PHYSIOLOGICAL REACTIONS OF STUTTERERS AND NON-STUTTERERS TO THE ROSENZWEIG PICTURE-FRUSTRATION STUDY PICTURES

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Wayne R. Maes

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This is to certify that the

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Physiological Reactions of Stutterers and Non-Stutterers to the Rosenzweig Picture--Frustration Study Pictures

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By

Wayne R. Maes

AN ABSTRACT

Submitted to the Department of Administrative and Educational Services of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

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Wayne R. Maes Abstract

There have been a great many studies conducted which have been concerned with observing the reactions of animals and humans to stress producing situations. It has been concluded that there are pronounced changes in autonomic nervous system functions when an organism meets stress or frustration. Very few of these studies, however, have been concerned with the reaction of the handicapped individual to frustration. The purpose of this study was to determine whether there is a physiological difference between the reaction of the stutterer and the non-stutterer in a frustrating situation.

The Rosenzweig Picture-Frustration Study was used as the stimulus to elicit the physiological response. The assumption was that when a person observes the situations presented by the P-F Study they identify with the person in the picture who is being frustrated, and elicit a response similar to that which they would make in such a situation.

To record the physiological response of each subject while they were observing the pictures in the Rosenzweig P-F Study, the Keeler Polygraph was used. Twelve of the twenty-four pictures in the P-F Study were selected for use in this study. As a subject observed each of these twelve pictures the pulse rate and breathing rate were recorded by styli. After the recording of the twelve pictures, each subject was asked to relax and close his eyes and a recording was made with the subject at rest.

Wayne R. Maes Abstract

The sample selected consisted of eighteen adolescent and young adult stutterers who were attending the summer speech clinic at Central Michigan College at Mt. Pleasant, Michigan. These were matched by eighteen adolescents and young adults of which fourteen were selected from the Mt. Pleasant Public Schools, and four selected from students at the summer session at Central Michigan College. These two groups were matched as nearly as possible for age, intelligence, and sex.

To interpret the results, the following method was used. The rest recording of pulse rate and breathing rate was considered as the normal function and the variations of these physiological functions while the subject was observing the pictures was computed.

Variations were considered with respect to the three following factors; heart beats per minute, inspirations per minute, and the inspiration-expiration ratio. The stutterers did not differ significantly from the non-stutterers with regards to deviation of the heart beat during observance of the pictures from heart beat during rest. There was, however, a highly significant difference between the groups both in the inspirations per minute and the inspiration-expiration ratio. The results show that the stutterers' responses on the pictures deviated more than did the responses of the control group in these two factors.

These results present two possible hypotheses:

1. The stutterers were more threatened by the pictures and, thus, elicited a more pronounced physiological response than the control group.

2. Part of the variation which the stutterers exhibited may merely indicate that the breathing of the stutterer is more variable than that of the non-stutterer.

However, if the second hypothesis were true it would be expected that the mean rest response and the mean response while observing the pictures would be very similar. Since this is not the case it can be assumed that the pictures were an adequate stimulus to influence breathing rate, and so the first hypothesis better satisfies the results of the data.

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CHAPTER I

THE PROBLEM

Statement of the Problem

The general problem with which this study was concerned was that of measuring physiological change which occurs when an individual is confronted with a frustrating situation. In this sense it is not unlike multitudinous studies which have been made upon the physiological reactions of humans during stress. More specifically, this study was concerned with observing changes which occur in breathing rate and heart beat in the stutterer when a picture is being observed which presents an individual (or individuals) in a frustrating situation.

Studies suggest that stutterers have a poorer emotional adjustment than do groups of normals. This led to the hypothesis which underlaid the study which is being reported here, viz., adolescent or young adult stutterers exhibit more pronounced physical changes in the face of a frustrating situation than do a group of normal non-handicapped individuals.

Need for the Study

Studies in animal psychology have contributed a tremendous body of information offering a lead to subsequent areas of study in human behavior. Considerable effort within this area has been devoted to the study of animal reactions to frustrating situations and to prolonged stress. Although the accumulation of data in the

study of human behavior is not as impressive, it has nevertheless been extensive. Studies in psychosomatic medicine and in somatopsychology have been in many cases aimed at determining whether what obtained in lower animals also holds for man. As the body of information has mounted, understanding has increased and each individual study tends to complement the whole.

Studies concerned with physiology and stress have been conducted in many cases with neurotics or psychotics as subjects. However, studies of this nature concerned with the handicapped have been few. Many studies have been reported in which projective methods and personality inventories were used in an attempt to evaluate the personality dynamics of groups of handicapped individuals, among which were groups of stutterers. Many of these studies suggested that the stutterer seemed to have more adjustment problems. It was felt that a study aimed at learning more about the stutterers physiological responses to frustrating situations would be a contribution to an area in which there has not been a great deal of work done.

Limitations

Frank (10) states that "Biology and psychology are limited by the principle of indetermination which, as in physics, asserts we cannot measure that which our instrument or procedure disturbs or distorts." The inability to prevent the instruments used from disturbing and distorting certainly posed a limitation in this study. The essential purpose of the study was to record breathing and heart

beats while the subject viewed twelve different pictures which presented varying frustrating situations. The ultimate (and unrealistic) goal would be to receive in the variations recorded only the physiological change which occurred as a result of the subjects identification with the individual being frustrated. That other factors resulted in changes in heart beat rate and expiration-inspiration ratio is certain. It is impossible to tell how much variation is due to the fact that being attached to the instruments posed as a new and possibly upsetting experience. The author was acquainted with the stutterers before they were run as subjects in this study, having worked with some of them individually and having associated with all of them as a group for three weeks previously. However, the only contact made with the control group previous to the experiment was by telephone, and even though an attempt was made to explain the apparatus and create rapport before the instruments were attached, the lesser degree of familiarity with this group may have accounted for some of the variations which were found on their records.

Furthermore, the instruments which were used to record, of necessity, must be quite sensitive in order to adequately measure heart beat and breathing rate. Because they are sensitive each inadvertent move of the arm on which the cuff was attached tended to distort the heart beat record and make interpretation more difficult. (Fortunately these occasions were few.) Also, if the

body was moved in certain ways the pneuomograph record was distorted, as it was when the subject coughed or spoke during recording. (Speech or coughs could be marked on the record but this nevertheless made for more difficult interpretation.)

Whenever instruments are used a distinct limitation, to which one is always subject, is mechanical failure. Throughout the course of this experiment there was no serious mechanical failure but on several occasions minor occurences rendered a portion of a record invalid. The measurements desired are recorded on a kymograph with red ink. The points on the recording styli although the best available at the time, tended to at times emit too much ink, causing blotting, and at other times in the middle of a recording the ink flow would cease, making it impossible to interpret the record. It is not felt, however, that this appreciably affected the results since this only occurred on several occasions and on not more than one picture with any individual.

The areas which the subject of this research embrace are very broad. As a result, an extensive treatment of the subject would include substantial knowledge in the areas of physiology, psychology, polygraphic techniques, and statistics. The author was only able to scratch the surface in some of these areas and call upon sufficient resources to make the portion of the data gathered which is of concern for this study meaningful. However, this may not be a limitation since data which was not treated here is available for future study.

As has been mentioned, all of the data gathered was not treated in this study, because the proposed scope of a study at this level does not call for a treatment so broad. As a result it was necessary for the author to select those data which were considered most important and reserve the rest for future study. This meant that the author used his judgment in deciding which part of the data should be treated.

CHAPTER II

REVIEW OF LITERATURE

Physiological Changes and Stress

The bio-social approach to studying human behavior has done much to clear up the mystery and controversy which has long accompanied discussions of the body-mind relationship, i.e., dichotomy versus "trichotomy", psycho-physical parallelism versus psycho-physical monism and all the rest. Mind and body, physiology and emotion, are no longer perceived as discrete entities but as interacting and as inseparable (except symbolically for purposes of study), being positions on a continuum. The insights in this area have contributed to the bodies of knowledge available today in psychosomatic medicine and somato-psychology. It is now a well established fact that the symbols of every day speech can have a profound affect not only upon "thoughts" but upon the entire organism and in like manner changes within the individual which are organic in nature may greatly affect the individual's thought content.

A great mass of the work which has been done in studying the organism's reaction to frustration was carried on with the lower animals. Pavlov, in his work with the conditioned reflex laid the ground work for much future speculation and study in the area of the meaning of symbols to the individual. He recognized that animals which were subjected to too long and intense conditioning tended to develop chronic emotional disturbances. He observed

that when an animal had difficulty in determining whether a symbol meant food or no food it became quite disturbed, a state which he called "experimental neurosis" and not unlike what is commonly called nervous breakdown. Since these first productive studies, many others have been conducted casting further light upon the problem. Masserman's studies in which he induced "neurosis" in cats is probably one of the most notable and the cats' responses to these relatively simple stimuli contributed to the understanding of what occurred with humans in the presence of ambiguous or mutually exclusive stimuli in an ultra-complex world of symbols. The essential conclusions which Masserman reached have been duplicated in other animals. For example, Liddell (17) has conducted studies for almost three decades in which he used sheep as subjects. He found that after an experimental neurosis had been induced in a sheep, undue sensitivity would be exhibited toward any situation which seemed dangerous and that even "the most feeble and innocuous change in the environment, if sudden, elicited an exaggerated alarm reaction." Of course accompanying this alarm reaction were definite measurable physiological changes which Hans Selye in his studies at the Institute of Experimental Medicine and Surgery, the University of Montreal, found could be elicited from rats either by such chemicals as atropine, and strychnine, or such non-chemical types of stress as subjection to emotional excitement.

Constantinides and Carey in reviewing the work of Selye (7) draw an analogy between the findings in animal experimentation and

what is known to exist in the life history of a man. They suggest that "it would not be surprising to find that much of our organic disease derives from psychological trauma, with the general adaptation syndrome as the bridge that links one to the other." Malmo (18) states that "Arterial blood pressure rise under conditions of emotional disturbance or stress is one of the best established phenomena in the physiology of emotion." He conducted a study on an experimental group of psychotics and neurotics and a control group which showed there to be an increase in blood pressure in both groups in the presence of stress but a more marked increase in the experimental group. Changes in respiratory pattern were noted by Stevenson and Ripley (22) who observed subjects exposed to stress.

The Stutterer and Physiological Change During Stress

As has been mentioned, there is conclusive evidence to the effect that physiological change can be noted while individuals are being subjected to stress. Furthermore studies indicate that these changes are more pronounced in neurotics and psychotics than in "normals". For the purposes of this study it is of concern whether or not the stutterer undergoes a more pronounced physiological change than does the normal in the presence of stressful or frustrating situations. Frank (10) presents a general discussion which is applicable to the stutterer. "When the individual is exposed to frequent or continual provocations to emotional reactions which he cannot escape or meet effectively, he may develop chronic

affective reactions; anger and rage become hostility, fear becomes anxiety and guilt, which he then carries in his organism as a pervasive set or physiological state, localized in one or more organ systems or functional processes (such as digestion or elimination, breathing or heart and circulation). Thereby, he can carry on various activities and functions necessary to life, such as eating, sleeping and motor activities but at the same time maintain these persistent affective reactions in his organism." It would surely seem that stutterers as a group, because of the stigma which seems to attend their handicap, would be more liable to experience "continual provocations to emotional reactions" and possible subsequent chronic physiological states than would the individual who has no handicap. The fact that they would tend to meet more frustration can be inferred from a statement by Dollard and Miller (9). "That the amount of frustration experienced by an individual is increased not only by unfortunate facial conformations and expressions, but also by bodily incapacities and defects, is obvious." Studies made in the area of the emotional adjustment of the stutterer, however, do not unanimously indicate emotional disturbance. Eisonson in Cruickshank (8) cites several studies which suggest that in light of data gathered thus far results are inconclusive. Fiedler and Wepman investigated the self concept of stutterers and concluded that it is not essentially different from the non-stutterer. Schultz used a non-directive counseling situation as a means of comparing

adult stutterers with psychoneurotics and concluded that the stutterers "had many symptoms common to psychoneurotics. The stutterers---- had many serious social and self-adjustment problems." Spriestersbach made a study in which he described the stutterer as possessing "mild degrees of social maladjustment." However, he reports that they differed a great deal from a group of psychotics who were included in the study. It would seem therefore that whether or not stutterers are less well adjusted than normals and whether they elicit more pronounced physiological changes in the presence of stress is a moot question.

In the preceding paragraph the stutterer was alluded to as handicapped but this may need some elaboration. There is a great deal of difference of opinion as to the cause of stuttering (Barbara (3) presents a discussion on causation.) but it is generally agreed that there is no physiological inadequacy but that psychological factors result in stammering while speedh is developing. One piece in the great mass of supportive evidence is that under hypnosis the stutterer is often capable of normal speech. Eisonson in Cruickshank (8) suggests that parent-child relations are very significant during the period when speech is developing. Now the fact that stuttering may be an expression of emotional stress does not mean that he cannot be considered as essentially different from just anyone who is emotionally disturbed as a result of distressing experiences during the developmental period. Regardless of causation

the stutterer during his years of growing up, has a handicap which in many respects is not unlike any other physical handicap which is very obvious in all social contacts. This handicap is different from a hysteric condition which satisfies some subliminal need, and the stutterer suffers the traumatic experiences which are the lot of the handicapped.

CHAPTER III

METHODOLOGY AND PROCEDURE

The Sample

The sample for this study consisted of eighteen adolescent stutterers who were attending the summer speech clinic at Central Michigan College in Mt. Pleasant, Michigan. There is an adult and a children's form of the Rosenzweig P-F test. As Anderson and Anderson (2) mention, the children's form is used for youngsters under fourteen. The pictures on the children's form are different from those on the adult form and it was felt that this would introduce considerable difficulty in interpretation. The experimental group of stutterers was therefore selected from those at the clinic who were fourteen years or older. Only those stutterers were included in the study who were within the normal range of intelligence.

The experimental group of stutterers was matched with a control group of non-stutterers. An endeavor was made to match the two groups for age, sex, and intelligence. Spache (22) reports that he found the responses of fifty girls to be different from fifty boys on the Children's Form of the Rosenzweig P-F Study, and it was felt that this may also hold for the Adult Form. Karhn and Schwartz (15) report a study which suggests that certain ability factors may determine responses. It was in an attempt to reduce these variables that the groups were equated as nearly as possible

for intelligence and sex. Although there seem to be no studies showing what relation age has to responses on the Adult Form, it appeared that this might be a possible source of error in interpretation, so the groups were also matched for age.

The age range in the experimental group was fourteen years and nine months to twenty-six years and six months. The ages of those in the control group ranged from fourteen years and nine months to twenty-four years and seven months. For the distribution of ages in each of the groups see Tables I and II. The mean age of the experimental group was 218.57 months with a standard deviation of 39.17. For the control group the mean age was 214.78 months and the standard deviation was 33.25. In each of the groups there were fifteen boys and three girls.

Intelligence scores for the stutterers were obtained from the Summer Clinic records. Each child at the clinic was given the performance scale of the Wechsler-Bellevue Scale and these scores were used in the study. Of the eighteen adolescents and young adults in the control group, fourteen were selected from the Mt. Pleasant Public Schools, and four were college students attending the summer session at Central Michigan College. Group intelligence scores were available for those who were attending the Mt. Pleasant Public Schools (Otis Self-Scoring, and California Mental Maturity) and the four college students had had complete Wechslers.

The intelligence range of the stutterers was 83 to 134 with a mean score of 111.50 and a standard deviation of 14.85. Table III

shows the distribution of scores for this group. In the control group the intelligence scores ranged from 80 to 135 with a mean score of 109.61 and a standard deviation of 13.45. The distribution of scores for this group is shown in Table IV.

TABLE I

EXPERIMENTAL GROUP
AGE DISTRIBUTION

Age	No.
14 - 15	3
16 - 17	6
18 - 19	7
20 - 21	0
22 - 23	0
24 - 25	0
26 - 27	2

TABLE II
CONTROL GROUP
AGE DISTRIBUTION

Age	No.
14 - 15	2
16 - 17	11
18 - 19	1
20 - 21	1
22 - 23	2
24 - 25	1
26 - 27	0

TABLE III

EXPERIMENTAL GROUP
I.Q. DISTRIBUTION

I.Q.	No.
80 - 89	2
90 - 99	3
100 - 109	1
110 - 119	6
120 - 129	5
130 - 139	1

TABLE IV

CONTROL GROUP
I.Q. DISTRIBUTION

I.Q.	No.
80 - 89	1
90 - 99	3
100 - 109	4
110 - 119	7
120 - 129	1
130 - 139	2

Methodology

In this study only the pneumograph, which measures breathing rate, and the cardiosphygmograph, which measures pulse rate and blood pressure were used. The interpretation of a psychogalvanic skin response record requires a good deal of clinical knowledge beyond the scope of the experience of the research person conducting this study. Furthermore it was necessary to limit the study as it was realized that handling all of the data which could be collected on the indicators of the polygraph is beyond the scope of this study.

In measuring blood pressure and pulse rate, it is necessary to wrap a cuff around the arm of the subject just above the elbow. In view of the fact that the cuff can cause discomfort to some people when it is repeatedly inflated (causing pressure on the arm, and often sensations of numbness), it was felt that the periods should be made as short as possible so as to make discomfort minimal. Further discomfort is often realized in measuring blood pressure as the air pressure within the cuff is increased until no pulse rate can be observed (systolic pressure). Since there would be repeated inflation of the cuff it was decided that only the pulse rate would be recorded so that the cuff would need only be inflated to sufficient pressure to register heart beat.

In light of the previous discussion, the only two readings which were taken on the subjects run were the breathing rate and pulse rate (heart beat rate).

Laboratory Procedure

The equipment consisted of a small room with a table on which was placed the Keeler Polygraph, the Rosenzweig P-F Study blanks, a card the same size as the P-F blank which had a rectangle cut out of one corner (the area of the rectangle was approximately one-quarter that of the entire card), and several sharpened pencils.

The Rosenzweig Picture-Frustration Study

The P-F Study, "by its full name, the Picture-Association Study for Assessing Reactions to Frustration," (20) consists of a four page booklet containing cartoon-like pictures each of which shows two people in a mildly frustrating situation. "The figure at the left of each picture is shown saying certain words which either help to describe the frustration of the other individual, or which are themselves actually frustrating to him." (A sample of the test booklet can be found in Appendix A) The test administrator advises the subject to examine the pictures one at a time and to write in the blank box the first appropriate response which he thinks of. A subject's responses are scored according to several criteria, the most important of which are direction of aggression in a response, i.e., whether the response is extro-punitive, intro-punitive, or impunitive and type of reaction which is concerned with whether the response is obstacle-dominant, ego-defensive, or need-persistent.

The reliability and validity of the test seem to be a moot question as various studies present conflicting evidence. These are

not sources of concern for the purpose of this study but information concerning validity and reliability can be found in Brower and Abt (5), Brown and Lacey (6), Anderson and Anderson (2), and Henry and Shedd (13). Since the Rosenzweig P-F Study was used in this study only as a stimulus to elicit certain physiological changes, validity and reliability need not be considered.

The Keeler Polygraph

Briefly, the Keeler Polygraph is an instrument used for measuring physiological changes in blood pressure, pulse rate, breathing, and psychogalvanic skin response. Changes in these physiological functions are indicated by the movement of styli on a kymograph. For this study the kymograph was set to move at twelve inches per minute. The use of the Polygraph is most notable in the field of lie detection and more literature is available in this area than any other.

Recording Procedure

Before the study was begun it was thought that a one or two minute recording session would be used for each picture, however, it was found that the pictures did not have sufficient interest to hold the attention of the subject for even one minute. Since it was only desired to record the individual's responses while he was looking at and thinking about the picture and not while he was looking about the room, the length of exposure of each picture was reduced to thirty seconds.

As has been mentioned, the cuff on the sphygmograph can become uncomfortable after a number of successive inflations. If recordings had been made on each of the twenty-four pictures, toward the end of the sessions many of the subjects would be thinking more about their uneasiness than about the pictures and the recordings would not contain what it is the purpose of this study to gain, i.e., the physiological changes which occur when the individual is observing and identifying with the characters in the pictures.

Even though the responses which the subjects wrote in the blanks on the pictures were not used in this study it was thought that they might be studied in relation to the polygraph recordings in the future. With this in mind, when the number of pictures on which the recordings were made was reduced, the reduction was made in such a way as to preserve, as much as possible, the possibility of gaining scores on the pictures on which the recordings were made. Rosenzweig (20) divides the pictures in his Study into two general kinds: those which are ego-blocking and those which are superego-blocking. In his scoring key, twelve of the pictures (1,2,5,7,9,10, 11,19,21,22,23,24) are used to give what he calls a Group Conformity Rating. Included in these twelve pictures are the same proportion of ego-blocking and superego-blocking situations as there are in the entire twenty-four pictures. It was these twelve pictures which were selected for use in this study.

As has been mentioned previously, the examiner had been acquainted

with the subjects in the experimental group previous to running them on the equipment but had had no face to face meeting with those in the control group. As a result, before the actual recording was begun, more time was spent with those in the control group in an attempt to establish rapport.

When the subject seemed to be relaxed and the machine discussed and explained to their satisfaction, they were seated in a chair directly to the left of a table which held the polygraph. The Pneumograph diaphragm was then attached and made as comfortable as possible. An attempt was made to place the diaphragm at the point of greatest movement during inspiration. That is, the instrument was placed around the chest of the chest breather and around the abdomen of the abdomen breather. After the attachment had been made, the stylus was placed on the kymograph and the graph started in motion. The inspiration-expiration cycle as recorded on the kymograph was observed to see that the whole cycle was being properly recorded and adjustments were made if necessary.

When the pneumograph had been properly adjusted, the cuff of the cardio-sphygmograph was attached to the left arm of those who were right-handed and to the right arm of those who were left-handed. This was done because each subject was asked to write in responses after the recording had been completed on each picture and excess movement of the arm might interfere with the adjustment of the cuff. The kymograph was again started and the recording of the heart beat by the stylus observed. Adjustment was again made if necessary.

When the sphygmograph and the pneumograph were adjusted properly the recording of responses was ready to begin. The subject was instructed to "Look at the picture and think about it. Please sit quietly and do not speak while the apparatus is running." Speaking tends to distort the pneumograph (especially with the stutterers) and movement will effect both the pneumograph and the cardio-sphygmograph. The kymograph was then started and the cuff inflated until a proper reading of the heart beat was indicated. The first picture was then presented (three of the pictures on the page being blocked out by the card which was mentioned). The breathing rate and pulse rate were then recorded for thirty seconds, during which time the subject was looking at and thinking about the picture. After the first picture was recorded, the subject was asked to write an appropriate response in the blank. The same procedure was followed with picture number two and each of those on which recordings were made (1,2,5,7,9,10,11,19,21,22,23,24). However, on the third picture, for which no recording was made, the subject was simply asked to write in the blank what he thinks the person in the situation might be saying. This same procedure was followed for each of the pictures on which no recording was made (3,4,6,8,12,13,14,15,16,17,18,20).

After the recording of the subject's responses while looking at the pictures, he was asked to relax and to close his eyes. A thirty second recording was then made of his breathing rate and heart beat. This recording made while the subject was relaxing

was considered a sample of the individual's normal physiological function and it was with this sample that the recordings during the pictures were compared.

CHAPTER IV

THE FINDINGS

Heart Beat

It was mentioned that the recording time for each picture was thirty seconds. Thirty seconds of recording with the kymograph set at twelve inches per minute, would furnish heart beat recording on a six inch length of graph. However, due to the fact that the very first part of a number of records was made hard to read by inadvertent movement on the part of subjects in spite of directions to sit still and not move, five inches of each recording (twenty-five seconds) was the length in which the heart beats were counted.

For each individual the heart beats were counted for each picture and during the period of rest. After the heart beats had been counted, it was desired to determine how much, if any, the heart beats while observing the pictures varied from the number of heart beats during rest. Several possibilities for computing this variation presented themselves. It was at first thought that the pulse rate during rest be used as an assumed mean and a standard deviation computed to determine how much the responses on the pictures deviated from the response during rest. However, if this was done a variation of five heart beats on a picture of a subject who had an average rate of 95 beats per minute would receive just as much weight as would a deviation of five beats on a picture of

the person who had an average rate of 75 beats per minute. It was decided that a ration would be used (picture rate/rest rate) so that an equal variation at 95 and 75 would receive greater weight with the person who averaged 75 beats per minute. Picture-rest ratios were then computed for each of the twelve pictures for each individual in both groups.

The next step was to find the mean ratio (the larger the number the greater the deviation from rest) for the eighteen in each group on each picture. This told how much the mean variation for each picture was for both groups. These mean ratios were then converted to standard scores so as to be more easily shown graphically.

Inspirations per Minute

When stress or frustration is experienced, there is an observable change in breathing rate, Goldensohn (11). As with heart beat the recording for each picture was examined and the number of inspirations during a certain amount of time counted. It was possible to count the number inspirations during a thirty second period (six inches of graph) on the breathing record. These results were treated in the same way as the heart beat record, i.e., a picture inspiration/rest inspiration ratio was computed and then for each picture the mean ratio was computed for each group. These ratios were also converted to standard scores.

Inspiration-Expiration Ratio

In addition to considering the inspirations per minute, the inspiration-expiration ration was computed. The meaning of this

measure is not quite so clear cut but during stress more oxygen is needed and the inspirations tend to be shorter in relation to the length of time taken for expiration, Stevenson and Ripley (23). A millimeter rule was used to measure the distance the graph travelled during inspiration and during expiration for every picture for each individual in both groups. The inspiration-expiration ratio was computed during a thirty second period for each picture. In computing the ration the millimeters for the inspirations was totaled and divided by the total of the expirations. It was then determined how much, if any, these quantities deviated from the inspiration-expiration ratio during rest. Then, as with the other factors, the mean ratio for each picture was determined for both groups and these figures were converted to standard scores. Also, for each individual, the mean ratio for the twelve pictures was computed.

Analysis of Data

In analyzing the data the first thing that was very evident was that there was considerable variation in the responses between pictures in each of the three factors. Table V shows how the responses of stutterers and non-stutterers as a group varied on the twelve pictures with respect to heart beat. Table VI presents the variation between pictures in inspirations per minute and Table VII shows the degree to which the inspiration-expiration ratio varied between pictures. This suggests that the pictures varied in their stimulus strength and it may follow that the amount of threat presented to the subject by the pictures is represented, at least

to a degree, by the variations among the pictures.

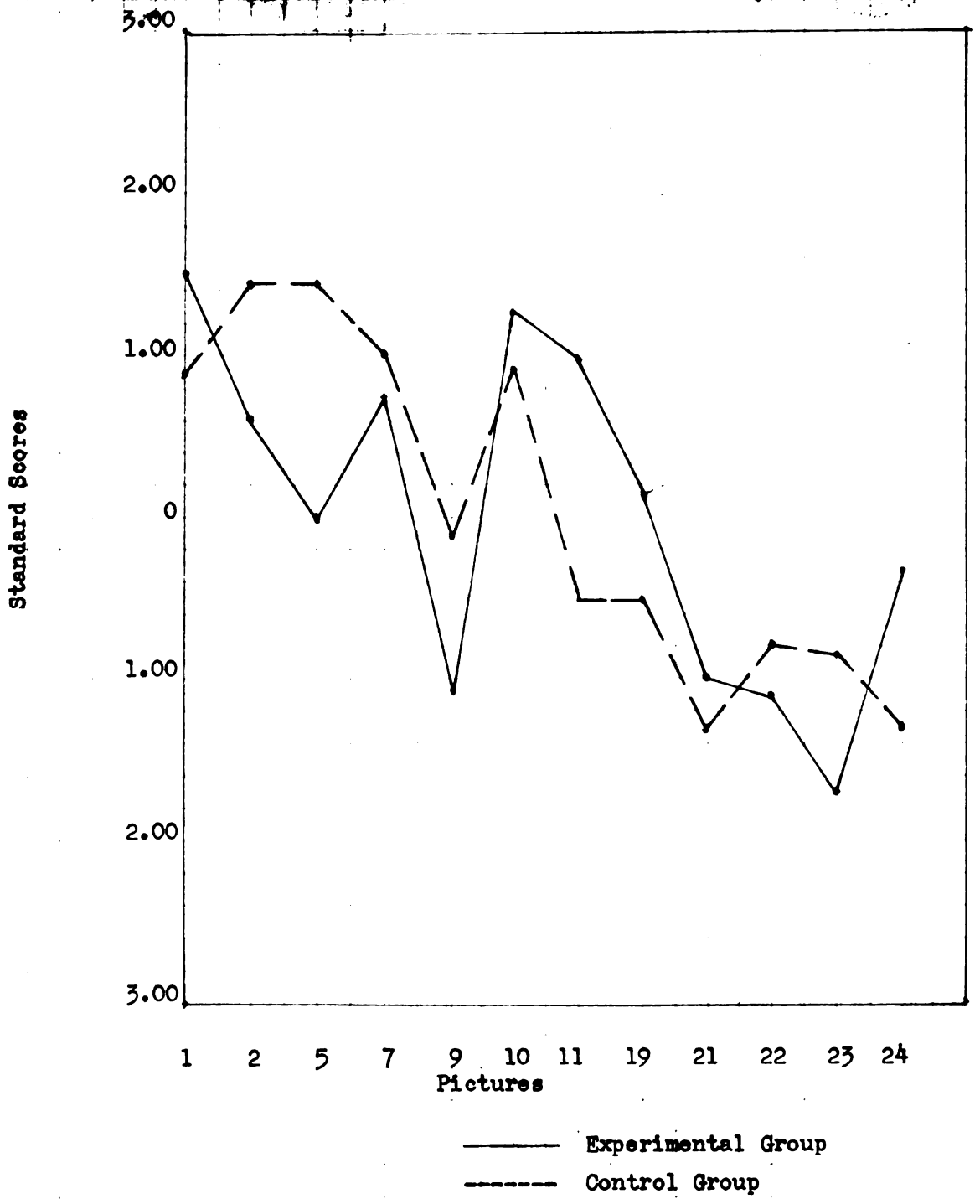
For the stutterers the mean heart beat per minute while observing the pictures was 82.66, while the mean heart beat for this group while at rest was 77.33. This indicates that the pictures were an adequate stimulus to produce a change in heart beat, in this case an increase. For the control group the average heart beat while observing the pictures was 82.27 and while at rest was 76.80. Again there is an increase in heart beat while observing the pictures. There was no significant difference between the two groups either on the heart beat while observing the pictures or at rest.

The mean inspiration per minute (ipm) for the stutterers while observing the pictures was 19.7 and while at rest 17.8. This suggests that the breathing cycle in this group was faster while observing the pictures than while at rest and again points out the stimulus adequacy of the pictures. The mean ipm for the control group during the pictures was 17.2 and during rest 15.8. As a group the normals had less breathing cycles per minute both while observing the pictures and during rest. This may be partly due to the fact that the stutterers tended to breathe more shallowly, not taking in as much air on inspiration and thus needing to breathe more rapidly.

On the third factor, inspiration-expiration (i-e ratio) ratio, the stutterers had a mean ratio of 46.5 while observing the pictures and 51.3 while at rest. The larger the number yielded by the i-e

TABLE V

VARIATION IN HEART BEATS PER MINUTE



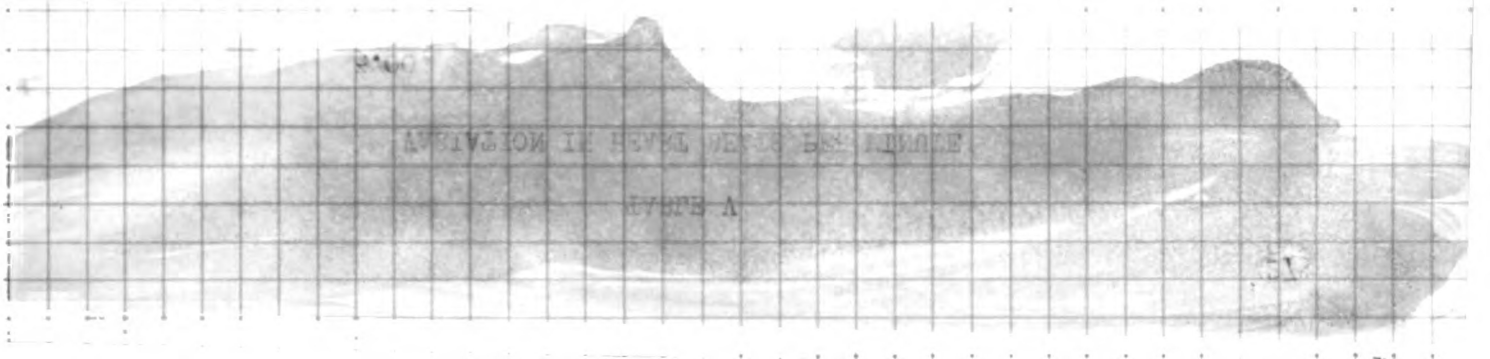
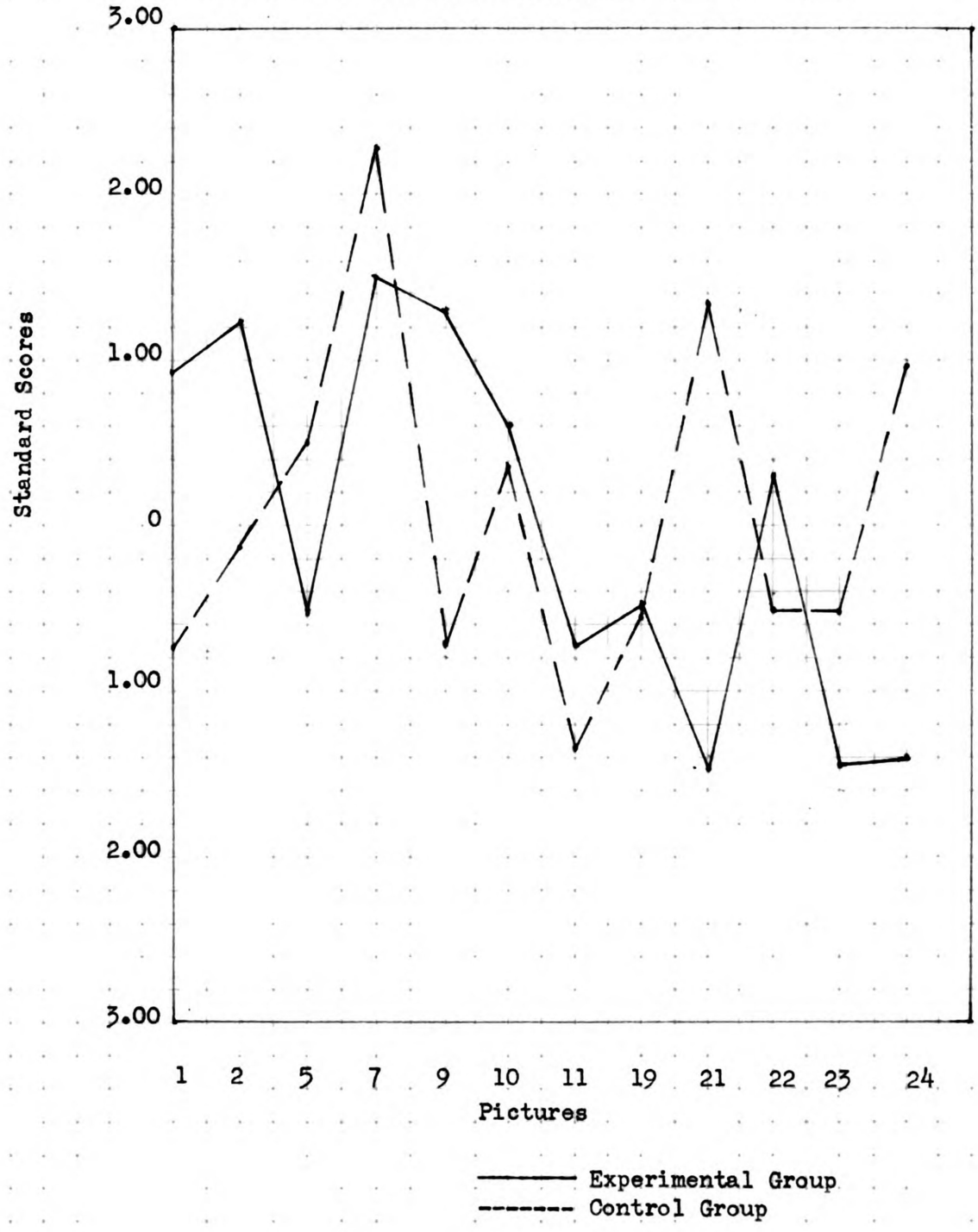


TABLE VI

VARIATION IN INSPIRATIONS PER MINUTE



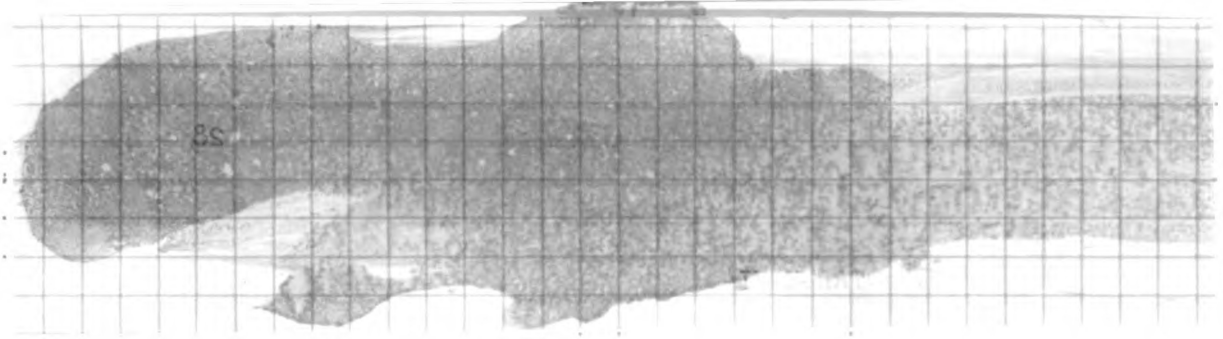
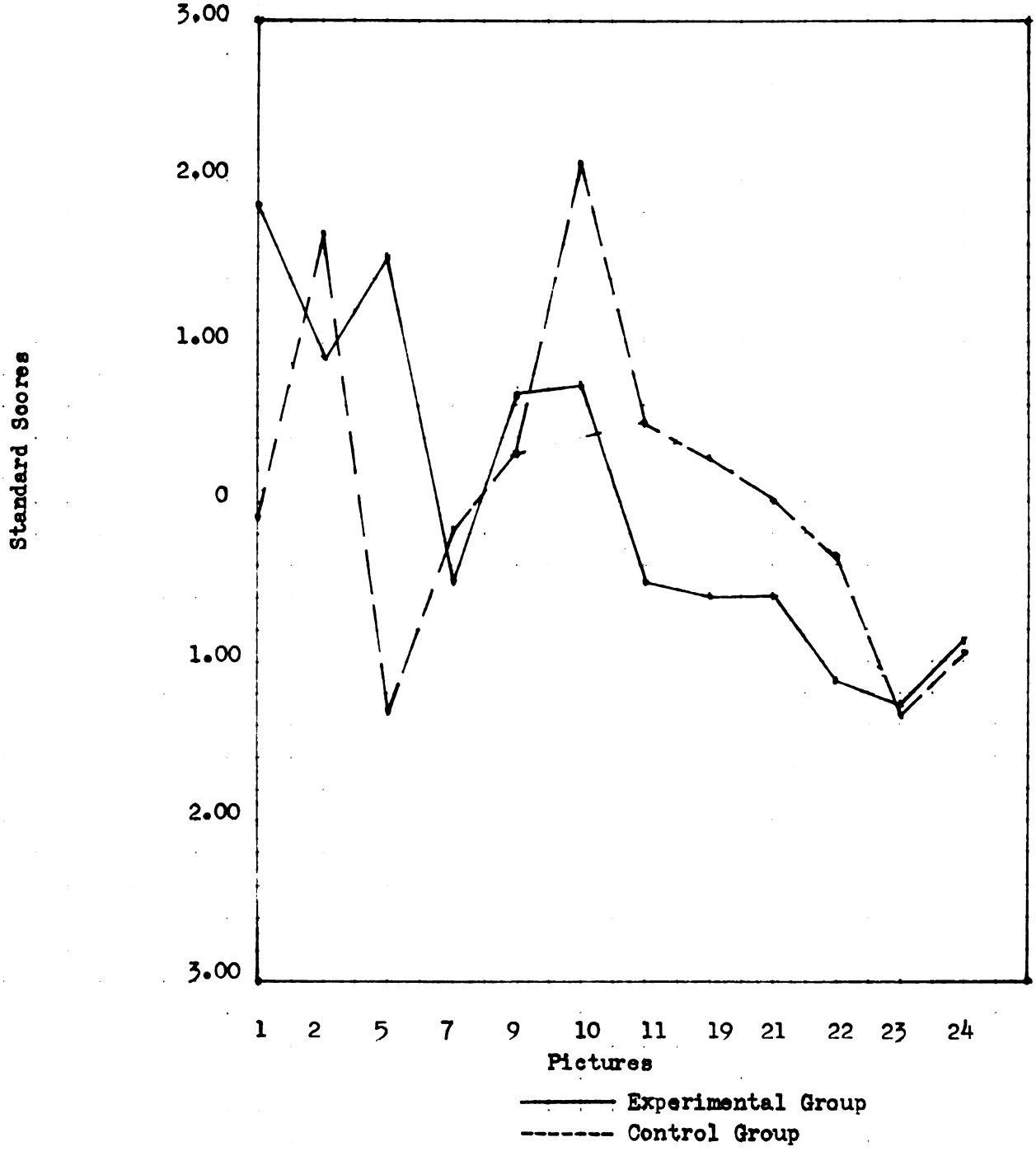


TABLE VII

VARIATION IN INSPIRATION-EXPIRATION RATIO



ratio the larger is the length of inspiration in relation to expiration. The figures mentioned for the experimental group indicate that the length of inspiration in relation to expiration was greater during rest than it was while observing the pictures. Assuming that the pictures are a mildly frustrating situation, these results agree with the findings of Stevenson and Ripley (23) who report that during stress expiration is prolonged (thus yielding a smaller ratio). The mean i-e ration of the non-stutterers during the pictures was 50.1 while the mean ratio during rest was 54.7, pointing out that also with this group there was an increase in the length of inspiration in relation to expiration during the pictures. Table VIII shows the mean response for each group during rest and while observing the pictures for each of the three factors mentioned.

The procedure for determining the variations of the three factors was described under "Analyzing the Recordings". Essentially, it was an attempt to determine how much an individual's physiological response on a picture differed from his record during rest. Having determined these variations, to then make them meaningful for the purposes of this study, it was necessary to find out if the groups differed significantly with respect to these variations. The average variation for the experimental group was found to be 107.6, whereas the mean variation for the control group was 108.6. This difference was tested by the T test and there was found to be not significant. (T=1.41). Previous findings indicated that both groups showed a difference between their heart beat while observing

the pictures and their heart beat while at rest. However, this difference is not significantly greater in the stutterer than in the non-stutterer.

TABLE VIII

MEAN RESPONSES

	Experimental		Control	
	Rest	Pictures	Rest	Pictures
Heart beats per minute	77.33	82.66	76.80	82.27
Inspirations per minute	17.1	19.8	15.8	17.2
Inspiration-Expiration Ratio	51.3	46.5	54.7	50.1

With respect to the second factor, inspirations per minute, the T test was again applied to determine whether there was a significant difference between the two groups in the ration of the number of inspirations during rest to the number of inspirations while looking at the pictures. The value obtained for T was 3.58 indicating that the difference between the two groups was highly significant. This denotes that the stutterers inspiration rate while observing the pictures differed more from their inspiration rate during rest than did the inspiration rate of the control group during the pictures differ from their rest rate. This difference was an increase in the number of breaths per minute and shows that

the stimuli (the pictures) produced a more pronounced physiological change in the stutterers than in the non-stutterers.

The T test was also used to determine if the difference between the two groups with respect to the variation of i-e ratio during the pictures and during rest was significant. A T value of 3.39 was obtained showing that the difference was highly significant. This points out that the difference between the i-e ratio during rest and during the pictures was greater for the experimental group than for the control group.

CHAPTER V

SUMMARY, CONCLUSIONS AND IMPLICATIONS FOR FURTHER RESEARCH

There have been a great many studies made of the reactions of animals and humans to stress and frustration. The studies have each made their individual contribution to the vast amount of knowledge which has now been accumulated in the areas of psychosomatic medicine and somatopsychology. That further study is needed to complement that which is already known cannot be doubted. This alone would justify the study that has been made. In addition there seem to be very few studies which have been made in an attempt to learn more about the physiological reaction of the handicapped to stress. It was the purpose of this study to determine whether the stutterers reaction to a frustrating situation was different from the reaction of a non-handicapped person.

In order to compare the reactions of stutterers with non-stutterers, two groups were selected and matched for age, intelligence, and sex. Each individual in each group was told to look, one at a time, at the Rosenzweig P-F pictures and while they were looking at them their breathing rate and pulse rate were recorded by styli on a kymograph.

The recordings were analyzed and tentative hypothesis was formulated to be substantiated by further study.

Findings

The findings for the three factors are as follows:

1. Both groups showed a faster heart beat rate while looking at pictures than while at rest. However, this difference was essentially the same for both groups.

2. Both groups showed a greater number of ipm while looking at the pictures than they showed during rest. The experimental group presented a significantly greater difference between the rest-picture ipm than did the control group. The ipm for both groups was greater while looking at the pictures.

3. For both groups the i-e ratio was smaller while observing the pictures than while at rest. (The smaller the ratio, the shorter the duration of inspiration in relation to expiration.) However, the deviation between rest response and picture response was significantly greater for the experimental group. This greater deviation was in the nature of a decrease in the length of inspiration in relation to expiration (or prolongation in expiration would give the same effect).

Conclusions

The heart beat recordings do not differentiate the groups. They both show variations between the pictures, which indicates that the stimulus strength of the pictures varied, but there is no significant difference between the groups.

The ipm does differentiate the groups. Both groups showed a faster breathing rate while observing the pictures, but the experi-

mental group showed a significantly greater difference between rest ipm and picture ipn than did the control group. Two possible hypotheses (possibly more) follow from these results:

1. The stutterers in identifying with the figures in the pictures, were more threatened than the non-stutterers and thus elicited a greater physiological response. This would support the hypothesis of this study.

2. Part of the variation which the stutterers exhibited may merely indicate that the breathing of the stutterer is more variable than that of the non-stutterer.

If the second hypothesis were true, however, the mean response for the pictures and for rest would be expected to be essentially the same. It is felt, therefore, that the first hypothesis more nearly satisfies the data.

The i-e ratio also differentiated the groups. Both groups showed a smaller ratio while observing the pictures, (Stevenson (23) found that the i-e ratio decreased during stress) however, the stutterers showed a greater variation between the rest and picture recording than did the control group. The same hypothesis could follow from this finding as were mentioned in relation the ipm.

In looking at the results of the three factors it is readily noted that there is a difference between the two groups with respect to i-e ratio and ipm but not in relation to heart beats per minute. Jost (14) mentions that individuals may differ in the physiological function which reacts most pronouncedly to stress and it may be that the stutterers tend to show a greater physiological change in

respiration than in the cardio-vascular functions.

Implications for Research

There were many more problem areas opened by this study than were answered. The study, of necessity, was restricted, as was mentioned in Limitations. Some of the more important areas for future study are as follows:

1. It would be of value to repeat this study, using certain procedures (e.g. a longer sample of the physiological factors with the subjects at rest) which would seem in looking back to be superior to those used in the study in an attempt to verify the hypothesis presented here.

2. There was considerable data collected in the present study which was not dealt with at all. It would seem worthwhile to run an analysis of variance between the heart beat, inspirations per minute, and the inspiration-expiration ratio.

3. The responses on the Rosenzweig P-F Study should be scored and analyzed statistically in relation to the physiological variations.

4. An analysis of variance could be made to determine which pictures produced the greatest physiological change.

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APPENDIX A

SAMPLE BOOKLET OF THE ROSENZWEIG P-F STUDY

Name_____ Age____ Birthday_____

Address_____ Education_____

Institution_____ Present date_____

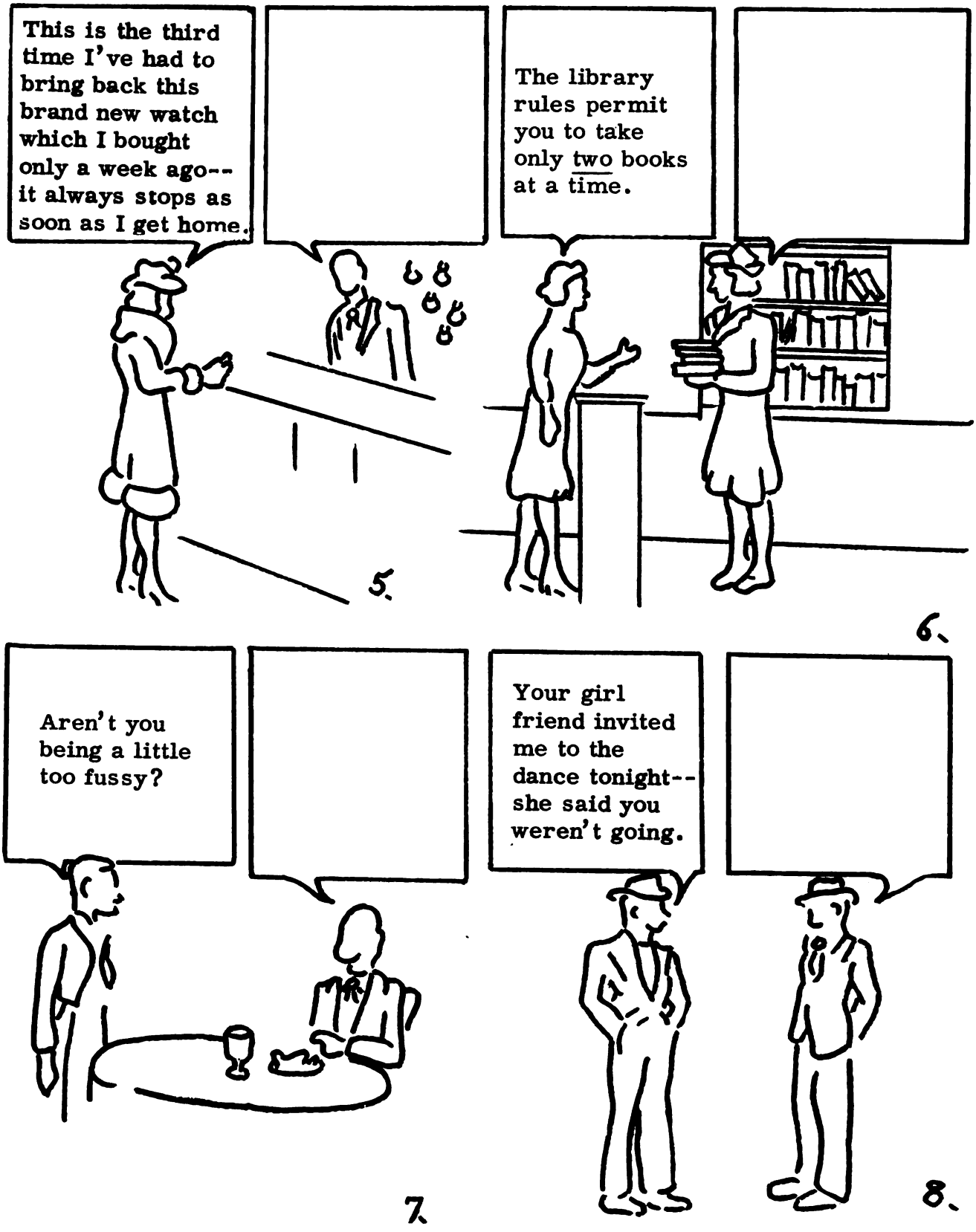
ROSENZWEIG P-F STUDY

(Revised Form for Adults)

Instructions

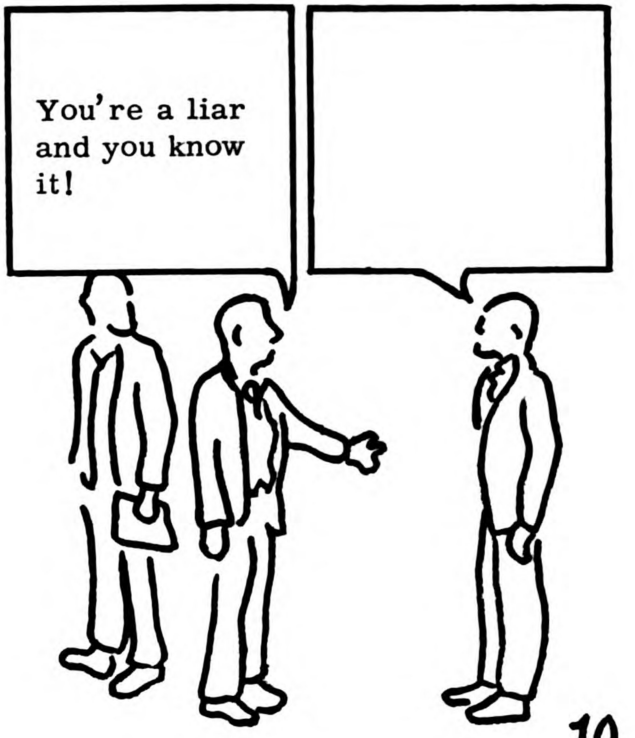
In each of the pictures in this leaflet two people are shown talking to each other. The words said by one person are always given. Imagine what the other person in the picture would answer and write in the blank box the very <u>first</u> reply that comes into your mind. Work as fast as you can.


I'm very sorry we splashed your clothing just now though we tried hard to avoid the puddle.
1.
How awful! That was my mother's favorite vase you just broke.
2.
You can't see a thing.
3.
It's a shame my car had to break down and make you miss your train.
R.R.STA
4.

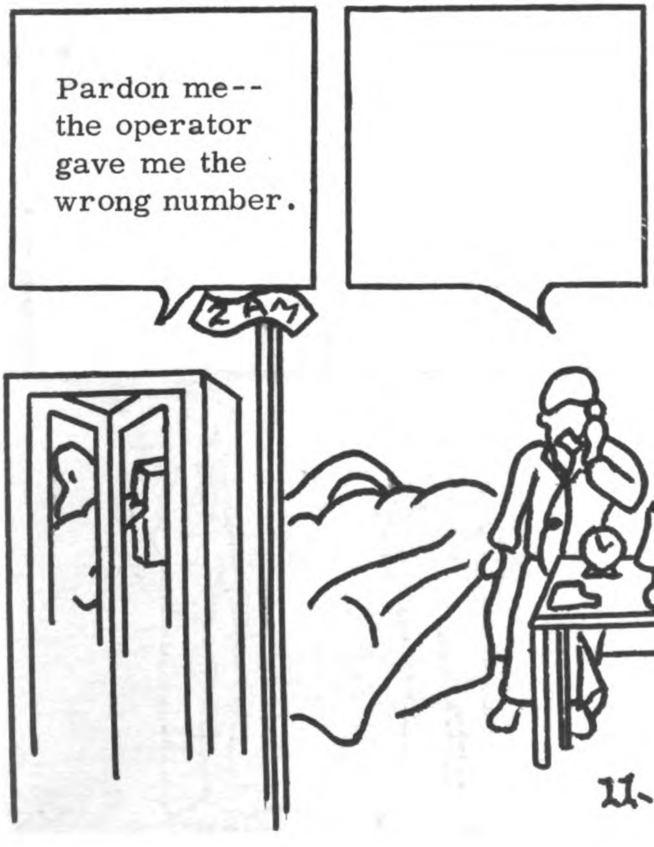

This is the third time I've had to bring back this brand new watch which I bought only a week ago-- it always stops as soon as I get home.
5.
The library rules permit you to take only two books at a time.
6.
Aren't you being a little too fussy?
7.
Your girl friend invited me to the dance tonight-- she said you weren't going.
8.


Perhaps you do need your umbrella but you will have to wait until this afternoon when the manager comes.
SHOP
PAWN

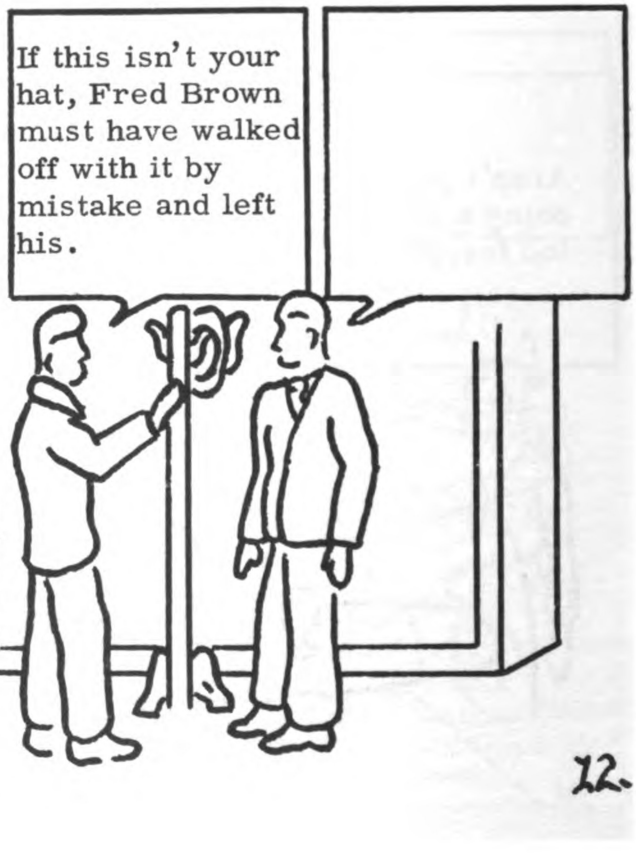
9.


You're a liar and you know it!

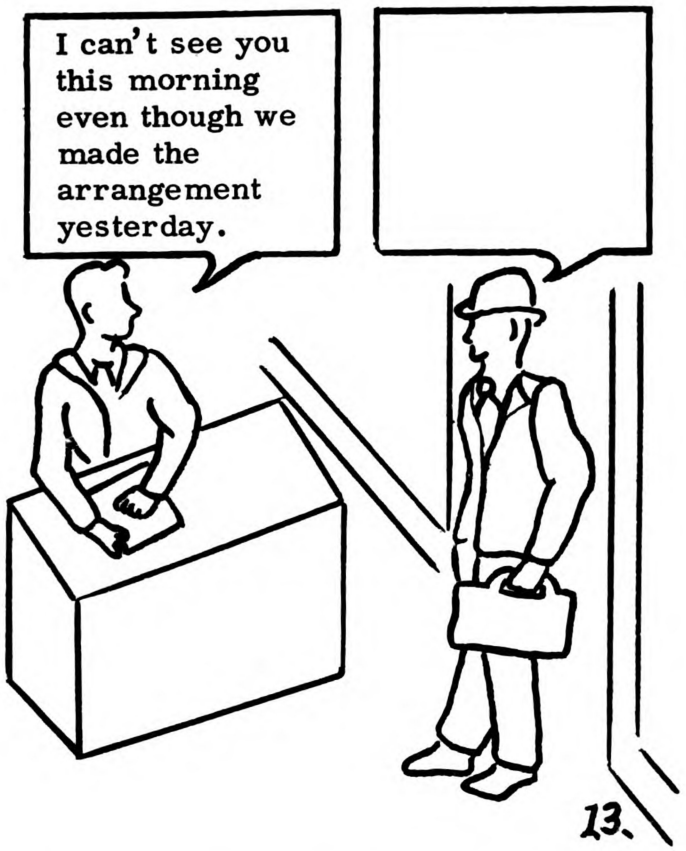
10.


Pardon me--the operator gave me the wrong number.
ZAM

11.


If this isn't your hat, Fred Brown must have walked off with it by mistake and left his.

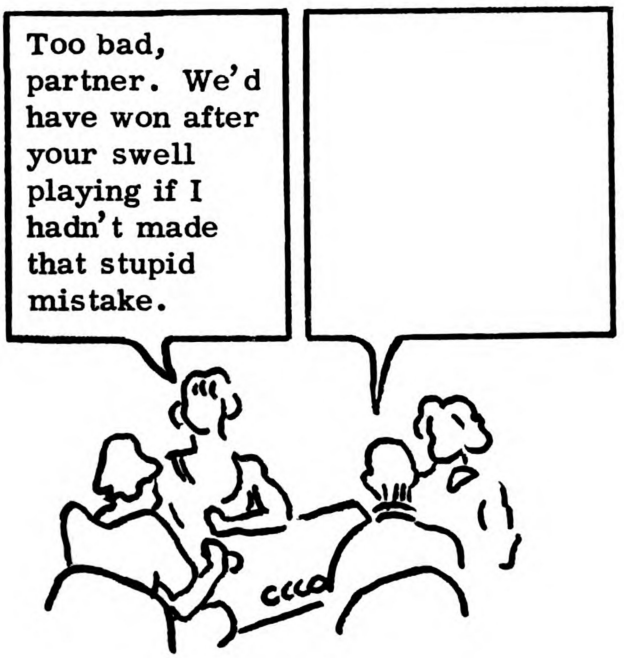
12.


I can't see you this morning even though we made the arrangement yesterday.

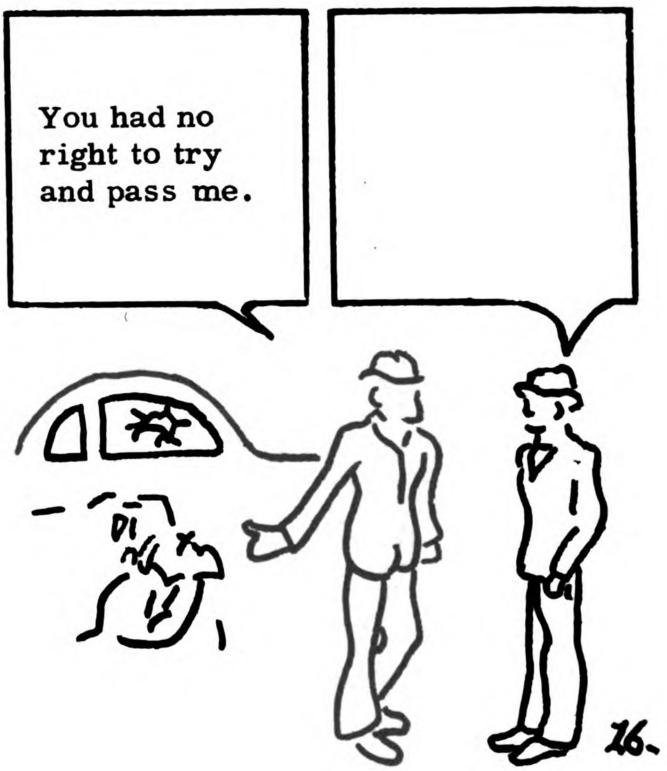
13.


She should have been here 10 minutes ago.

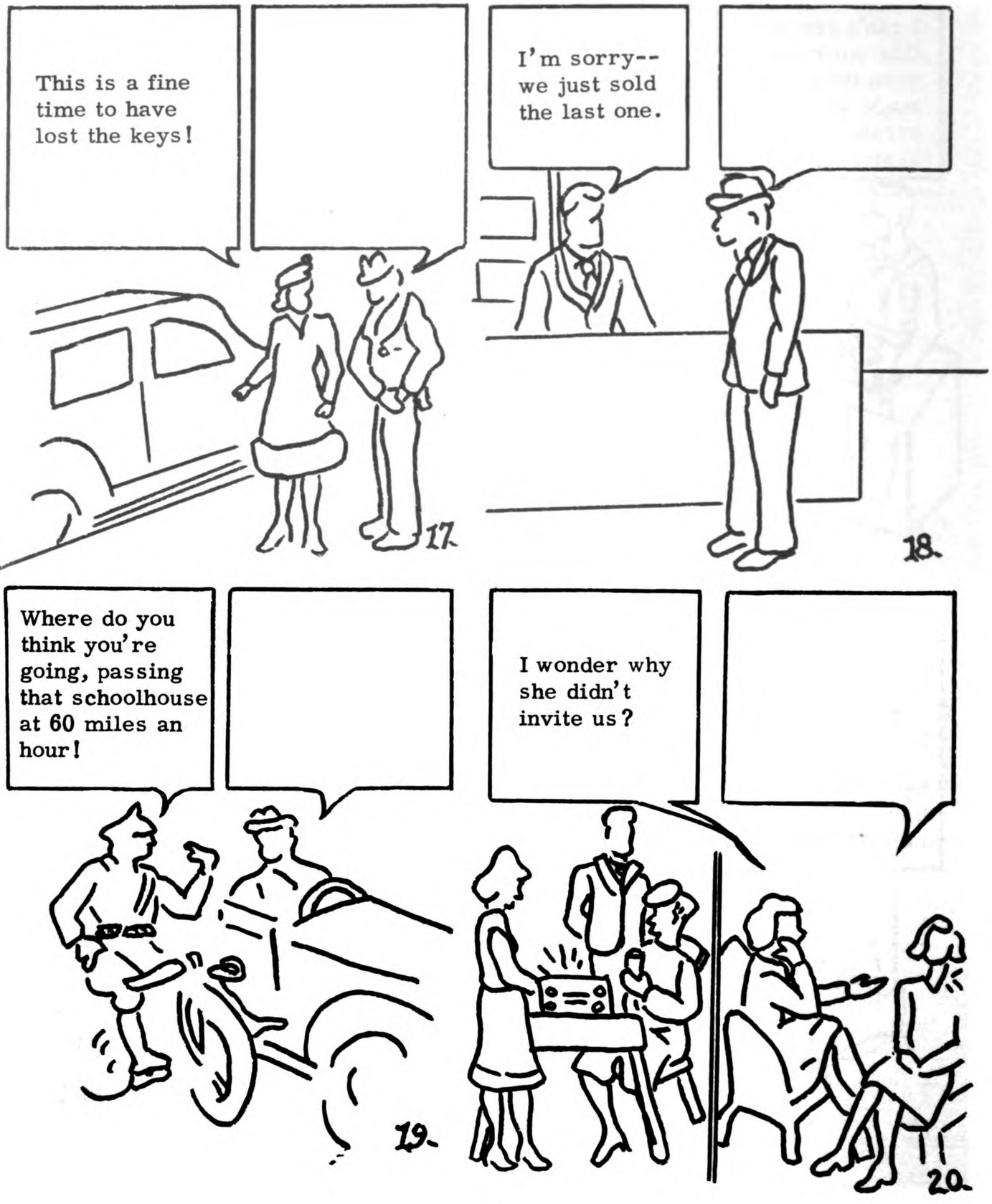
14.

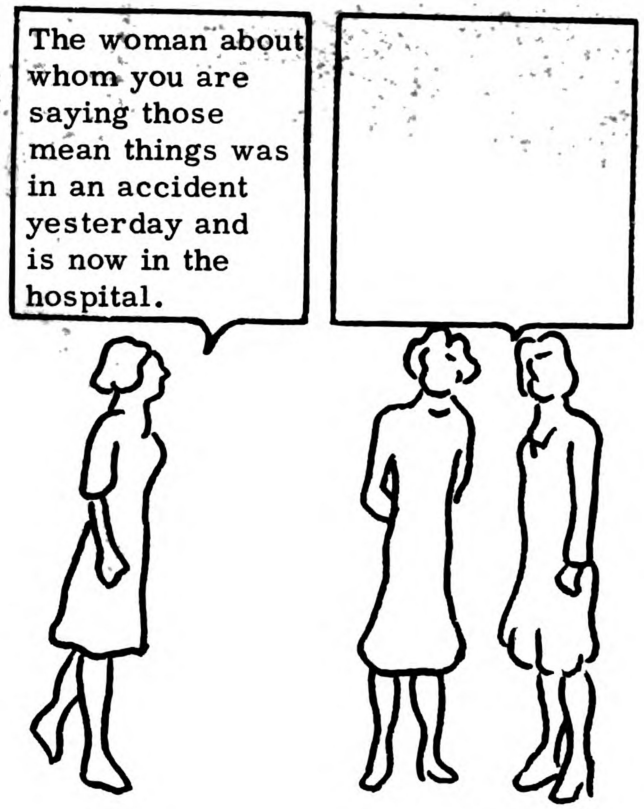

Too bad, partner. We'd have won after your swell playing if I hadn't made that stupid mistake.

15.

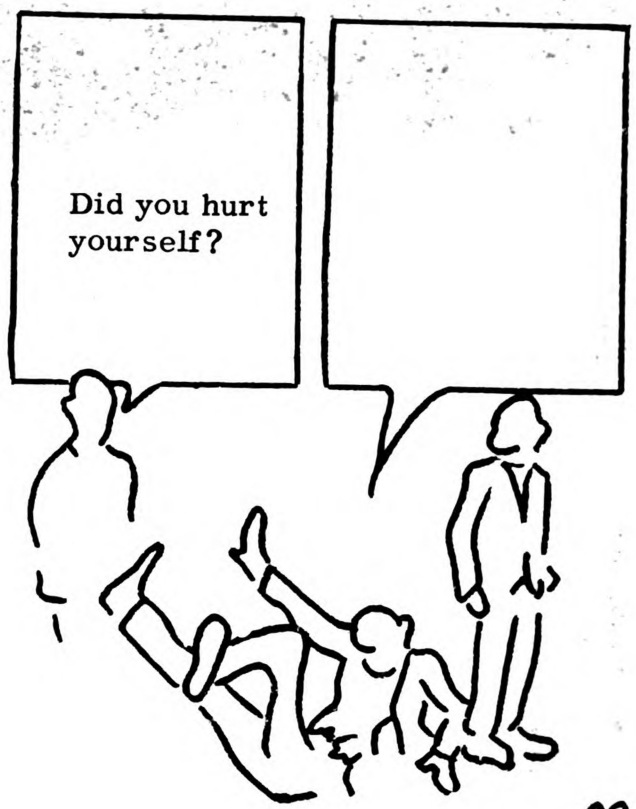

You had no right to try and pass me.

16.


This is a fine time to have lost the keys!
17.
I'm sorry-- we just sold the last one.
18.
Where do you think you're going, passing that schoolhouse at 60 miles an hour!
19.
I wonder why she didn't invite us?
20.


The woman about whom you are saying those mean things was in an accident yesterday and is now in the hospital.

21.


Did you hurt yourself?

22.


It's Auntie. She wants us to wait awhile until she can get here to give us her blessing again.

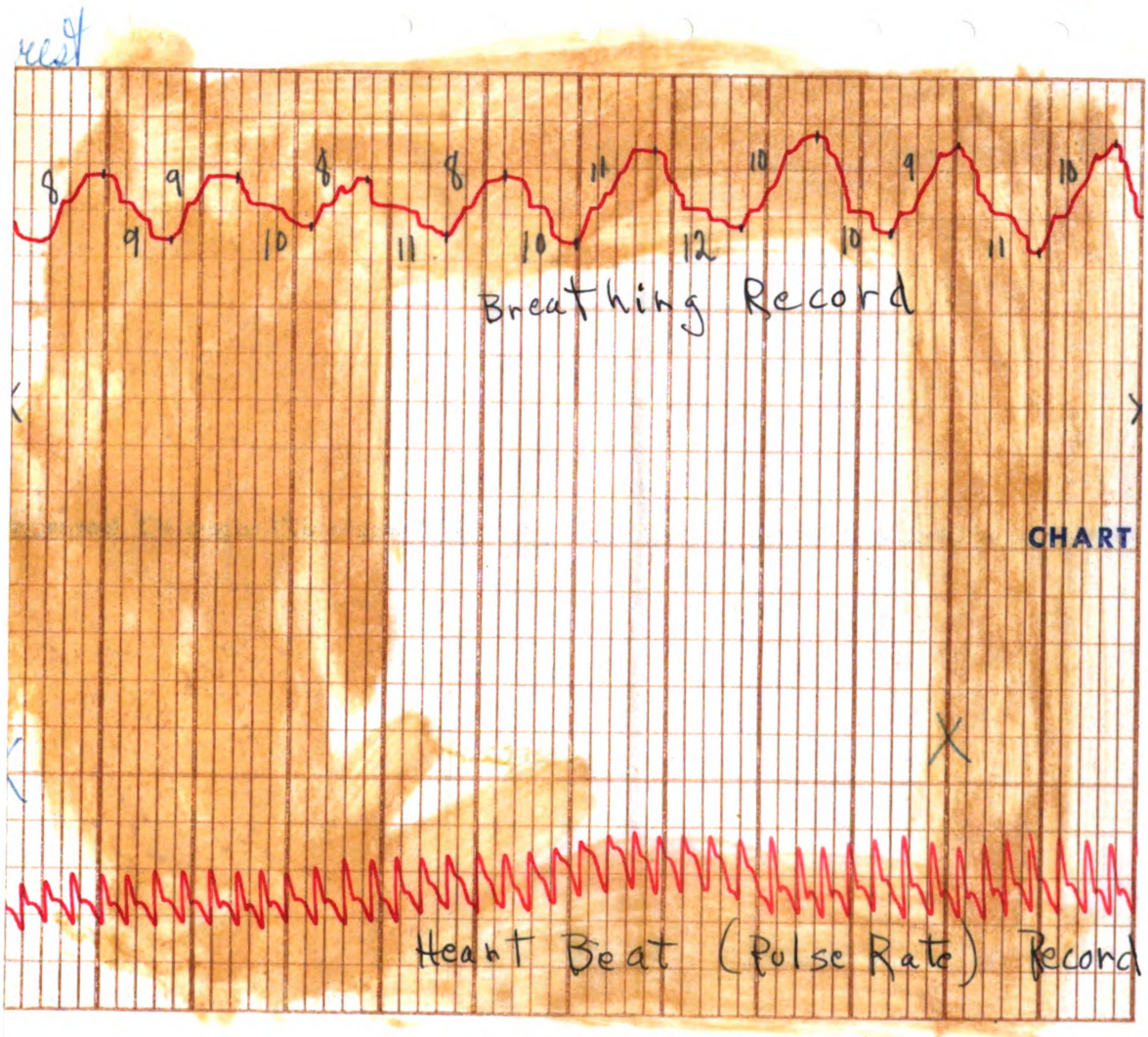
23.


Here's your newspaper I borrowed-- I'm sorry the baby tore it.

24.

APPENDIX B

SAMPLE OF KYMOGRAPH RECORD


rest
8
9
9
10
8
11
8
10
11
12
10
9
11
10
Breathing Record
CHART
Heart Beat (Pulse Rate) Record