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THE USE OF A MICROCOMPUTER BASED CARDIOTACHOMETER WITH VIDEO DISPLAY, DISCONTINUOUS TIME SAMPLES AND STATE-TRAIT ANXIETY SCALES TO MONITOR ANXIOUS AROUSAL IN EMR PUPILS IN THE MAINSTREAM AND SPECIAL EDUCATION CLASSROOMS

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In Partial Fulfillment
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Doctor of Education

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by

Ann L. Barefield

Dr. James Craigmile Dissertation Supervisor

July 1981

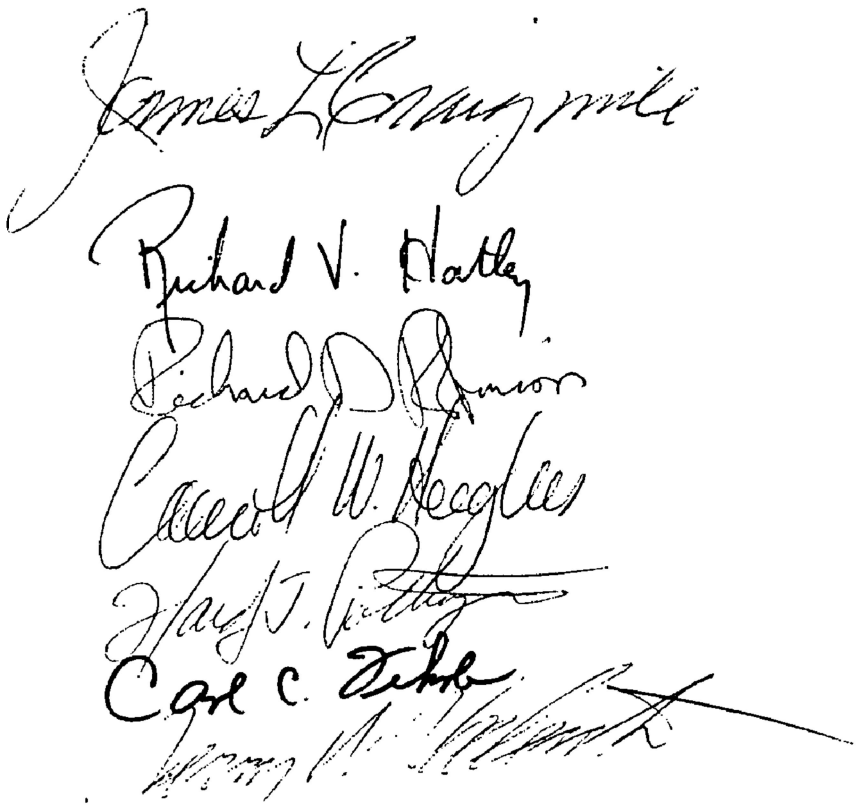
The undersigned, appointed by the Dean of the Graduate Faculty, have examined a dissertation entitled

THE USE OF A MICROCOMPUTER BASED CARDIOTACHOMETER WITH VIDEO DISPLAY, DISCONTINUOUS TIME SAMPLES AND STATE-TRAIT ANXIETY SCALES TO MONITOR ANXIOUS AROUSAL IN EMR PUPILS IN THE MAINSTREAM AND SPECIAL EDUCATION CLASSROOMS

presented by Ann Lee Barefield

a candidate for the degree of Ed.D.

and hereby certify that in their opinion it is worthy of acceptance.



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CHAPTER 1

Introduction

Theoretical and Empirical Rationale

Although there has been a great deal of research on the effects of anxiety on children (Castanada, McCandless, & Palermo, 1956; Merryman, 1974; Naylor & Gaundry, 1973; Phillips, 1978; Sarason, 1966; Sarason, Lighthall, Davidson, Waite, & Ruebusch, 1960; Sieber, O'Neil, & Tobias, 1977), the vast majority of the research deals with paper-pencil measures. Very little of the research employs physiological measures of arousal in a naturalistic setting (Sieber, et al., 1977).

Tennyson and Boutwell (1973) report that measuring state or trait anxiety prior to the performance of a task provides a poor estimate of anxiety effects as compared to measures of state anxiety during the performance of the given task. It would appear that the constant monitoring of arousal by physiological measures would be more productive than trying to use paper-pencil measures to measure a situation that is suspected to be anxiety producing.

Most of the research dealing with the use of heart rate monitoring has occurred in laboratory settings (Hong, Bowden, & Kagan, 1977; Lacey, 1967; Obrist, Gaebelein, Teller, Langer, Light, & McCubbin, 1978; Papay, Costello, Hedl, & Spielberger, 1975). However, according to Sieber,

O'Neil, and Tobias (1977), "The eventual treatment procedures will be of questionable usefulness unless they are employed and evaluated in the setting in which they will be used by the practitioner" (p. 50).

Over the past 10 to 14 years much attention has been given to the need for mainstreaming special education students into the regular classroom setting (Ballard, Corman, Gottlieb, & Kaufman, 1977; Carroll, 1967; Dunn, 1968; Eysenck, 1979; Gottlieb, 1978; Porter, Ramsey, Tremblay, Iaccobo, & Crawley, 1978). However, research reports to date are inconclusive in regard to the advantages and disadvantages of this procedure (Carroll, 1967; Iano, Ayers, Heller, McGettigan, & Walker, 1974; Reese-Dukes & Stokes, 1978).

Purpose of the Study

The focus of the study was on the anxious arousal of fourth grade special education pupils in the mainstream and special education classrooms. Video tape, heart rate telemetry, discontinuous time sampling and state-trait anxiety scales were used to study the following phenomena:

1. How often do the behaviors from the discontinuous time probe samples occur in the two settings?

2. What behaviors accompany heart rate acceleration?

3. Do high-anxious pupils exhibit specific behaviors more often than other pupils?

4. Do high-anxious pupils exhibit accelerated heart rate more often than other pupils?

The technology provided heart rate data obtained using telemetry and a cardiotac unit with data recorded simultaneously on a video tape recording of the classroom. The data collected were used to establish hypotheses regarding possible cause and effect relationships which may be tested in experimental settings. It is believed that this study has provided valuable insights about the arousal of special education pupils in special education and mainstream settings for future research. The validity of many of the results will require experimental verification.

Need for the Study

This descriptive study has several major strengths that are believed to be important at this point in time. First, there are few, if any, research efforts using the type of technology applied in this study that have been implemented in the classroom setting. Second, the research to date dealing with mainstreaming as opposed to self-contained special education settings for educable mentally retarded subjects has been inconclusive. Third, hypotheses have been generated for future experimental research.

Research Questions

The present study observed subjects in the special education and mainstream classrooms by means of cardiotachometer, video tape, discontinuous probe time samples and scores on a state-trait anxiety measure in order to obtain information concerning the following questions:

1. How often do the behaviors from the discontinuous time probe samples occur in the two settings?

2. What behaviors accompany heart rate acceleration?

3. Do high-anxious pupils exhibit specific behaviors more often than other pupils?

4. Do high-anxious pupils exhibit accelerated heart rate more often than other pupils?

Design of Study

The subjects for this study were special education and normal pupils from a fourth grade class in a rural south central Missouri elementary school. They were chosen from the fourth grade class into which educable mentally retarded pupils were mainstreamed. All four educable mentally retarded pupils from the mainstream classroom were given the state-trait anxiety measure as were four normal subjects from the same class. Two EMR and two normal subjects were observed by video-tape recording and discontinuous probe time samples. Two EMR subjects were monitored by heart rate telemetry in the mainstream and the EMR setting.

Definition of Terms

For the purpose of this study, the following terms are defined:

1. A-State: Refers to anxiety that has its source in given situations rather than in the personality of the individual.

2. A-Trait: Refers to anxiety that has its source in the personality of the individual and is a rather stable, permanent personality characteristic.

3. EMR: Stands for educable mentally retarded. This term is used to refer to individuals who have been carefully screened, tested and diagnosed as needing more educational help than they can receive when placed in the mainstream full time without special assistance.

4. Ethological Method: This term refers to a total study of behavior as it occurs in a naturalistic setting.

5. Mainstream: Refers to the regular classroom setting where the majority of the pupils are assigned.

6. Mean Heart Rate: Refers to the arithmetic mean for a designated minute.

7. Normal Subjects: Refers to those pupils who function in the regular classroom without the need of special education services.

8. Special Education: Refers to the services and/or the classroom to which pupils are assigned when they have been diagnosed as needing special educational assistance.

CHAPTER II

Review of Selected Literature

Literature on Anxiety

Anxiety has been viewed in a variety of ways. Bergman and Escalano (1949) have indicated that babies, whose reaction to the birth process is highly traumatic, are usually very sensitive and have little tolerance for frustration later in life. Some philosophers view anxiety as being caused by religious and moral issues (Heidegger, 1949; Kierkegaard, 1944; Sarte, 1970).

Darwin was one of the earliest scientists to explore anxiety (Darwin, 1872). He proposed that the manifestation of anxiety in man was highly adaptive and necessary for his survival.

Freud (1936) viewed anxiety as being either objective or neurotic. He described the first as being a reaction to something in the external world and the second as having an internal source.

Hull (1943) and Spence (1958) developed a theory of anxiety that is based on the strength of an individual's learning habit and drive state. Taylor (1953) developed the Taylor Manifest Anxiety Scale on the basis of the Hull-Spence theory.

In 1960, Sarason and his associates published their study of anxiety in elementary school children. They used

the Test Anxiety Scale for Children and the General Anxiety Scale for Children in their research.

Many of the studies of anxiety in children have been directed at how high- and low-anxious children respond to the classroom learning situation (Manley & Rosemier, 1972; Merryman, 1974; Naylor & Gaudry, 1973; Phillips, 1978; Sarason, et al., 1960). Also, several self-report instruments have been developed to measure this anxiety (Phillips, 1978; Sarason, et al., 1960; Smith & Lay, 1974; Spielberger, 1973).

The anxiety research literature is replete with information which indicates that the more anxious the individual, the more the anxiety interferes with learning. According to Hilgard (1951), the more anxious the person is the less discriminating he is. Merryman (1974) supported this when he stated that anxious children need to be in situations where they can take risks without being afraid of punishment by teachers, parents, other adults or their peers. Dreikurs (1968) indicated that the result of lack of acceptance is an increase in socially destructive aims and eventually hopelessness and withdrawal. Sarason (1966) also predicted that discouraged children would withdraw.

Spielberger (1973) developed the State-Trait Anxiety Inventory for Children. This inventory is a self-report measure of levels of state and trait anxiety. In Anxiety and Behavior, Spielberger (1966) indicated that trait anxiety measures rather stable, permanent personality characteristics.

He also proposed that state anxiety is based on a pattern of variables that covary over occasions of measurement. He defines state anxiety as a transitory state that fluctuates over time.

Spielberger (1966) emphasized that although physiological variables markedly loaded the state anxiety factor, this is not true of trait anxiety. Ego-weakness, guilt proneness, tendency to embarrassment, tension, and suspiciousness are the variables on which trait anxiety is loaded.

Basowitz, Persky, Korchin and Grinker (1955) stated that if one reports he/she is anxious, this indicated that he/she is anxious. Also, Krause (1961) indicated that anxiety has traditionally been inferred by six different types of evidence. They are: self-reports, physiological signs, body language, task performance, clinical intuition, and response to stress. He proposed that self-report provides the most widely accepted basis for inferring state anxiety. Both the above statements lend support to the use of self-report measures of anxiety.

Spielberger's State-Trait Anxiety Inventory is purported by Levitt (1967) to be the most carefully developed self-report instrument both theoretically and methodologically. The State-Trait Anxiety Inventory for Children is based on that instrument.

Sarason (1972) posited that high test anxious subjects were inferior in performance under achievement-oriented or evaluating conditions. He further indicates that subjects

who are test anxious tend to produce more self-centered and interfering responses when they are confronted with evaluative situations.

Papay, et al. (1975) proposed that elevations in A-state and poorer performance result for many children under stressful evaluative classroom conditions. Also, Spielberger (1972) posits that high A-trait children tend to view evaluative conditions as more threatening and thus they experience more pronounced elevation in A-state and thus perform less well.

Sarason et al. (1960) and Phillips (1978) have both indicated that their research shows that boys receive lower scores than girls on anxiety self-report measures. However, Sarason and his colleagues put forth three hypotheses related to this data. They posit that the differences could be because boys are more defensive about admitting anxiety, that it is more acceptable for girls to admit anxiety and that the questions on the self-report measure tap areas of anxiety more pertinent to boys than to girls. Phillips (1978) reports that similar results have been obtained with Yugoslavian, Australian and Japanese children.

Literature on Special Education

The studies that have been reported to date on the status of the educable mentally retarded (EMR) child in the regular classroom setting have been inconclusive. Reese-Dukes and Stokes (1978) reported that when students in a regular class were allowed to rate their classmates on a

sociometric device, the sociometric scores of EMR students were significantly lower than those of non-EMR students. This data is corroborated by a number of recent sociometric studies (Gottlieb & Davis, 1974; Goodman, Gottlieb, & Harrison, 1972; Iano, et al., 1974; Meyerowitz, 1967).

Iano, et al. (1974) reported that, in situations where supportive services were provided for EMR students, when the supportive services ceased the EMR students were not any better accepted than the EMR students in other studies who did not receive the services.

According to Reese-Dukes and Stokes (1978), the majority of research from 1941 to 1962 was overwhelmingly in support of segregated classrooms for EMR students. However, following Dunn's (1968) benchmark article the climate seemed to change. It is interesting to note that even though the climate has appeared to change drastically since 1968, the research does not conclusively support the mainstreaming position.

According to Ann Welch Carroll (1967), EMR children placed in a partially integrated setting appeared to have a better self-concept than those in a totally segregated or integrated situation. However, there were some conflicting results on children placed in a segregated setting all day.

Goldstein, Moss, and Jordan (1965) proposed that children with intelligence quotients lower than 80 should be placed in special classes. Their study did not support the contention that children placed in special classes achieve less

well academically than those placed in regular classes. They also purported that EMR students in special classes seem to show better personality development and social adjustment.

Bradfield, Brown, Kaplan, Rickert, and Stannard (1973) researched a program that provided an in-service training program on individualized instruction and positive consequences for teachers. Most teachers did not show an attitude change toward the special education students and changes that did occur were negative. The authors concluded that the regular classroom programs will need to be modified to meet the needs of special students in order to get positive results.

Ballard, et al. (1977) agreed with other studies mentioned when they indicated that EMR children do not gain social acceptance by contact alone. They proposed that EMR students' status can be improved, but it requires a continuous program of activities and support between non-EMR and EMR pupils. Ballard also indicated that EMR children, placed in regular classes without some helpful interventions, show a decline in status.

We continue to struggle with the issue of how to best educate educable mentally retarded pupils. Perhaps physiological data can provide some valuable insights into how the pupils react to various settings.

Literature on Heart Rate

In addition to the above mentioned studies, much work has been done in the area of heart rate as a measure of

arousal. Even though the researchers are not in complete agreement, there appears to be sufficient evidence to warrant using heart rate telemetry to measure arousal in individuals (Hong, et al., 1977; Lacey, 1967; Obrist, et al., 1978; Papay, 1975). Also, video tape equipment is available and has been used successfully in studies similar to the research reported in this document (Baker, 1970; Hong, et al., 1977). Although there has been work done in all the above mentioned areas, very little research has been done in the classroom setting using heart rate telemetry to assess what kind of interactions result in arousal in students.

According to Kelly, Brown, and Shaffer (1970) forearm blood flow and heart rate were said to be the best measures of arousal in his study. Lawler, et al. (1976) indicated that heart rate was by far the most sensitive physiological measure in their study. They reported also, that decreases in certainty resulted in larger increases in heart rate.

Some research findings on heart rate that might have relevance for educational practices were reported by Lykken and others. Lykken (1972) observed that there were vast differences in the ability of individuals to tune out noxious stimuli. He suggested that some individuals might have the ability to use negative perception to reduce the impact of painful stimulation. He further stated that heart rate responses to shock were decreased when the individual received a warning signal prior to the shock.

Hodges (1976) found that heart rate was the only measure with significant relationship to state self-rated anxiety. Hodges mentions that Spielberger has proposed the "trait anxiety scores reflect a predisposition to respond with heightened state anxiety to situations involving the possibility of failure or loss of self-esteem, and not to situations involving harm or the threat of harm" (p. 181). Thus, he indicated that because of the above mentioned data it is not unusual for there not to be a relationship between trait anxiety and physiological measures of stress.

Although, at this time, there is some controversy over the use of physiological measures in relation to anxiety, some definite trends have resulted from the research that have implications for this study.

> In school children, attention to visual and auditory stimulation produced cardiac deceleration and stabilization, even though respiratory rate increased; 'thinking' produced cardiac acceleration, although respiratory rate increases were more modest. (Lacey, 1967, p. 90)

In the same article, Lacey indicated that "only heart rate and blood pressure yielded a clear-cut and dramatic difference between the 'environmental detection' situations and those that resulted in 'environmental rejection" (p. 91).

Sroufe and Waters (1977), in their very thorough review of heart rate literature as it applies to use with children, concluded heart rate can be a very valuable tool even though

it has been subjected to criticism and is not at this time extensively used in research. They suggested that it cannot be a substitute for detailed behavioral observation but that it can be useful in "specifying the meaning of behaviors, and in hypothesis generation in laboratory, clinic, and natural settings" (p. 22).

An article that offers further credence to this study is Hong, et al. (1977). In this research the authors were able to effectively combine heart rate telemetry and video tape for analyzing interactional and physiological variables in a naturalistic setting. Some of the data noted in this study suggests that heart rate is slower and the child is more attentive to task when there is a friendly and affectionate relationship between the child and the adult involved. They also indicated that low heart rate and warm affect are related to frequent instances of smiling.

Tobias, et al. (1977) noted that there is evidence that some subjects who are highly reactive to stress on physiological measures evidence very little, if any, anxiety. They suggest that some people may have more ability to adapt to high levels of arousal. It is important to keep this in mind when using physiological measures in research.

CHAPTER III

Methods and Procedures

Selection of Subjects

The four educable mentally retarded subjects were chosen because of their grade placement and because they attended class in both the mainstream and the special education setting. The four normal subjects were chosen at random from the same mainstream classroom as the EMR subjects.

It was necessary for the subjects to be in either the fourth, fifth or sixth grade because the state-trait anxiety measure was normed on pupils from those grades. Fourth grade was chosen because the school in which the study was conducted contained kindergarten through fourth grade.

After permission was obtained from the school board to conduct the study, permission was procured from the teachers of the selected fourth grade class and the special education class to use their classroom and pupils in the research effort.

The parents of each subject chosen to participate in the study were called and they gave their verbal permission for their child to participate after the experimenter gave them a detailed account of what would occur. A follow-up letter (Appendix A) and a consent form (Appendix B) were sent home with the subjects the day of the telephone conversation. The subjects returned the signed consent forms the

next day. On the Friday before the study was to begin, a second letter (Appendix C) was sent to inform the parents that the study would begin on the following Monday.

During the week prior to the beginning of the study, the experimenter explained to all the children in both the special education and mainstream classes what the subjects would experience. On the first day of the study the procedure was again explained to each class as the gloves were connected.

State-Trait Anxiety Measures

All eight children in the study were given the State-Trait Anxiety Inventory for Children (Spielberger, 1973). On the STAIC alpha coefficients were used to measure the internal consistency as well as test-retest correlations due to the transitory nature of anxiety states.

The test-retest reliability coefficients for fourth, fifth and sixth grade children over a six-week interval were .65 for males and .71 for females on A-Trait, and .47 for females and .31 for males on A-State (Spielberger, 1973). The alpha coefficients were .82 for males and .87 for females on A-State, and .78 for males and .81 for females on A-Trait (Spielberger, 1973).

It was pointed out in the manual (Spielberger, 1973) that the test-retest correlations for the A-State were low due to the variability of state anxiety. Also, when the A-Trait scale was compared with the Children's Manifest Anxiety Scale (Castanada, et al., 1956) and the General

Anxiety Scale for Children (Sarason, et al. 1960) it correlated .75 with the CMAS and .63 with the GASC (Platzek, 1970).

The A-Trait and A-State scales were administered to the entire fourth grade population prior to the experimentation with the telemetry and the video tape recording. The A-Trait scale was administered after the A-State scale as recommended by Spielberger (1973). Also, the A-State scale was administered with instructions to answer questions according to how they felt when taking a test. The A-State scale was administered again after the experimentation in both the mainstream and special education classrooms.

Cardiotachometer

Two educable mentally retarded pupils were monitored in the special education classroom and in the mainstream classroom by a microcomputer based cardiotachometer with a video display. The instrument uses a KIM-1 microprocessor to combine telemetric monitoring of heart rate with video camera signal. This cardiotachometer is capable of providing a composite video output signal of a frame displaying elapsed time in minutes and seconds together with a subject's measured R-R interval. This was mixed with a television camera signal to provide a composite view of a subject's behavior and his or her heart rate (Pottinger, Hughes, Schroeder, Barefield, & Craigmile, 1980).

The cardiotachometer is similar to those described recently in Dejong (1980) and Klosterhalfen (1980). A

unique feature of the system was the combination of telemetry to acquire sensor data, and superimposing heartrate data with a video image of the subject. All of the components with the exception of the transducer interface are standard off-the-shelf components.

The input sensor consisted of a simple crystal plethysmograph mounted on a finger of the subject. The output of the sensor was transmitted via a small FM transmitter to a nearby receiver whose output drives the transducer interface. R-wave pulses were amplified, filtered and peak detected by the transducer interface to produce an interrupt request (IRQ) to the 6502 microprocessor.

The number of 10 msec intervals which occur between interrupts were counted by a program residing in nonvolatile read-only memory (1K EPROM). The 10 msec intervals were produced by an on-board crystal controlled programmable interval timer (PIT). The reciprocal of the R-R intervals were calculated and a running average of four consecutive rates maintained. The resulting heartrate in beats-per-minute was displayed on the integral LED display and output to an alphanumeric frame buffer (MVM 1024). Elapsed time in minutes and seconds was also displayed in the frame buffer for convenience and the display was updated every second.

The video output from the frame buffer was mixed with video from a small television camera and the resulting composite image was recorded on video tape for off-line analysis.

Microcomputer

The primary component of the system was a KIM-1 single board computer. The KIM-1 is a familiar component in many instrumentation systems used in psychology and will not be described further here. In order to expand the basic KIM, a Riverside Electronics KEM expansion motherboard, an MVM-1024 alphanumeric display module and a KIMSI power supply were used. Regulators to supply +5, -5, and -12 vdc were added to the unregulated power supply. The KEM is an S-100 bus compatible adaptor for the KIM-1 which also contains room for four 2708 EPROM's. These provide an extra 4096 bytes of program storage. The cardiotach program and video driver routines are stored in a single 1024 byte EPROM. This storage is non-volatile and need not be reloaded after power is removed.

Transducer Interface

The transducer interface is similar to a circuit used by Dejong (1980) and seemed to work reasonably well. A bandpass filter was added to reduce noise from the telemetry system.

Video Display

The primary component of the video display consists of a Riverside Electronics MVM-1024 Microprocessor Video Display driver. The MVM is capable of displaying 16 rows of 64 alphanumeric characters on a standard television monitor, and contains its own 1024 character display buffer. The

lower left-hand corner was used for display purposes with the rest of the area available for future display of additional parameters.

The MVM-1024 was slightly modified by the addition of two connectors for horizontal and vertical syncronization signals. The MVM's own sync signals were used to externally syncronize the television camera and thus eliminate the need for a common external syncronization source. A simple resistor network sufficed to mix the two video signals to provide a composite data/image video signal for recording and/or display.

Input Transducer

The input transducer was a Lafayette Instrument number 76605 Pulse Pickup Crystal. It was attached to a velcro strip that wrapped around the finger to hold the plethysmograph in place.

The transducer was mounted inside a child's glove and the battery and FM transmitter were attached by elastic strips to the back of the glove. This apparatus provided a rather unobtrusive instrumentation package. Dummy packages were used on subjects not being monitored with the end result that no one knew who was being monitored.

Telemetry System

An existing Bio-Sentry Telemetry Model 4200 instrumentation receiver and Model 201 transmitter were used to

telemeter sensor output to the transducer interface. The transmitter operated on IRIG channel 7. There was nothing special about this system which was used simply because it was available. A smaller transmitter package and one tailored specifically for this application would have been desirable. The current package measured 2.35 x .65 x 1.5 inches excluding the battery and sensor. The Bio-Sentry Telemetry Model 2200 voltage controlled oscillator and amplifier were originally designed to monitor ECG and had to be preceded with a resistive voltage divider to reduce the sensor output signal to a level compatible with the transmitter. Many alternative telemetry packages are available.

Ethological Method

The data collected were analyzed by direct observational methods for the purpose of developing hypotheses for future testing. Several articles and books written within the last five to 10 years have emphasized the importance of ethological studies (Blurton-Jones, 1972; Charlesworth, 1978; Hutt & Hutt, 1970; Patterson, 1977; Sackett, 1978a). Sackett (1978a) spoke to the issue of using observational methods to address basic research questions concerning mental retardation. He stated that naturalistic research allows the investigator to see what the individual is actually doing when he or she is given the opportunity to respond freely. He

indicated that ethological studies are more costly in terms of time and money but he believes, in order to study how individuals interact with their environment, more longitudinal studies of this type are necessary.

Patterson (1977) posits that some variables that control behavior in the laboratory, such as reinforcement contingencies, may not even be attended to in the naturalistic setting. He indicates that some variables that are significant in the laboratory setting may be of very little value in real life situations. According to Blurton-Jones (1972):

> Ethological methods give the traditionally 'soft sciences' of child development and social behavior a useful opportunity to make themselves a little 'harder' without at the same time getting as narrow-minded as could result from too successful an imitation of the physical sciences. (p. 28)

In a recent investigation (Porter, Ramsey, Tremblay, Iaccobo, & Crawley, 1978) social interactions of retarded and normally developing children were studied by means of video tape and an ethological approach. This study verified research already published using sociometric measures (Goodman, Gottlieb, & Harrison, 1972; Iano, Ayers, Heller, McGettigan, & Walker, 1974; Meyerowitz, 1967).

Sackett, Ruppenthal and Gluck (1978) have indicated that "most controlled experiments and standardized tests measure the skills and abilities of people under conditions bearing little relevance to those of everyday life" (p. 3).

They suggest that even though observational research can be time consuming, complicated and costly it may be the only method available to study complex behavior occurring in real life situations.

Hutt and Hutt (1970) made the following statement regarding the need for descriptive normative studies:

> Present-day psychology is essentially an analytic science, concerned with the whys of behavior, and as such its method is experimental. It is often forgotten that an animal in an experimental procedure already has a well-established behavioral repertoire and that knowledge of this repertoire may be essential to understanding the results of an experiment. In other words, before attempting to modify behaviors, we need to know what behavior there is to modify. (p. 4)

The use of time sampling was employed in the present research. Arrington (1943) has given the following definition of time sampling:

> Time sampling, as here discussed, is a method of observing the behavior of individuals or groups under the ordinary conditions of everyday life in which observations are made in a series of short time periods so distributed as to afford a representative sampling of the behavior under observation. It is, in other words, a method of sampling, the validity of which is primarily a

> function of the amount and distribution of the time spent in observation or of the number, length and distribution of the separate observations or time samples. As contrasted with the experimental method, it is a form of controlled observation in which the behavior, the method of sampling, the method of recording, and the manner of selecting the behavior to be observed are subject to control rather than the situation in which observations are made. Finally, it is a method whose essential function is accurate measurement of the incidence of specific behavior acts or patterns under specified conditions. (p. 82)

Sackett (1978b) discusses the same method described by Arrington (1943) and he calls the method "discontinuous probe time samples" (p. 27). He suggests that the recordings can either be done instantaneously at the end of a set period, or for a short duration at the end of a set time interval.

In this study, the recording was done instantaneously at the end of a 10-second interval. A recording sheet was developed for the purpose of coding the behaviors (Appendix D). The behaviors for recording were chosen because they were typical classroom occurrences that could be easily observed. The purpose for observing typical classroom occurrences was to see how they interacted with heart rate variability, whether they were approximately the same for

EMR and normal subjects, whether they were approximately the same for high- and low-anxious individuals and whether they were approximately the same in the special education and the mainstream setting.

One male EMR subject and one female EMR subject were observed in both the mainstream and special education setting. The subject's behavior was recorded instantaneously at the end of each 10 seconds during a 30-minute session. Also, one normal male subject and one normal female subject were observed by the same method in the mainstream only.

Two observers coded the behaviors of the four subjects during the 30-minute sessions. In order to determine the interrater reliability, a statistic (Kappa) developed by Cohen (1960) for nominal scale agreement was used.

According to Hollenbeck (1978) this statistic does not have the drawback of many of the statistics that have been used to determine nominal scale agreement in the past. Several references are available to those who wish to explore the computation of Kappa in more depth (Cohen, 1960; Fleiss, 1971; Fleiss, Cohen, & Everett, 1969; Hollenbeck, 1978).

The proportion of agreement that remains after chance agreement is removed is defined as Kappa. The formula for Kappa is as follows:

$$\text{Kappa} = (P_o - P_c)/(1 - P_c)$$

where: P_o = the proportion of codings on which the observers agreed; P_c = the proportion of codings for which agreement was expected by chance. An illustration of the computation

of Kappa for the observation of the EMR girl in the special education classroom is shown in Table 1.

In five out of the six observations the proportion of rater agreement was above .90 with the highest proportion of agreement being .96. In the case of the observation of the EMR boy in the mainstream, the proportion of agreement was .89. Thus, the information about the subjects' behaviors presented in Chapter IV would appear to be valid.

Data Analysis

State-Trait anxiety inventory for children. The data obtained from this instrument were analyzed by converting the raw scores to the percentile ranks found in the manual (Spielberger, 1973). Table 2 was devised to show the results of the scales that were administered.

Discontinuous time probe samples. Time samples were taken throughout the sessions in both the mainstream and the special education class by use of the video tape recording. However, the time samples for the 30-minute segments shown in Tables 3, 4 and 5 were coded one-half hour after the video taping was begun in both the mainstream and the special education setting. These 30-minute segments were also coded by a second individual and statistically analyzed by the use of Kappa in order to establish interrater reliability.

Heart rate data. The digital heart rate readings were transcribed for each minute and the mean heart rate for each minute was obtained. The time samples and the mean heart rate for each minute were compared as part of the analysis

Table 1

Matrix of Agreement for Observation of

EMR Girl in EMR Classroom

		Observer 1										
	Category	A	B	C	D	E	F	G	H	I	J	Proportion of Total for Observer 1 (P_1)
Observer 2	A	78	0	0	4	0	0	0	0	0	0	82/180 = .46
	B	0	37	0	1	0	3	0	0	0	2	43/180 = .24
	C	0	0	14	0	0	0	0	0	0	0	14/180 = .08
	D	0	0	0	15	0	0	0	0	0	0	15/180 = .08
	E	0	0	0	0	17	0	0	0	0	0	17/180 = .09
	F	0	0	0	0	0	0	0	0	0	0	0
	G	0	0	0	0	0	0	0	0	0	0	0
	H	0	0	0	0	0	0	0	0	0	0	0
	I	0	0	0	0	0	0	0	0	0	0	0
	J	0	0	0	0	0	0	0	0	0	9	9/180 = .05
Proportion of total for observer 2 (P_2)		.43	.31	.08	.11	.09	.02	0	0	0	.06	

P_o = sum of diagonal entries/total of all entries 170/180 = 0.94

$P_c = \sum_{1}^{K} (P_1 \times P_2) = (.46 \times .43) + (.24 \times .31) + (.08 \times .08) + (.08 \times .11) + (.09 \times .09) + (.02 \times 0) + (.05 \times .06) = 0.28$

Kappa = (0.94 - 0.28)/(1 - 0.28) = 0.92

Note. The letters A through J represent the behaviors on the coding sheet in Appendix D.

Table 2

STAIC Percentile Ranks

For EMR and Normal Subjects

Subjects	Setting and Scale			
	A-Trait Mainstream	A-State (Test Situation) Mainstream	A-State EMR Room	A-State Mainstream
*EMR Female	83	68	48	10
EMR Female	62	97	72	34
*EMR Male	92	100	100	98
EMR Male	83	87	79	91
*Normal Male	58	2		2
Normal Male	53	94		6
Normal Male	58	65		37
*Normal Female	48	97		48

Note. An asterisk is placed by the subjects who were monitored by cardiotachometer and/or videotape.

Table 3

Time Samples for EMR Girl and EMR Boy

In the Special Education Classroom

Subjects	Occurrences Over Time						Total	% of 180 Time Samples
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.		
				Attending to Task				
EMR Boy	4	6	3	5	3	6	27	15
EMR Girl	25	7	11	20	7	8	78	43
				Interacting with Teacher				
EMR Boy	0	0	0	2	0	1	3	2
EMR Girl	2	1	2	0	15	17	37	21
				Interacting with Peers				
EMR Boy	13	5	15	12	7	5	57	32
EMR Girl	0	5	5	4	0	0	14	8
				Looking Around				
EMR Boy	8	9	10	3	4	1	35	19
EMR Girl	3	4	9	0	3	1	20	11
				Moving Around				
EMR Boy	0	6	0	0	0	4	10	6
EMR Girl	0	10	2	3	1	1	17	9

Table 3 (continued)

Subjects	Occurrences Over Time							
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.	Total	% of 180 Time Samples
				Asking for Assistance				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	2	1	3	2
				Elation				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	0	0	0	0
				Displeasure				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	0	0	0	0
				Showing Off for Camera				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	0	0	0	0
				Fidgeting				
EMR Boy	5	4	2	8	16	13	48	27
EMR Girl	0	3	1	3	2	2	11	6

Table 4

Time Samples for EMR Girl and EMR Boy In the Mainstream

Subjects	Occurrences Over Time						Total	% of 180 Time Samples
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.		
				Attending to Task				
EMR Boy	15	4	12	4	15	11	61	34
EMR Girl	13	16	29	11	12	9	90	50
				Interacting with Teacher				
EMR Boy	3	11	2	0	3	4	23	13
EMR Girl	5	0	0	1	4	0	10	6
				Interacting with Peers				
EMR Boy	0	1	0	0	0	0	1	1
EMR Girl	4	4	1	13	4	5	31	17
				Looking Around				
EMR Boy	3	10	9	15	5	6	48	27
EMR Girl	6	3	0	3	7	2	21	12
				Moving Around				
EMR Boy	6	1	0	3	3	1	14	8
EMR Girl	0	0	0	0	0	4	4	2

Table 4 (continued)

Subjects	Occurrences Over Time						Total	% of 180 Time Samples
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.		
				Asking for Assistance				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	1	0	0	1	1
				Elation				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	0	0	0	0
				Displeasure				
EMR Boy	0	0	0	0	0	0	0	0
EMR Girl	0	0	0	0	0	0	0	0
				Showing Off for Camera				
EMR Boy	1	0	1	0	0	0	2	1
EMR Girl	0	0	0	1	0	0	1	1
				Fidgeting				
EMR Boy	2	3	6	8	4	8	31	17
EMR Girl	2	7	0	0	3	10	22	12

Table 5

Time Samples for Normal Girl and Normal Boy

In the Mainstream

Subjects	Occurrences Over Time							
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.	Total	% of 180 Time Samples
Attending to Task								
Norm. Girl	23	11	25	14	10	11	94	52
Norm. Boy	16	18	25	9	11	15	94	52
Interacting with Teacher								
Norm. Girl	0	1	0	0	0	0	1	.05
Norm. Boy	0	6	1	0	0	0	7	4
Interacting with Peers								
Norm. Girl	2	9	0	6	5	14	36	20
Norm. Boy	4	2	1	14	5	0	26	14
Looking Around								
Norm. Girl	0	6	5	8	1	3	23	13
Norm. Boy	7	2	0	7	10	0	26	14
Moving Around								
Norm. Girl	5	2	0	0	12	1	20	11
Norm. Boy	0	0	0	0	0	15	15	8

Table 5 (continued)

Subjects	Occurrences Over Time							
	1-5 Min.	6-10 Min.	11-15 Min.	16-20 Min.	21-25 Min.	26-30 Min.	Total	% of 180 Time Samples
Asking for Assistance								
Norm. Girl	0	0	0	0	0	0	0	0
Norm. Boy	0	0	0	0	0	0	0	0
Elation								
Norm. Girl	0	0	0	0	0	0	0	0
Norm. Boy	0	0	0	0	0	0	0	0
Displeasure								
Norm. Girl	0	0	0	0	0	0	0	0
Norm. Boy	0	0	0	0	0	0	0	0
Showing Off for Camera								
Norm. Girl	0	0	0	0	0	0	0	0
Norm. Boy	0	1	0	0	2	0	3	2
Fidgeting								
Norm. Girl	0	1	0	2	2	1	6	3
Norm. Boy	3	1	3	0	2	0	9	5

of the data. Also, the mean heart rates for each minute were ordered from lowest to highest and placed in groups of 10 according to beats per minute (60s, 70s, 80s, 90s, above 100). The percentage of mean heart rates for each group was also determined.

Rationale for Procedures

While only four subjects were monitored by video tape and two by cardiotachometer, the State-Trait Anxiety Inventory was administered to four EMR subjects and four normal subjects. Also, all eight subjects wore similarly wired gloves on their non-dominant hand but only one glove contained the live transmitter. This procedure served to mask the identity of the subjects being studied at any given time.

In the mainstream, six to eight desks were normally placed together to form a table and the teacher routinely changed the seating arrangement. Therefore, no new procedure was introduced when the eight subjects were seated at a table together a week prior to the beginning of the study. This arrangement facilitated the monitoring of the subjects.

All equipment was housed in a large moveable cabinet that was placed in a remote part of the classroom. The person monitoring the camera and other equipment stood behind the cabinet and thus, was inconspicuous. The cabinet was transported between the two classrooms when the pupils were at lunch in order to avoid disrupting the normal classroom schedule.

CHAPTER IV

Results

State-Trait Anxiety Measures

The State-Trait Anxiety Inventory for Children had been administered to all fourth graders in the school by school personnel for school use. The results from those scales as well as the results from the scales administered for the purpose of this study will be presented.

For the school purposes, the fourth grade pupils were asked to answer the 20 statements on the A-State scale indicating how they felt during a test. The administration of the A-Trait scale followed that of the A-State scale, as recommended by Spielberger (1973). On the 20-item A-Trait scale the pupils were instructed to answer indicating how they generally felt. Sample questions from the A-State and A-Trait scales can be found in Appendix E.

The A-State scale was administered to all eight subjects in the mainstream and to the EMR subjects in the special education class by their teachers in order to obtain a measure of the subjects' general anxiety level in the two settings. This scale was administered one day after the conclusion of the study and the subjects were asked to respond in terms of how they felt at that particular moment.

The results of these scales were analyzed by comparison to the published norms (Spielberger, 1973).

The results of the A-Trait scale showed that all four EMR subjects were at or above the 62nd percentile in trait anxiety according to the scale norms. Three of the EMR subjects were at or above the 83rd percentile with one subject being at the 92nd percentile. The percentile rank for the male and female subjects who participated in the heart rate monitoring were 92 for the male and 83 for the female. All four normal subjects ranked at or below the 58th percentile with the lowest rank being the 48th percentile.

The results of the A-State scale given with instructions for the subject to tell how he/she felt when taking a test showed percentile ranks from two to 100 when compared to the norms (Spielberger, 1973). The percentile ranks for the four subjects who were observed by the use of discontinuous time probe samples were as follows: EMR girl, 68; EMR boy, 100; Normal girl, 97; Normal boy, 2.

The percentile ranks for the A-State scale administered to the four EMR subjects in the special education classroom were 48, 72, 79 and 100. The percentile rank of 48 was scored by the EMR female and the 100 was scored by the EMR male who were monitored by the cardiotachometer and video tape.

The results of the A-State scale administered to all eight subjects in the mainstream ranged from the 2nd to the 98th percentile. The normal boy's rank was at the 2nd percentile while the EMR boy ranked at the 98th percentile. The EMR girl ranked at the 10th percentile and the normal

girl at the 48th. The specific ranks given were for the subjects who were monitored by cardiotachometer and/or video tape. A summary of the results of all the anxiety scales administered is shown in Table 2.

Heart Rate

One fourth grade girl and one fourth grade boy who attended special education and mainstream classes were monitored for two hours in both settings by the use of the cardiotachometer described in Chapter III. Both subjects had been diagnosed as educable mentally retarded prior to the year in which the study was conducted and had been attending special education and mainstream classes for several years.

Elapsed time and digital heart rate in beats per minute were superimposed on the video tape so that the researcher was able to make a record of the digital readings by minutes. A mean heart rate for each minute was obtained by adding the digital readings and dividing by the total number of readings for that minute.

Due to movement and other artifacts a full 120 minutes of valid readings were not obtained for any session.

Seventy minutes of valid readings were obtained for the girl in the EMR class. During this period, 1% of the mean digital readings per minute were between 60 and 70 beats per minute, 18% were between 70 and 80 beats per minute, 50% were between 80 and 90 beats per minute, 29% were between 90 and 99 beats per minute and 1% were above 100 beats per minute.

The range of the means was from 69.33 to 101.33 beats per minute.

In the mainstream, 54 minutes of valid readings were obtained for the EMR girl. In this setting, 23% of the mean digital readings per minute were between 70 and 80 beats per minute, 60% were between 80 and 90 beats per minute, 15% were between 90 and 100 beats per minute and 2% were above 100 beats per minute. The range of the means was between 74.54 and 104.05 beats per minute.

Due to the same artifacts, only 35 minutes of valid readings were obtained on the EMR boy in the special education setting. Twenty-three percent of the means of the digital readings were between 70 and 80 beats per minute, 49% were between 80 and 90, 23% between 90 and 100, and 6% were above 100 beats per minute. The range was from 72.00 - 104.30.

In the mainstream setting, 49 minutes of valid readings were obtained for the EMR boy. Two percent of the mean heart rates were between 70 and 80 beats per minute, 10% were between 80 and 90 beats per minute, 67% were between 90 and 100 beats per minute and 20% were above 100 beats per minute. The range was from 77.50 to 110.35 beats per minute.

When the mean heart rate for the EMR girl in the special education room was between 90 and 99 beats per minute, the major incidents involved interaction with the teacher about classwork, difficulty with mathematics problems, movement, and one negative interaction with the aide.

In the situations where teacher interaction was involved, several interesting phenomena occurred. During the time periods in which the subject was waiting to talk with the teacher, having her papers graded, asking the teacher's permission to go to the restroom or receiving instruction about what to do next, the subject's mean heart rate per minute was in the nineties and at one point the mean was above 100 beats per minute. However, when the subject was in the reading group with her peers, and the teacher called on her to answer a question and showed the subject where to look in the book, her mean heart rate was in the high seventies. When the subject began to work in the workbook alone her mean heart rate was in the eighties. At one point while the subject was in the reading group the teacher graded her workbook and handed it back to her. At this point her mean heart rate per minute was in the nineties.

At one point the subject had difficulty with her mathematics lesson and called on the aide to help her often during the 29-minute period. On several occasions the subject made comments such as "It's hard" and "I need help". When these comments were made her mean heart rate fluctuated between 90 and 99 beats per minute. However, when the aide worked with her the mean heart rate was between 80 and 89 beats per minute. At one point her mean heart rate was between 76 and 86 beats per minute for six minutes while she worked with the aide on the mathematics lesson. The subject's mean heart

rate returned to the nineties when the aide left her to do her work on her own.

The subject and a peer were busy looking at a calendar on the bulletin board and talking to each other when the aide approached them and asked them to return to their desks. At this point the subject's heart rate went from between 70 and 80 beats per minute up to a high of 108 beats per minute.

It is difficult to tell how much of the heart rate increase in any time period was due to movement. However, it should be noted that there were periods when the subject was moving and the mean heart rate for the one-minute period was as low as 76 beats per minute. In the periods where the mean heart rate was above 90 beats per minute, factors other than movement appeared to account for the majority of the increase.

In the mainstream, when the EMR girl's heart rate was between 80 and 90 beats per minute she appeared to be listening to the teacher as she discussed the lesson. When her mean heart rate was between 70 and 80 beats per minute she appeared to be attending to the lesson. However, there were several occasions when specific incidents appeared to be connected with heart rate changes.

At the beginning of the session, when the experimenter was explaining to the class what was being done, the subject's digital readings were between 91 and 104 beats per minute. After the experimenter completed the orientation the subject's heart rate was between 80 and 90 beats per minute.

At another point the subject was working on a paper about which the teacher was asking questions. The subject's heart rate was between 91 and 107 beats per minute during this time. She also had digital heart rate readings between 91 and 105 beats per minute while interacting with one of her peers. During the interaction she put her hand over her mouth in a gesture that appeared to indicate disapproval or surprise at what the peer had said.

The teacher reprimanded one of the subject's peers and quizzed him about whether he would like to go back to first grade. The subject's mean heart rate for the minute in which this interaction occurred was 91.04 beats per minute. The mean heart rate for the minute before this occurrence was 81.50 beats per minute. There did not appear to be other causes that would account for the change.

For two minutes the subject's mean heart rate was 90.71 and 91.56 consecutively. The digital readings were as high as 106 beats per minute during this time. It was not readily apparent what might have accounted for the increase.

The educable mentally retarded boy had 10 one-minute periods in the special education classroom when his mean heart rate was above 90 beats per minute. During one of the periods he raised his hand to ask for assistance. The teacher's aide could not come immediately and the subject spent the next 40 seconds simply looking around. Once the aide had finished helping him and moved away, he asked for more help and she came back to work with him. In the minute

following this episode he continued to work in his workbook alone and his mean heart rate was 86.67 beats per minute.

Another time when his heart rate was above 90 beats per minute was when he was working in his workbook alone. He made mistakes and had to erase his work. Some of the increase could have been caused by movement. However, it should be noted that there were times when he was moving around the room or getting things out of his desk and his heart rate was only between 75 and 85 beats per minute.

Two episodes when the subject's mean heart rate was above 90 beats per minute involved interaction with his peers. They were discussing the camera. For the minute immediately following the two minutes of interaction with his peers, his mean heart rate was 104 beats per minute. During this time his peers were acting silly for the camera and he was laughing out loud. In the minute immediately following this occurrence he walked over to the person who was monitoring the equipment to have them check his glove. His mean heart rate for this minute was also over 100 beats per minute.

In the next episode in which the subject's mean heart rate was over 90 beats per minute he was looking around for the entire 60 seconds. It was obvious that he was very aware of the camera. It should be noted that in the minute preceding this episode he had been attending to task and doing some fidgeting, and his mean heart rate for that minute was only 81 beats per minute.

At one point the subject's heart rate was above 90 beats per minute while he was copying work from the chalkboard. He had been copying work from the chalkboard for several minutes and his mean heart rate had not been over 88 beats per minute. During the minute following the increase his mean heart rate was 82.63 beats per minute. No reason for the increase was observed.

Twenty-three percent of the subject's mean heart rates were in the 70 to 80 beats per minute range while he was in the special education class. The behaviors during these periods seem to indicate that the subject's attention was focused on his environment. The subject's behaviors include such things as watching a peer, looking around the room, looking for something in his desk, talking and picking something up off the floor.

In the mainstream setting 20% of the mean heart rates were above 100 beats per minute and 67% were between 90 and 100 beats per minute. The major episodes that showed a mean heart rate over 100 beats per minute were incidents involving the teacher reprimanding the class or a peer, the teacher giving the subject assistance, listening to the teacher and the subject volunteering to answer a question asked by the teacher.

During one episode when the subject's mean heart rate was 110.35 beats per minute he was asking for and receiving help from the teacher on an assignment. Another time he went to the teacher's desk, as did several other pupils, and the

teacher sent them all back to their seats. At this point his mean heart rate was 104.71 beats per minute.

Several times during the recording session the teacher reprimanded a pupil or the entire class. When the pupil being reprimanded was at the subject's table his mean heart rate was over 100 beats per minute. His mean heart rate was also over 100 beats per minute when the teacher reprimanded the class for talking and sat down at her desk. She threatened to take minutes off their recess if they did not get quiet.

At one point the subject's digital heart rate was between 103 and 114 beats per minute while he appeared to be attending to what the teacher was saying about the lesson. However, it should be noted that in the minute just prior to the episode the teacher had reprimanded a pupil who was sitting at the subject's table.

The subject's mean heart rate was 108.50 during a one-minute episode in which he appeared not to be attending to the teacher. He was looking around the room, yawning and then he leaned his upper body across his desk seeming to indicate that he was tired. Movement could have accounted for some of this increase. However, there were several occasions when the subject's movement was much more vigorous and his heart rate did not exceed 100 beats per minute.

The subject did raise his hand two times in response to questions the teacher had asked. During these times his digital readings were between 99 and 110 beats per minute.

Another time the teacher called on him to answer a question and his digital readings were between 100 and 111 beats per minute.

The teacher reprimanded the subject and told him to put what he was doing away. She then called his name four times asking him questions about what she had been telling the class. During this time the subject's digital readings were between 90 and 108 beats per minute. It was interesting that every time he was asked a question someone else answered for him.

It should be noted that the one time the subject's mean heart rate was in the seventies, the teacher was really chastising the class. He appeared to pay attention to every word she said and then he got busy on his assignment. During this episode the teacher did not sit at her desk or threaten to take minutes off the recess.

During the five episodes when the subject's mean heart rate was between 80 and 90 beats per minute he was either looking around the room, talking to peers or attending to what the teacher was saying about a paper on his desk and about labeling the parts on a drawing of a body.

Discontinuous Time Probe Samples

The behaviors of the two educable mentally retarded subjects, one boy and one girl, were coded during 30-minute time segments in the special education and mainstream classrooms. Behaviors of two normal subjects, one boy and one girl, were coded in the mainstream setting. The method used

was described in Chapter III. A description of the behaviors is shown in Appendix F.

The coding sessions that took place in the special education classroom were during a period when the subjects were supposed to be completing an assignment at their desks. The teacher was working with a reading group at the reading table and the teacher's aide was moving about the room assisting pupils who needed help.

In the mainstream setting the teacher was lecturing to the class and asking questions about punctuation. The pupils were then given an opportunity to complete a work-sheet. Following the language lesson the teacher presented a science lesson in which she lectured and asked questions about the human body.

Table 3 shows the behavior coding for the educable mentally retarded girl and boy in the special education classroom. It should be noted that while 43% of the female subject's discontinuous time samples were for attending to task, only 15% of the male subject's time samples were for that activity. Also, a greater percentage of the female subject's time samples were for interacting with the teacher, asking for assistance and moving around. The male subject had a greater percentage of time samples for interacting with peers, looking around and fidgeting.

Since it was observed that attending to task, interacting with the teacher and asking for assistance were all related to time on task, a total of the time samples for all

three divided by the total number of time samples gives a percentage estimate of time on task. Thus, the female subject spent approximately 66 percent of her time on task while the male subject spent approximately 19 percent of his time in the same way.

Table 4 shows the time samples for the educable mentally retarded girl and boy in the mainstream. In this setting, the EMR girl spent 16% more of her time attending to task than the EMR boy and 16% more time interacting with peers. The boy spent 15% more time looking around and 6% more time moving around. He also spent 7% more time interacting with the teacher and 9% more time fidgeting. Differences on the other behaviors did not appear to be significant.

Table 5 shows the time samples for the normal boy and the normal girl in the mainstream. None of the differences appear to be significant. Only one difference was above 5% and that was on interaction with peers.

A comparison of the EMR male subject's behavior in the special education class and the mainstream indicates that he spent 17% more time attending to task and 11% more time interacting with the teacher in the mainstream. In this setting, he spent 28% less time interacting with peers and 10% less time fidgeting than in the special education classroom.

When the EMR female subject's time samples were compared for the two settings, it was noted that she spent 7% more time attending to task in the mainstream. She also spent 9%

more time interacting with peers and 6% more time fidgeting. However, she spent 7% less time moving around and 15% less time interacting with the teacher.

When the behaviors of the EMR boy and the normal boy in the mainstream setting were compared, it was noted that the normal boy spent 18% more time attending to task and 13% more time interacting with peers. The EMR boy spent 9% more time interacting with the teacher, 13% more time looking around and 12% more time fidgeting.

There were very few significant differences between the behaviors of the EMR girl and the normal girl in the mainstream. The normal girl spent 9% more time moving around while the EMR girl spent 9% more time fidgeting. It is interesting to note that there was only a 2% difference between their time samples for attending to task.

Since there were so few differences in the time samples of the normal boy and the normal girl in the mainstream, it did not seem necessary to compare the time samples for the EMR girl and the normal boy or the EMR boy and the normal girl.

CHAPTER V

Summary and Recommendations

Summary

The answers to the research questions asked in Chapter I will be summarized in this section. It is important to note that due to the small sample and the exploratory nature of this study, one cannot generalize from these findings. However, it should be pointed out that the findings do illustrate what this method can produce and reveal many results similar to already established findings from the anxiety and heart rate literature.

Behaviors and setting. The results of the discontinuous time probe sampling seem to indicate that the male EMR subject spent significantly less time interacting with his peers in the mainstream than in the special education classroom. He also spent significantly more time interacting with the teacher in the mainstream.

Just the opposite was true for the EMR girl. She was observed interacting with the teacher more often in the special education setting and with her peers more often in the mainstream. While normal subjects were observed interacting with the teacher 5% of the time, EMR subjects interacted with her 19% of the time.

These findings could relate to anxiety levels indicated on the State-Trait Anxiety Inventory for Children for the EMR boy (Spielberger, 1973). This hypothesis will be discussed in more detail later in this chapter.

Both EMR subjects were observed spending less time on task than the normal subjects. However, only the EMR boy's time on task was significantly less. In the mainstream he spent 18% less time on task than the normal subjects and 28% less time than the EMR girl in the special education class.

The EMR boy had significantly higher percentages of "looking around" and of "fidgeting" than the other three subjects in both the mainstream and the special education setting. The time samples for "moving around" did not indicate significant differences in the two settings.

No incidents of obvious displeasure were observed and one incident of elation was coded under "interacting with peers" because the subject's back was to the camera. It should also be noted that there were only six observations of showing off for the camera and three of those were by the normal boy. Other pupils in both the special education and the mainstream classrooms did show off for the camera more often than the subjects being studied. This might have occurred because they were not chosen to participate in the study.

Behaviors and heart rate. The behaviors that were associated with accelerated heart rate for the EMR girl were interactions with the teacher that may have been

ego-involving, such as having papers graded and being reprimanded. Hodges (1966) indicated that the individual's "cognitive appraisal" of a particular event, as threatening or not, determines the amount of autonomic nervous system arousal. Thus, the heart rate accelerations during these events would appear to indicate that the subject perceived them as threatening.

Heart rate accelerations were also noted while she was having difficulty with her mathematics. Lacey et al. (1963) indicated that heart rate accelerates during problem solving and cognitive tasks. This would appear to indicate that the subject's effort to solve the mathematics problem caused the heart rate acceleration. The subject's heart rate did decelerate when the teacher's aide was helping her with the problem. Lawler, Obrist, & Lawler (1976) have indicated that heart rate is sensitive to situations of uncertainty and will accelerate as uncertainty increases. Also, Lewis & Wilson (1970) indicated that most subjects, regardless of age, show heart rate acceleration to mental arithmetic.

The EMR boy showed heart rate accelerations while interacting with the teacher's aide in order to receive assistance with his work. This would appear to indicate that he perceived the situation as threatening. He also showed accelerations while attending to task. He made a mistake and had to erase. Thus, the increase could have been due to uncertainty.

During an interaction with peers, in which the peers were showing off for the camera, the EMR boy's mean heart rate was above 100 beats per minute. Immediately following this interaction he went to the person who was monitoring the equipment to have his glove checked and his heart rate remained above 100 beats per minute. Over half of periods with a mean heart rate over 100 involved interactions with others.

While the EMR girl's baseline heart rate appeared to remain approximately the same in both the special education classroom and the mainstream, the EMR boy's baseline heart rate was approximately 10 beats per minute higher in the mainstream. This could relate to his A-Trait and A-State scores that are discussed in the next two sections.

Anxiety and behavior. The EMR boy ranked above the 90th percentile on the A-Trait scale and on all three A-State scales. He attended to task significantly less and spent more time looking around and fidgeting than the other three subjects.

The literature indicates that the more anxious an individual is the more he will resort to fantasy and day-dreaming (Phillips, 1978 & Reiter, 1973). There is no way of knowing from this study whether the looking around and fidgeting also involved fantasy and daydreaming, but one might assume that there was some relationship between the two.

Hodges (1968) reported that the subjects in his study who were less prone to anxiety were able to attend to task more. This has implications for future research as to whether some high-anxious pupils are labeled EMR due to anxiety. According to Bloom (1980) time on task is "related to the quality of instruction and the student's readiness for what is being taught" (p. 383). Has failure due to lack of readiness caused the anxiety that results in less time on task for some EMR pupils? This question needs to be carefully studied.

Heart rate and anxiety. The EMR boy not only responded with high levels of A-State and A-Trait, he appeared to have a higher baseline heart rate in the mainstream. Research findings have indicated that EMR students are not readily accepted by their normal peers (Ballard, 1977, Iano et al., 1974). Also, Eson (1972) has pointed out that teacher-pupil interactions appear to have a direct relationship to pupil anxiety levels.

It is important to note that the EMR boy's baseline heart rate was approximately 10 beats per minute lower in the special education classroom. One major difference between the special education class and the mainstream was that the teacher in the special education setting was working with a small group while the teacher in the mainstream was lecturing to the entire class. It should be further noted that six of the 10 times that the EMR boy's mean heart

rate was over 90 beats per minute, while in the special education class, he was interacting with other individuals.

Even though higher base-line heart rate was noted for the high-anxious EMR boy, research question number four cannot be answered from the results of this study.

Recommendations

Answers to the research questions have been summarized and will be used as a basis for the recommendations. Although the recommendations for further studies are based on the results of this research, the methods can be applied to the field of education in general and to educational administration.

Recommendations for further studies. According to Gunn, Wolf, Block and Peron (1972):

> Attempts to classify people according to personality types correlated with cardiovascular physiological patterns or disease have been inconclusive. Attempts to make meaningful correlations at a single point in time encounter further difficulty caused by the variability in an individual's visceral reactivity and other behavior. On the other hand, correlations of behavior, attitudes, and reactions in the same individual over time offers considerable promise, especially if observations can be made as the subject goes about his day-to-day activities in his natural environment. Such studies enable one to observe

> an individual's psychophysiological responses to his own environment, both internal and external, but have not yet offered an opportunity for replication and comparison with the responses of different subjects, since the situational aspects can never be the same from person to person and from time to time. The subject may, however, serve as his own control, providing information as to how he reacts to his varying life situations. (p. 463-464)

The above statement adds credibility to the present study and to the studies being recommended. The results of this exploratory study have convinced the author that other more sophisticated studies can be implemented in educational settings using heart rate telemetry and/or video tape. However, some precautions will be discussed in the next section.

Many studies have indicated that EMR subjects are not accepted by their normal peers (Ballard et al., 1977, Reese-Duke & Stokes, 1978, Iano et al., 1974). In order to expand on this knowledge, it would be helpful to monitor EMR subjects in the mainstream and special education settings by use of cardiotachometer, video tape and ethological methods in order to see what kinds of peer interactions are taking place in both settings and how the subject responds physiologically. Sackett (1978) has edited two volumes of

information on the use of ethological methods that should prove useful to anyone wishing to pursue this topic.

As mentioned earlier, Bloom (1980) has indicated that time on task is a significant variable in learning. A study using cardiotachometer, video tape and ethological measures could be used to monitor physiological arousal and time on task when the subject is assigned to various tasks at varying degrees of difficulty. The variable of state anxiety level could be added to this study.

Another study that might produce interesting findings would be to administer the A-State scale and then monitor high-anxious subjects in the mainstream and special education settings in order to see if their baseline heart rates vary in the two settings. This study showed that the high-anxious EMR boy's baseline did increase in the mainstream.

This study also raised a question about teacher-pupil interaction, and Eson (1972) has indicated that the relationship between the pupil and teacher is a significant variable in the anxiety level of pupils. Also, Phillips (1978) indicates that ego-involving instructions are anxiety producing. The cardiotachometer, video tape, and ethological methods can be used to study how pupil-teacher interactions affect heart rate. This study showed increases in heart rate for pupil-teacher interactions that did not involve the teacher assisting the EMR pupils. The population sample should be from both EMR and non-EMR.

Several research efforts indicate that small groups working together to perform classroom activities reduce isolation and rejection among children and lead to more positive social interactions. However, Johnson and Johnson (1980) dealt specifically with mainstreaming and handicapped children. He indicates that "in cooperative learning situations, the student's goal attainment is positively correlated and students coordinate their actions to achievement" (p. 94). A study of cooperative versus individualistic learning situations would involve the monitoring of both EMR and normal pupils by use of heart-rate telemetry to learn if there is a change in the baseline heart rate for EMR and normal pupils in either setting. Time on task as measured by ethological methods would add an important variable to this study.

Larivee and Cook (1979) have indicated that teacher's attitude toward mainstreamed pupils tends to become more negative the higher the grade level, with junior high school teachers being the most negative. It would be interesting to measure and compare the teacher's heart rate when interacting with normal and EMR pupils in the classroom.

This study indicates that the subject whose baseline heart rate was higher in the mainstream was also a high-anxious individual. Further studies are needed using heart-rate telemetry and anxiety measures in the naturalistic setting to check the validity of this result. In fact, an anxiety measure could be a part of all the future studies

that have been recommended in this chapter. Also, the use of heart-rate telemetry in conjunction with A-State and A-Trait measures might help clarify the research on differences in anxiety in boys and girls that has been reported by several experimenters (Sarason, et al. (1960); Phillips (1978).

General considerations. Although this study produced significant results, a more thorough study is recommended with field-proven equipment. The equipment was assembled in a university laboratory and due to limited funds the equipment on hand had to be adapted for use. It is recommended that all equipment be compatible without adaptation in order to get cleaner results.

Also, unless the experimenter has had broad experience with video-taping equipment and heart-rate telemetry, it is advisable to have an experienced technician monitor the equipment. Electrodes would probably produce less artifact than the plethysmograph used in this study. A two-way mirror in the equipment cabinet would have allowed the subjects to be filmed without the camera being obvious. It is advisable to use the same video-taping equipment when monitoring the behaviors and analyzing the data in order to avoid technical complications.

Due to the excess of data generated in continuous recordings of physiological experiments, it is necessary to have access to a computer and people trained in computer electrocardiogram applications when using large numbers of

subjects (Gunn, 1972). Computer analysis is also suggested for the behavioral observations (Sackett, 1978b).

REFERENCES

Arrington, R. E. Time sampling in studies of social behaviors: a critical review of techniques and results with research suggestions. Psychological Bulletin, 1943, 40, 81-124.

Ballard, M., Corman, L., Gottlieb, J., & Kaufman, M. J. Improving the social status of mainstreamed retarded children. Journal of Educational Psychology, 1977, 69, 605-611.

Basowitz, H., Persky, H., Korchin, S. J. & Grinker, R. R. Anxiety and stress. New York: McGraw Hill, 1955.

Bergman, P. & Escalona, S. K. Unusual sensitivities in very young children. The psychoanalytic study of the child. Vol. 3/4, New York: International University Press, 1949.

Bloom, Benjamin S. The new direction in educational research: alternate variables. Phi Delta Kappan, 1980, 61, 382-385.

Blurton-Jones, N. Characteristics of ethological studies of human behavior. In N. Blurton-Jones (Ed.), Ethological studies of child behavior. New York: Cambridge University Press, 1972, 3-36.

Bradfield, H. R., Brown, J., Kaplan, P., Richert, E., & Stannard, R. The special child in the regular classroom. Exceptional Children, 1973, 39, 384-390.

Carroll, A. W. The effects of segregated and partially integrated school programs on self-concept and academic achievement of educable mentally retardates. Journal of Exceptional Children, 1967, 34, 115-121.

Castanada, A., Palermo, D. S., & McCandless, B. R. Complex learning and performance as a function of anxiety in children and task difficulty. Child Development, 1956, 27, 327-332.

Charlesworth, W. R. Ecological psychology and mental retardation. In G. P. Sackett (Ed.), Observing behavior. Vol. 1. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 7-32.

Cohen, J. A. A coefficient of agreement for nominal scales. Educational and Psychological Measurement, 1960, 20, 37-46.

DeJong, M. L. A digital cardiotachometer implemented with the IM 65. Compute II, 1980, 32-35.

Dreikurs, R. Psychology in the classroom. (2nd ed.) New York: Harper & Row, 1968.

Dunn, L. M. Special education for the mildly retarded: is much of it justified? Exceptional Children, 1968, 35, 5-22.

Eson, M. E. Psychological foundations of education. New York: Holt, 1964.

Eysenck, M. W. Anxiety, learning and memory: a reconceptualization. Journal of Research in Personality, 1979, 13, 363-389.

Fleiss, J. L. Measuring nominal scale agreement among many raters. Psychological Bulletin, 1971, 76, 378-382.

Fleiss, J. L., Cohen, J., and Everett, B. S. Large sample standard errors of Kappa and weighted Kappa. Psychological Bulletin, 1969, 72, 323-327.

Freud, S. The problem of anxiety. New York: Psychoanalytic Quarterly Press & Norton, 1936.

Goldstein, H., Moss, W., & Jordan, J. The efficacy of special class training on the development of mentally retarded children. Cooperative Research Project No. 619, Office of Education, U.S. Department of Health, Education and Welfare, 1965.

Goodman, H., Gottlieb, J., & Harrison, R. H. Social acceptance of EMRs integrated into a nongraded elementary school. American Journal of Mental Deficiency, 1972, 76, 412-417.

Gottlieb, J. Observing social adaption in schools. In G. P. Sackett (Ed.), Observing behavior. Vol. 1. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 285-308.

Gottlieb, J. & Davis, J. Social acceptance of EMR children during overt behavioral interactions. American Journal of Mental Deficiency, 1974, 78, 141-143.

Gunn, C. G., Wolf, S., Block, R. T., & Person, R. J. Psychophysiology of the cardiovascular system. In N. S. Greenfield & R. A. Sternbach (Eds.), Handbook of Psychophysiology. New York: Holt Rinehart and Winston, 1972, 457-490.

Heidegger, M. Existence and being. Chicago: Regnerg, 1949.

Hodges, W. F. Effects of ego threat and threat of pain on state anxiety. Journal of Personality and Social Psychology, 1968, 8, 364-372.

Hodges, F. The psychophysiology of anxiety. In M. Zuckerman & C. D. Spielberger (Eds.), Emotions and anxiety: New concepts, methods and applications. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1976, 175-193.

Hodges, W. F., & Spielberger, C. D. The effects of threat of shock on heart rate for subjects who differ in manifest anxiety and fear of shock. Psychophysiology, 1966, 2, 287-294.

Hollenbeck, A. R. Problems of reliability in observational research. In G. P. Sackett (Ed.), Observing behavior: Vol. 2. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 79-98.

Hong, K. M., Bowden, M., & Kagan, K. L. Telemetered heart rate as a psychophysiological correlate of mother-child interaction. Paper presented at the annual meeting of the American Academy of Psychiatry, Houston, 1977.

Hull, C. L. Principles of behavior. New York: Appleton, 1943.

Hutt, S. J. & Hutt, C. Direct observation and measurement of behavior. Illinois: Charles C. Thomas, 1970.

Iano, R. P., Ayers, D., Heller, H. B., McGettigan, J. F., & Walker, V. S. Sociometric status of children in an integrative program. Exceptional Children, 1974, 40, 267-271.

Johnson, D. W. & Johnson, R. T. Integrating handicapped students into the mainstream. Exceptional Children, 1980, 47, 90-98.

Kelly, D., Brown, C. C., & Shaffer, J. W. A comparison of physiological and psychological measurements on anxious patients and normal controls. Psychophysiology, 1970, 6, 429-440.

Kierkegaard, S. The concept of dread. W. Lowrie, trans. Princeton, New Jersey: Princeton University Press, 1944.

Klosterhalfen, W. A computer-controlled cardiotachometer. Behavior Research Methods and Instrumentation, 1980, 1, 58-62.

Krause, M. S. The measurement of transitory anxiety. Psychological Review, 1961, 68, 178-189.

Lacey, J. I. Somatic response patterning and stress: some revisions of activation theory. In M. H. Appley & R. Trumbull (Eds.), Psychological stress: issues in research. New York: Appleton-Century-Crofts, 1967, 14-42.

Lacey, J. I., Kagan, J., Lacey, B. C., & Moss, H. A. Situational determinants and behavioral correlates of autonomic response patterns. In P. J. Knapp (Ed.),

Expression of the emotions in man. New York: International University Press, 1963, 191-196.

Lacey, J. I., Kagan, J., Lacey, B. C., & Moss, H. A. The visceral level: situational determinants and behavioral correlates of autonomic response patterns. In P. H. Knapp (Ed.), Expressions of the emotions in man. New York: International Universities Press, 1963.

Larrivee, B. & Cook, L. Mainstreaming: a study of the variables affecting teacher attitude. The Journal of Special Education, 1979, 13, 315-324.

Leavitt, E. E. The psychology of anxiety. Indianapolis: Bobbs-Merrill, 1967.

Lewis, M. The cardiac response during infancy. Methods in Physiological Psychology, 1975, 1, 201-229.

Lewis, M. & Wilson, C. D. The cardiac response to a perceptual cognitive task in the young child. Psychophysiology, 1970, 6, 411-420.

Lawler, K. A., Obrist, A., & Lawler, J. E. Cardiac and sematic response patterns during a reaction time task in children and adults. Psychophysiology, 1976, 13, 448-455.

Lykken, D. T., Macindo, J., & Tellegen, A. Perception: autonomic response to shock as a function of predictability in time and locus. Psychophysiology, 1972, 9, 318-333.

Manley, M. J. and Rosemier, R. A. Development trends in general and test anxiety among junior and senior high

school students. The Journal of Genetic Psychology, 1972, 120, 219-266.

Merryman, P. The effects of manifest anxiety on the reading achievement of fifth grade students. Journal of Experimental Education, 1974, 42, 36-41.

Meyrowitz, J. H. Self-derogation in young retardates and special class placement. Child Development, 1962, 33, 443-451.

Meyerowitz, J. H. Peer groups and special classes. Mental Retardation, 1967, 5, 23-26.

Naylor, F. D. & Gaudry, E. The relationship of adjustment, anxiety, and intelligence to mathematics performance. The Journal of Educational Research, 1973, 66, 413-417.

Obrist, P. A., Gaebelein, C. J., Teller, E. S., Lanzer, A. W., Grignolo, A., Light, K. C., & McCubbin, J. A. The relationship among heart rate, carstid dP/dt and blood pressure in humans as a function of stress. Psychophysiology, 1978, 15, 102-115.

Papay, J. P., Costello, R. J., Hedl, J. J. Jr., and Spielberger, C. D. Effects of trait and state anxiety on the performance of elementary school children in traditional and individualized multiage classrooms. Journal of Educational Psychology, 1975, 67, 840-846.

Patterson, G. A. A performance theory for coersive family interaction. In R. Cairns (Ed.), Social interaction: methods, issues and illustrations. Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1979.

Phillips, B. School stress and anxiety. New York: Human Sciences Press, 1978.

Porter, R. H., Ramsey, B., Tremblay, A., Iaccobo, M., & Crawley, S. Social interactions in heterogeneous groups of retarded and normally developing children: An observational study. In G. P. Sackett (Ed.), Observing behavior. Vol. 1. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 311-328.

Pottinger, H. J., Hughes, C. W., Schroeder, P., Barefield, A. L., & Craigmile, J. C. A microcomputer based cardiotachometer with video display. Behavior Research Methods and Instrumentation, 1981, in press.

Reese-Dukes, J. L. & Stokes, E. H. Social acceptance of elementary educable mentally retarded pupils in the regular classroom. Education and Training of the Mentally Retarded, 1978, 13, 356-361.

Reiter, H. H. Some personality correlates of the Page Fantasy Scale. Perceptual and Motor Skills, 1963, 16, 747-748.

Sackett, G. P. Introduction. In G. P. Sackett (Ed.), Observing behavior. Vol. 1. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 3-6. (a)

Sackett, G. P. Measurement in observational research. In G. P. Sackett (Ed.), Observing behavior. Vol. 2. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 25-44. (b)

Sackett, G. P., Ruppenthal, G. C., & Gluck, J. Introduction: An overview of methodological and statistical problems in observational research. In G. P. Sackett (Ed.), Observing behavior. Vol. 2. Theory and application in mental retardation. Baltimore: University Park Press, 1978, 1-14.

Sarason, I. G. Experimental approaches to test anxiety: Attention and the uses of information. In C. D. Spielberger (Ed.), Anxiety, current trends in theory and research. Vol. 2. New York: Academic Press, 1972, 381-403.

Sarason, S. B., Lighthall, F. F., Davidson, K. S., Waite, R. R., & Ruebush, B. K. Anxiety in elementary school children. New York: John Wiley and Sons, 1960.

Sarte, J. P. Being and nothingness. New York: Philosophical Library, 1956.

Sieber, J. E., O'Neil, H. F. Jr., & Tobias, S. Anxiety, learning and instruction. New York: John Wiley and Sons, 1977.

Smith, R. C. & Lay, C. D. State and trait anxiety: An annotated bibliography. Psychological Reports, 1974, 34, 519-594.

Spence, K. W. A theory of emotionally based drive (D) and its relation to performance in simple learning situations. American Psychologist, 1958, 13, 131-141.

Spielberger, C. D. The effects of anxiety on complex learning and academic achievement. In C. D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966.

Spielberger, C. D. Anxiety: current trends in theory and research (Vol 1). New York: Academic Press, 1972.

Spielberger, C. D. Preliminary test manual for the State-Trait Anxiety Inventory for Children. Palo Alto, California: Consulting Psychologists Press, 1973.

Spielberger, C. D. The nature and measurement of anxiety. In C. D. Spielberger and R. Diaz-Guerriro (Eds.), Cross-cultural anxiety. New York: John Wiley and Sons, 1976.

Sroufe, L. A. & Waters, E. Heart rate as a convergent measure in clinical and developmental research. Merrill-Palmer Quarterly, 1977, 23, 3-24.

Taylor, J. A. A personality scale of manifest anxiety. The Journal of Abnormal and Social Psychology, 1953, 48, 285-290.

Tennyson, R. D. & Boutwell, R. C. Pretask versus within-task anxiety measures in predicting performance on a concept acquisition task. Journal of Educational Psychology, 1973, 65, 88-92.

Thurstone, T. G. An evaluation of educating mentally handicapped children in special classes and in regular grades. Cooperative Research Project Report No. OE-SAE-6452. Washington: U.S. Office of Education, 1959.

Tobias, S. Anxiety research in educational psychology. Journal of Educational Psychology, 1979, 71, 573-582.

APPENDIX A

Initial Letter to Parents

Dear _____,

This note is to confirm our conversation on _____. As I told you on the telephone, I would like to use your child in an experiment that I will be conducting in partial fulfillment for my doctorate from the University of Missouri-Columbia.

Your child will participate in the experiment for one hour and forty-five minutes in the morning and one hour and forty-five minutes in the afternoon for five consecutive days. During that time I will monitor his/her heart rate by placing a glove on his/her hand that contains a finger cuff and a transmitter. His/her heart rate will be transmitted to other equipment that will allow the heart rate to be printed on a videotape recording that will be filmed at the time the heart rate is being monitored.

The videotape recording and the heart rate will be studied to see how your child reacts to various situations in his special education classroom and in his mainstreamed classroom. No names will be used in this study and your child's identity will not in any way be revealed.

Seven other pupils in your child's class will be wearing gloves, but only one child will be monitored each day. The children will not know which child is being monitored.

Thank you for allowing your child to participate in this experiment.

Sincerely yours,

Ann Barefield

APPENDIX B

Consent Form

THE PROJECT THAT MRS. ANN BAREFIELD IS CONDUCTING HAS BEEN EXPLAINED TO ME. I GIVE MY CHILD, _____ PERMISSION TO PARTICIPATE IN THE PROJECT.

PARENT SIGNATURE_____ DATE_____

WITNESS SIGNATURE_____ DATE_____

APPENDIX C

Follow-Up Letter to Parents

Dear _____,

This is to notify you that the experiment in which you have agreed to allow your child to participate will be conducted the week of May 11, 1981. If at anytime during the week you think your child does not wish to continue to participate in the experiment, you may withdraw your permission by calling me at 759-7149 or by sending a note.

If you have any questions or concerns about the experiment, please call me. You are also welcome to come by the school to talk with me at anytime.

Sincerely,

Ann Barefield

Please sign this letter and return it to school with your child so that I will know that you received it.

Signature _____

APPENDIX D

Sample Behavior Coding Sheet

Direct Observation of Classroom Behavior

Name: Where seen:

Date: Session:

Observer:

	A Attending to task	B Interacting with teacher	C Interacting with peers	D Looking around	E Moving around	F Asking for assistance	G Elation	H Displeasure	I Showing off for camera	J Fidgeting	Notes
1											
2											
3											
4											
5											
6											
1											
2											
3											
4											
5											
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APPENDIX E

Samples of the Questions and Instructions

For the State-Trait Anxiety Inventory for Children

HOW-I-FEEL QUESTIONNAIRE

Developed by C. D. Spielberger, C. D. Edwards, J. Montuori and R. Lushene

STAIC FORM C-1

NAME _____ AGE _____ DATE _____

DIRECTIONS: A number of statements which boys and girls use to describe themselves are given below. Read each statement carefully and decide how you feel right now. Then put an X in the box in front of the word or phrase which best describes how you feel. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, find the word or phrase which best describes how you feel right now, at this very moment.

1.	I feel	☐ very calm	☐ calm	☐ not calm
2.	I feel	☐ very upset	☐ upset	☐ not upset
3.	I feel	☐ very pleasant	☐ pleasant	☐ not pleasant
4.	I feel	☐ very nervous	☐ nervous	☐ not nervous
5.	I feel	☐ very jittery	☐ jittery	☐ not jittery
6.	I feel	☐ very rested	☐ rested	☐ not rested
7.	I feel	☐ very scared	☐ scared	☐ not scared

APPENDIX E (continued)

8.	I feel	☐ very relaxed	☐ relaxed	☐ not relaxed
9.	I feel	☐ very worried	☐ worried	☐ not worried
10.	I feel	☐ very satisfied	☐ satisfied	☐ not satisfied
11.	I feel	☐ very frightened	☐ frightened	☐ not frightened
12.	I feel	☐ very happy	☐ happy	☐ not happy
13.	I feel	☐ very sure	☐ sure	☐ not sure
14.	I feel	☐ very good	☐ good	☐ not good
15.	I feel	☐ very troubled	☐ troubled	☐ not troubled
16.	I feel	☐ very bothered	☐ bothered	☐ not bothered
17.	I feel	☐ very nice	☐ nice	☐ not nice
18.	I feel	☐ very terrified	☐ terrified	☐ not terrified
19.	I feel	☐ very mixed-up	☐ mixed-up	☐ not mixed-up
20.	I feel	☐ very cheerful	☐ cheerful	☐ not cheerful

APPENDIX E (continued)

HOW-I-FEEL QUESTIONNAIRE

STAIC FORM C-2

NAME _____ AGE _____ DATE _____

DIRECTIONS: A number of statements which boys and girls use to describe themselves are given below. Read each statement and decide if it is hardly-ever, or sometimes, or often true for you. Then for each statement, put an X in the box in front of the word that seems to describe you best. There are no right or wrong answers. Do not spend too much time on any one statement. Remember, choose the word which seems to describe how you usually feel.

1.	I worry about making mistakes	☐ hardly-ever	☐ sometimes	☐ often
2.	I feel like crying	☐ hardly-ever	☐ sometimes	☐ often
3.	I feel unhappy	☐ hardly-ever	☐ sometimes	☐ often
4.	I have trouble making up my mind	☐ hardly-ever	☐ sometimes	☐ often
5.	It is difficult for me to face my problems.	☐ hardly-ever	☐ sometimes	☐ often
6.	I worry too much	☐ hardly-ever	☐ sometimes	☐ often
7.	I get upset at home	☐ hardly-ever	☐ sometimes	☐ often
8.	I am shy	☐ hardly-ever	☐ sometimes	☐ often
9.	I feel troubled	☐ hardly-ever	☐ sometimes	☐ often
10.	Unimportant thoughts run through my mind and bother me	☐ hardly-ever	☐ sometimes	☐ oftem

APPENDIX E (continued)

11.	I worry about school	☐ hardly-ever	☐ sometimes	☐ often
12.	I have trouble deciding what to do	☐ hardly-ever	☐ sometimes	☐ often
13.	I notice my heart beats fast	☐ hardly-ever	☐ sometimes	☐ often
14.	I am secretly afraid	☐ hardly-ever	☐ sometimes	☐ often
15.	I worry about my parents	☐ hardly-ever	☐ sometimes	☐ often
16.	My hands get sweaty	☐ hardly-ever	☐ sometimes	☐ often
17.	I worry about things that may happen . . .	☐ hardly-ever	☐ sometimes	☐ often
18.	It is hard for me to fall asleep at night .	☐ hardly-ever	☐ sometimes	☐ often
19.	I get a funny feeling in my stomach	☐ hardly-ever	☐ sometimes	☐ often
20.	I worry about what others think of me . . .	☐ hardly-ever	☐ sometimes	☐ often

Note. Copied with permission.

APPENDIX F

Descriptors for Discontinuous Time Probe Sampling Behaviors

A. Attending to Task: looking at a book, writing, reading, attending to teacher.

B. Interacting with Teacher: answering questions, being scolded, talking with teacher, receiving assistance, raising hand in response to a question.

C. Interacting with Peers: receiving assistance, giving assistance, arguing, fighting, talking, teasing, listening.

D. Looking Around: looking around the room, looking at at camera, watching peers, looking out window or door, just looking around.

E. Moving Around: walking around room, sharpening pencil, going to restroom, general movement around room or building.

F. Asking for Assistance: raising hand for assistance, verbally asking for assistance.

G. Elation: laughing out loud, smiling broadly.

H. Displeasure: obvious frowning, statements indicating negative or hostile feelings.

I. Showing Off for Camera: making gestures that are obviously intended for camera.

J. Fidgeting: moving around at desk, playing with pencil or other objects, playing with glove or transmitter, getting things out of desk.

VITA

Ann Lee Barefield was born July 7, 1937, in Winston-Salem, North Carolina. After attending the Winston-Salem Public Schools, she received the following degrees: B. A. in Religious Education from Salem College in Winston-Salem, North Carolina (1959); M. Ed. in Elementary Education from the University of Missouri-Columbia (1976); Ed. D. in School Administration from the University of Missouri-Columbia (1981).

She has had 18 years of experience in the field of education. Six years of her experience were gained from teaching and directing private, church-related kindergartens and nursery schools. She was a classroom teacher for seven years and has been an elementary school principal for five years. She is presently employed as an elementary school principal by the Dixon R-1 School District.