found in larger, more cumbersome, and more expensive instruments. Yet the 1565-B fits in the palm of your hand and operates in severe environments for up to 50 hours on self-contained batteries. There are no line cords to bother with or microphone cords to trip over, and an imaginative combination of controls permits one-hand operation and rapid interpretation of the result – just aim and read.



Easily-read meter provides fast, accurate answers.

The 1565-B is the successor to the 1565-A, long popular for rapid measurements of plant, traffic and community noise.

The -B version is a total redesign to take advantage of the experience gained with its predecessor and of the latest advances in components and techniques – it is smaller, 40% lighter, and easier to use. It offers 50% longer life on batteries that are readily available. In common with the 1565-A, the 1565-B is approved by the Bureau of Mines for use in gassy coal mines.

Performance and versatility built-in The 1565-B uses a rugged, yet laboratory-quality, ceramic microphone that can be checked easily, when necessary, by such standard calibration devices as the GR 1562 Sound-Level Calibrator. An output jack is provided for use with headphones or recorders, and a lock is provided so the range control can be fixed in a single position. The instrument is housed in a tough plastic case, tapered at the microphone end to reduce the effects of case diffraction, and meets all ANSI requirements for a Type 2 general-purpose sound-level meter.

The 1563 is similar to the 1565-B but is designed to meet the less stringent requirements for ANSI Type 3 survey meters. Other differences include a pressure-calibration restriction to 1000 Hz and the inability to be adapted for use with vibration transducers, an external microphone, or microphone windscreens.

specifications

Sound Level 40 to 140 dB re 20 μN/m²

Weighting A, B, and C. 1565-B conforms to ANSI S1.4-1971 Type 2 and IEC 123.1961 1563 conforms to ANSI S1 4-1971 Type 3

Meter Rms response with fast and slow speeds.

Input MICROPHONE Lead-zirconate-titanate ceramic. For 1565-B, a 1560-P96 Adaptor converts input to 3-pin male A3 connector, for correct weighting, source impedance must be 380 pF ± 5% INPUT IMPEDANCE ≈ 13 MΩ//15 pF

Output: ≥ 1 2 V rms behind 620 Ω with meter at full scale, will drive 1556 Impact-Noise Analyzer, 1558 Octave-Band Noise Analyzer, 1521 or 1523 recorders, oscilloscopes, or low impedance headphones HARMONIC DISTORTION ≤ 0 5% (0.1% typical) from 32 Hz to 8 kHz, C-weighted with meter at full scale

Calibration (with 1562 Sound Level Calibrator) 1565-B can be acoustically calibrated at 125, 250, 500, 1000, and 2000 Hz; at 1000 Hz only for 1563.

Environmental: TEMPERATURE −10 to 50°C operating −40 to +60°C storage, with batteries removed, coefficient of sensitivity ≈ −0.01 dB/°C at 6 dB below full-scale meter reading. HUMIDITY 90% RH. MAGNETIC FIELD 1-Oersted (80 A/m) 50- or 60-Hz field causes ≈ 45 dB C-weighted indication when meter is oriented to maximum sensitivity to field.

Supplied Carrying pouch, miniature phone plug to connect to output, screwdriver for calibration adjust, batteries.

Available For 1565-B only, when used with 1560-P96 Adaptor: 1560-P52 Vibration Pickup, 1560-P73 or -P73B Extension Cable for remote microphone connection.

Power Two 9-V batteries (Burgess 2U6 or equal) supplied, provide ≈ 50-h operation

Mechanical Shielded plastic case DIMENSIONS (wxhxd): 1565-B, 3.63x6.5x2.09 in. (92x165x53 mm), 1563, 3.63x5.38x2.09 in. (92x137x53m). WEIGHT 1 lb (0.45 kg) net, 3 lb (1.4 kg) shipping.

	Catalog Number
1565-B Sound-Level Meter	1565-9702
1563 Sound-Level Meter	1563-9701
Windscreens for 1-in. microphone on 1565-B only, reduce wind noise and protect against contaminants, pack of 4	1560-9521
Battery, spare for 1565-B and 1563 (use 2)	8410-3200

APPENDIX C

DATA COLLECTION SHEET

DATA COLLECTION SHEET

Date________ NURSERY__________

NB No.______
Race C or N
Age_________
Gestational Age____wks.

Apgar Score:
1 minute____
5 minutes____

Time	Equipment	Dr.	R.N.	LVN	NA	O	V	Activity	Sound Meter	Resp.	Heart Rate	Comments

Infant Activity Criteria

1. Regular sleep-at full rest, muscle tonus is low, most parts are completely still
2. Irregular sleep- eyelids are closed- grimaces and other facial expressions are frequent.
3. Drowsiness- relatively inactive- eyes open and close intermittently- dull, glazed appearance.
4. Alert inactivity- is relatively inactive-face is relaxed and does not grimace
5. Waking activity- frequently engages in diffuse motor activity involving the whole body-eyes are open but not alert
6. Crying- crying vocalizations with vigorous, diffuse motor activity.
7. Indeterminate state- Infant's state did not clearly meet the criteria of any of the above.