CHAPTER IV

THE DESCRIPTION OF THE EXPERIMENT

1. Selection of Test-material

The experiment required the selection of three word-lists with twenty English-Russian pairs in each list. List I was a scrambled list of ten noun-pairs and ten verb-pairs. List II was a list of twenty noun-pairs, plus two practice examples. List III was a list of twenty verb-pairs, plus two practice examples. Especially lists II and III were prepared after a careful scrutiny of certain standard dictionaries, published by the U. S. War Department (100,110). Certain steps in the selection of the words are worth mentioning:

(i) The first step was a decision to use the transliterated form of Russian words instead of the original Russian script. It is the experience of Russian language teachers that it takes at least two hours to familiarize a student with the Russian alphabet. As it was not likely that any student will have this much time for the experiment, the decision to forego use of the Russian characters was made. There is no unanimity of opinion among the Russian language experts regarding the English spelling of Russian transliterated words. A satisfactory solution of this problem was arrived at by sending the selected lists to three individuals[2] who were well-versed in Russian and kindly agreed to indicate their

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[2](i) Prof. W. B. Edgerton, the Head of the Russian Department at The Pennsylvania State College, (ii) Mrs. Gagarin, a Russian-born resident of State College, Pa., (iii) Mr. R. F. Munn of the Reference Library at the University of West Virginia, Morgantown, W. Va.

opinion of the correctness of the transliterated forms. Those words which showed greatest agreement among these three judges were finally selected.

(ii) The second step was to select from the dictionaries those action-words which were definitely suitable from the point of view of making an action scene for each of them. The suitability of an action-word was judged by asking the question: Will it be possible to make a film-sequence with a "molecular" action generally common from scene to scene by employing as few props as possible and without the need of going out of the motion picture studio? The original population of such "filmable" words is given in Appendix I.

(iii) The third step was to select from the population of the original words, a representative sample of different kinds of "molecular" action-words that had film-feasibility. Thus, five action-words were selected as representing the action of an object by itself (e.g., boy walking). Five more action-words were selected because they require the action of an object to take place against a set background (e.g., light flickers). Five other action-words were selected as they require the action of some agent on some object (e.g., reading a book: here the person reading is the agent, book is the object of action and reading is the action). Lastly, five more action-words were selected on the basis that the action implies at least three aspects - agent of action, some instrument of action and the object of action (e.g., in the action of cutting, the person is the agent, the knife is the instrument and the apple is the object of action). Thus, a list of twenty verbs was selected, as having a satisfactory film-feasibility. (This made list III.)

(iv) The fourth step was to select a list of twenty English-Russian nouns (List II) to go along with each of the twenty action-words

in the list of action-words.

(v) The fifth step was to select a list for the control version called List I, made of 10 noun-pairs and 10 action-words.

(vi) The sixth and last step was to get the transliterated forms of these words checked by the three Russian language experts.

One point worthy of mention is the precaution taken to keep the words fairly distinct from each other in order to avoid any possibility of generalization in learning. So, it was decided to select from a variety of verb forms - such as third person singular, imperative as well as infinitive. But to indicate that English verbs like "brush" and "drink" should not be taken for nouns, the infinitive sign TO preceded each English word (S) on the screen. It was put in parenthesis like (TO).

Lists I, II, and III are reproduced in Appendix II. The average length of the Russian words in List I was 6.15 letters. The average length of the Russian words in List II was 6.70 letters. The average length of the Russian words in List III was 6.00 letters. Thus, insofar as the difficulty of a word is a function of its, length, there were no extreme differences in difficulty among the three lists.

The work of list-selection was completed in March 1952.

2. The Minimum Film Production Required for this Experiment (for further details, see Appendices III and IV)

This study required the production of 17 sets of 16 mm. film-versions. Six of these were to be used for the pilot testing done in August 1952. The seventh was to be used as a control version. The last ten sets were to be used as the ten experimental film versions.

The production of an instructional film passes through two broad

steps: (a) scripting stage, and (b) the production stage. The scripting stage of this study was complete in March 1952, when the lists of words were decided upon and the nature of the visuals (still or motion picture) was determined in consultation with the members of the staff of the Motion Picture and Recording Studio of The Pennsylvania State College. The production stage started in April 1952 and continued until the second week of November 1952 when the final prints of different film versions were received from the laboratory. In April 1952, the narration, i.e., the pronunciation of the English-Russian pairs of words by a Russian born resident[3] of State College, Pa., was recorded on a magnetic tape recorder. During the same period, a complete sample of a film sequence for the pair "WATER-VODA" was made and was shown to the members of the staff of the Psychology Department at Columbia University and of the Instructional Film Research Program, for approval.

In June 1952, the shooting of the different versions required for the main experiment was completed. Each pair of words was photographed at least for 10 seconds to facilitate preliminary experimentation.

In July 1952, the six sets of film version #1 were received from the laboratory. These sets were, then, edited in State College, Pa., in such a way that one set presents each pair of words for 5 seconds, another for 6 seconds, and so on, the last set giving an exposure time of 10 seconds.

The pilot-test held in August 1952, helped in the evaluation of the relative effectiveness of the relative exposure time of different pilot test films. On the basis of this evaluation, it was decided to use 10 seconds as the proper exposure time for each pair.

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[3]Mrs. Gagarin of State College, Pennsylvania.

Then, the next stage was to edit the films so as to put the sound on the optical track on those films which used the sound motion picture method. The final prints of different experimental versions were received in the second week of November 1952.

It should be noted that care was taken to integrate the picture and sound in each version, in accordance with the qualification of the Perceptual Reinforcement hypothesis stated in Chapter II.

This was accomplished in the following ways:

(i) The action in the motion picture method and the still shot in the still picture method for a given word were closely related. The still shot was supposed to be a phase of the total action sequence - in fact, the last stage of each action sequence.

(ii) In the "sound motion picture" method, and in the sound motion picture method with learner participation, the narration was put in the film so as to coordinate picture and sound and integrate them as closely as possible. The first two seconds were left without any sound, so that the subjects get the full opportunity to observe the picture and the title. The third, fourth and fifth seconds, were occupied by narration. The sixth and seventh seconds contained the words "now you say it." During the last three seconds, the subjects get the opportunity to participate in the situation by imitating the narrator.

(iii) A graph-like impression introduced between one picture and the next picture, or between a picture and clear film or between clear film and the frame showing the correct answer, served as a natural cue to the subjects in more ways than one. The subjects soon got into the habit of turning the page as soon as the graph-like impression appeared,

or to look up for the next stimulus word, or to get set to write the Russian word when the clear film would appear.

3. Two Parts of the Experiment

The whole experiment can be divided into two parts chronologically:

(a) The pilot test: The object of the pilot test was to decide:

(i) the rate of presentation at which the English-Russian pairs of words should be exposed to the subjects.

(ii) the number of film repetitions, i.e., the number of times a given film version should be shown, and,

(iii) to test the efficiency of the entire testing procedure.

These tests were held on August 4, 5, and 6, 1952. The results, and the decisions made on the basis of the pilot tests will be explained in a later section of this chapter.

(b) The final experiment: The final experiment compared the effectiveness of ten experimental film versions for learning and retention by using ten groups of subjects, one group for each version. Actually 11 groups were available; so one of the ten versions was replicated on the eleventh group. The final experiment started on November 17, 1952 and concluded on December 11, 1952. The final experiment passed through three stages.

(i) The first stage (November 17-20). During this stage, all the groups - eleven in all - were tested on a control film version. The control film version differs from the ten experimental film versions in that the control version was shown to every one of the eleven groups alike during this week. The reason for using the control version was to adjust statistically the scores of groups on the main experimental versions.

(The control versions yielded the pre-test score of each individual subject in a given group, and as the film was repeated six times, there were six scores for each individual subject in a group as a result of the first stage.) On the contrary, the ten experimental versions were not shown to every group, but only one experimental version was shown to any given group. No group saw more than one experimental version. The decision to use the control version was made because this procedure dispensed with the necessity of using matched or equated groups and facilitated, instead, the use of the covariance method of analysis.

(ii) The second stage (December 1-4). This stage involved testing each of the eleven groups used in the first stage on one of the ten experimental versions, so as to yield the learning score of each individual subject in any group. As there were six repetitions of a given film-version, the learning score consisted of six scores for each individual in any group, as a result of the second stage of the experiment. Actually, there were eleven groups available. So the experimental film version #8 was repeated for two groups alike.

(iii) The third stage (December 8-11). This stage involved the retesting of all the eleven groups used in the first stage and in the second stage. For this third and last time, each group was first tested with the control version for the retention score on the control version. Unlike the first and second stages, each group saw the control version only once instead of six times. Thus, there was a single retention score for each individual in any group for the control version. After the retention score on the control version was obtained, each group saw the particular experimental film version, which was assigned to that group, during the second

stage. But unlike the second stage, the experimental film version was also shown only once in the third stage. Thus the retention score on the experimental film version for any individual in a given group was a single score and not six scores as in the second stage.

It should be noted that each one of the eleven groups came at the same time and on the same day for all the three weeks. Therefore, separate rooms were used. On any given day, during these three weeks, when the testing was going on, there were either two or three groups to be tested at the same time. Generally each testing session started at 7 p.m. In the first and third week (November 17 and December 1), the testing session lasted for about two hours, as the film version had to be shown six times, allowing for the time (15-20 minutes) to give instructions. In the fourth week, the testing took one hour.

Lastly, it should be pointed out that during all the three testing sessions, each subject had to take a reversal test. This test consisted of passing out sheets to subjects, on which the Russian words were mimeographed and the subjects wrote down the English words. Thus, in addition to the six pre-test scores for each subject, there was also a reversal test score for each subject. Again, in addition to the six scores for each individual subject, for the experimental film version assigned to that subject, a reversal test score was also available for that subject. Similarly, two reversal test scores were obtained for each subject's reversal test score for retention on the control version and that subject's reversal test score for retention on the experimental film version.

Thus, following would be the plan of the entire final experiment for any subject:

First Week Control Version	Third Week Experimental Version	Fourth Week Retesting for Retention
Firstly, the subject is tested for the number of words he writes correctly during each one of the six repetitions of the control version. This gives six scores. Next - the subject is given a reversal test. This gives (an additional or seventh) reversal test score.	Firstly, the subject is tested for the number of Russian words he writes correctly during each one of the six repetitions of the experimental film version. This gives six scores for that subject. Next - the subject is given a reversal test. This gives (an additional or seventh) reversal test score.	Firstly, the control version is shown only once. This gives the S's single score for retention of the control version. Next - the S is given the reversal test for the control version. This gives the S's reversal retention test score. The above procedure is repeated for getting the S's two retention scores on the experimental film version.

It should be noted that the reversal learning and retention test scores for most of the subjects were usually high, whatever the S's showing on the film-test. In the final analysis of the data, the reversal test scores for learning and retention were, therefore, omitted.

4. Description of the Different Film Versions which were Used as the Test Material

At the outset, the complete set of a given film version consists of at least three prints. One of these prints is called the orientation section. When projected, this section just shows two practice pairs of English-Russian words in order to acquaint the S's with the experimental procedure and after that it presents all the twenty pairs of English-Russian words, in succession. The second frame in each of the four samples of Plates I, II, and III is a sample of how that word would be shown in the orientation section. The two remaining prints are identical. The two prints of the same type are required to make a complete set, because the experimental procedure necessitated the showing of a film-version continuously six times. Thus, one print was threaded on one projector and

Plate I

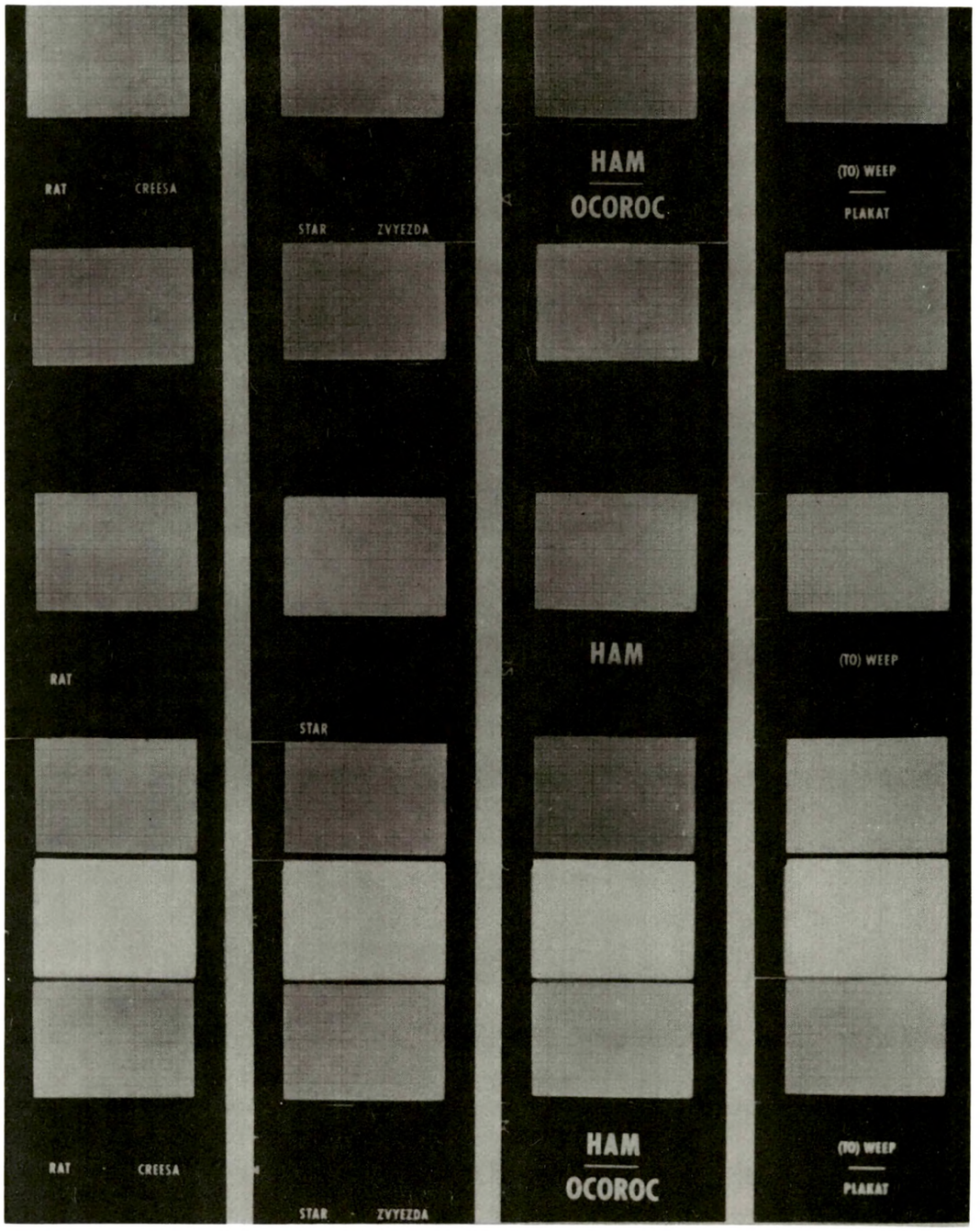

Plate I. Sample illustrations of the film sequences used in the control version.

Plate II

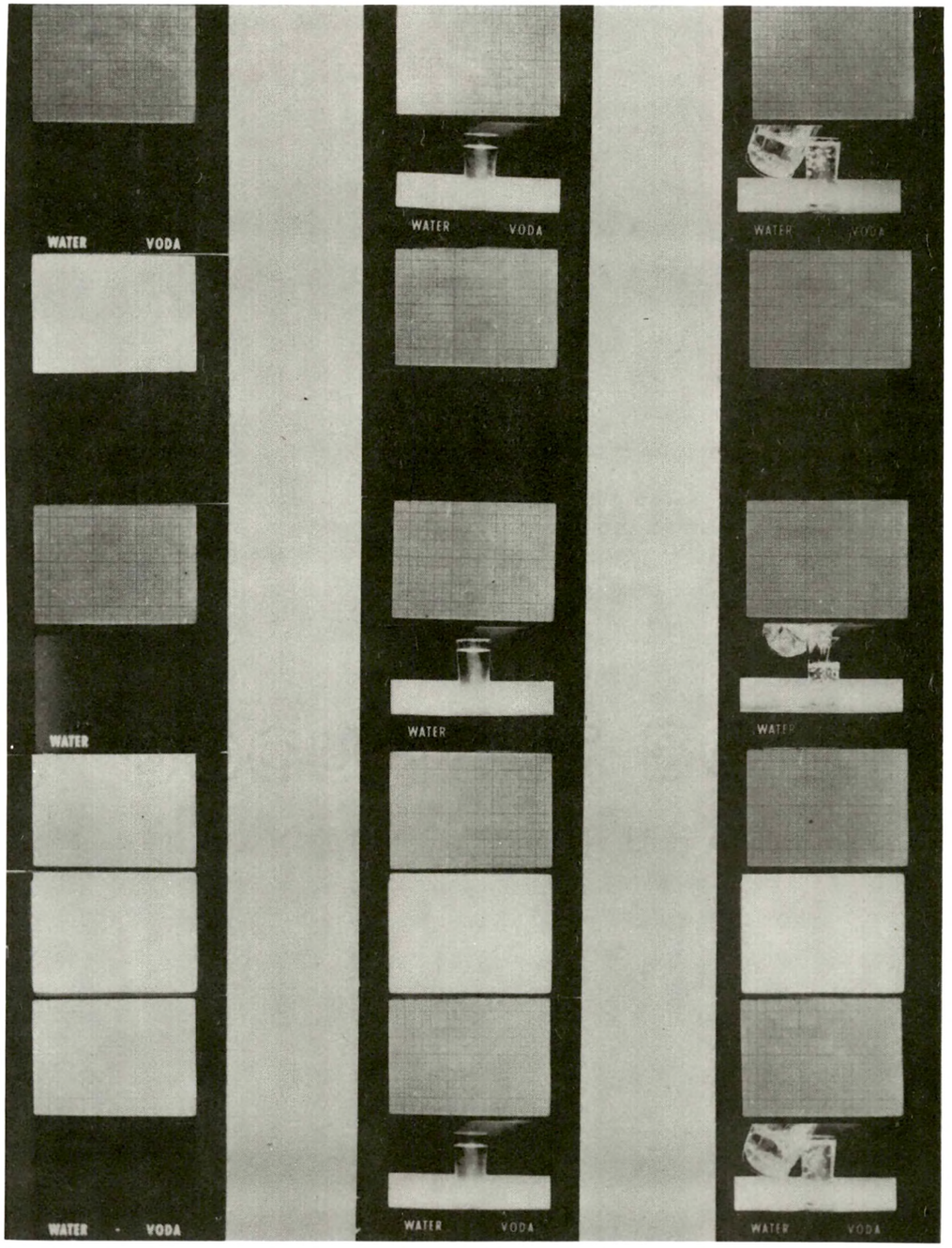

Plate II. Sample illustrations of the film sequences used in experimental film versions 1, 2, and 3. (The pictorial sequences in versions 4 and 5 are the same, as in version 3.)

Plate III

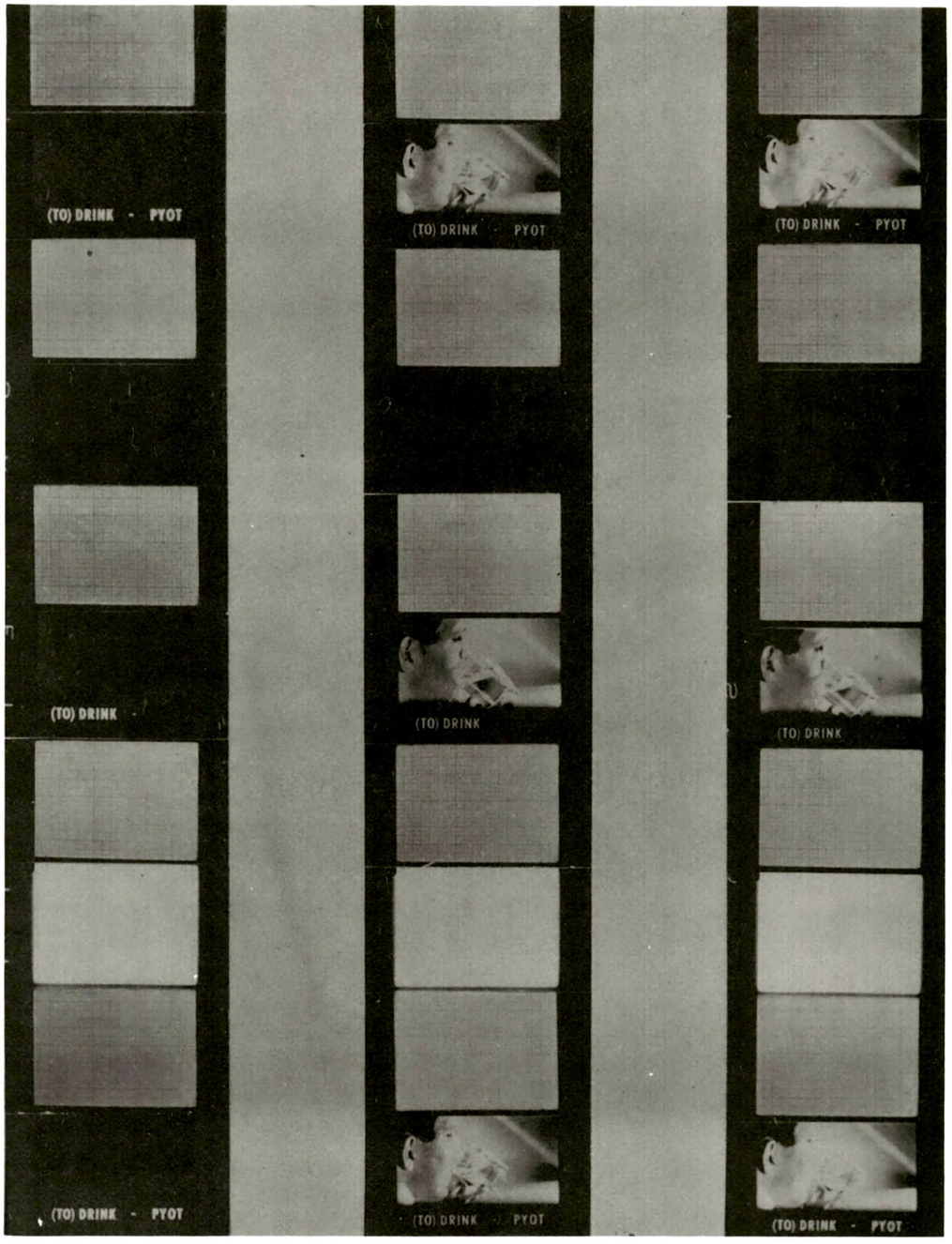

Plate III. Sample illustrations of the film sequences in experimental versions 6, 7, and 8. (The pictorial sequences in versions 9 and 10 are the same, as in 8.)

the other print was threaded on another projector. And as soon as the film on one projector came to an end, the other projector was started almost synchronously. (This made repetitive showing of a film possible). The two prints, thus, together make the testing section. The last six frames in each one of the four samples in Plates I, II, and III are an illustration of how a particular word would appear in the testing section. It will be observed that each sample consists of ten frames. When projected, any of these prints first showed a cross-hatch or graphic-like impression. Then the English word (S), with or without picture or sound was seen on the screen. This gave time for subjects to think what the Russian word might be. This was followed by a cross-hatch impression and a strip of clear film. The clear film reflected enough light from the screen to the room to allow the subject to write down their respective response - the Russian word and to turn the page of the booklet. This was followed by a cross-hatch impression. The cross-hatch impression was succeeded by the correct answer, i.e., both the English and Russian words. The correct answer gave the S's "knowledge of results" and was followed by the cross-hatch impression, for the last time. The frequent use of cross-hatch impression was made in an attempt to minimize visual fatigue to the subjects which may result from sudden transition from titles with black background to clear film and vice versa.

The following is a complete list of all the types of films made for this study.

(a) The pilot-test films: These were six in number. They were exactly alike in all respects, except the length of time for which each pair of words was exposed on the screen. Thus, the film #1 exposed each pair for five seconds, the film #2 exposed each pair for six seconds, the film #3 exposed

each pair for seven seconds and so on, up to the film #6 which exposed each pair for ten seconds. All these films were used for preliminary experimentation held in August, 1952. They were not used in the final experiment. All of them consisted of twenty pairs of English-Russian nouns, given in Appendix II-(B).

(b) The control version: This consisted of 20 word-pairs, ten nouns and ten verbs, presented in random order in the form of film titles (no pictures). A special feature of the control version was that the size and the position of the word-pairs on the screen were systematically varied so that the following combinations resulted: five word-pairs occupy the smallest visible size and are seen in the bottom 1/4th part of the frame; five word-pairs are of the smallest visible size but occupy the central position on the screen with English words on the top and the Russian word beneath it; five words are of the largest possible size and occupy the center of the screen; and lastly five word-pairs are of the largest possible size on the screen but occupy the bottom 1/4th part of the frame. The reason of varying size and position is that the same data on control version could be used, at a later date, to compare the relative effects of size and position of titles on the learning from an instructional film. All of the four of these combinations are illustrated in Plate I. The list of words in the control version is given in Appendix II-(A).

(c) The experimental film versions:

(i) Version #1. This version used the "titles-method" of presentation and used 20 noun-pairs. The list of nouns selected is given in Appendix II-(B). An illustration of one sequence in this film-version appears to the extreme left side of Plate II.

(ii) Version #2. This used the still-picture method and the list of noun-pairs. An illustration of one sequence in this version appears in

the middle of Plate II.

(iii) Version #3. This used the motion-picture method and the list of noun-pairs. An illustration of one sequence in this version appears to the extreme right of Plate II.

(iv) Version #4. This used the sound motion picture method and the list of noun-pairs. An illustration of this version is the same as for Version #3, except that it would contain sound.

(v) Version #5. This used the sound motion picture method with learner participation. An illustration of this sequence would be the same as Version #4.

(vi) Version #6. This used the "titles method" or the words-alone method, and the list of verb-pairs. This list is given in Appendix II-(C). An illustration of one sequence in this version appears to the extreme left of the Plate III.

(vii) Version #7. This used the still-picture method and the list of verb-pairs. An illustration of one sequence in this version appears in the middle of Plate III.

(viii) Version #8. This used the motion picture method and the list of verb-pairs. An illustration of one sequence in this version appears to the right of Plate III.

(ix) Version #9. This used the sound motion picture method and the list of verb-pairs. The illustration for this version would be the same as that for Version #8.

(x) Version #10. This used the sound motion picture with learner participation and the list of verb-pairs. The illustration for this version would be the same as for Versions #8 and #9.

5. Apparatus

Generally, two Bell and Howell-"202" 16 mm. sound projectors were used in every classroom as the projection equipment for this experiment. Since only four of the ten experimental film versions used sound, the projector was used to show most of the versions just like any other silent film. Each projector had a 2" lens and 750 watt lamp. In each room, the distance of the projector lens from the screen was 25' 9". The image of the picture on the screen was about 58.5" wide and 44" high. The classrooms used for each group were large enough with fixed seats to accommodate about 40 subjects. Each seat had an arm on the right side, which the subjects could use to rest their test-booklets upon. No effort was made to assign seats to subjects either at random or systematically, because of the extreme unwieldiness involved in doing so.

The method of using two projectors needs a little explanation. It was desired that the repetitions of a film should really be worthy of being called repetitions. In other words, they should be continuous, without any break. This would make the film repetitions in this experiment analogous to the trials in any learning experiment. For this purpose, it was decided to use what may be called the alternate projector system. Under this method, two projectors are needed, with two prints of the testing sections of a film version. Let us suppose that at the beginning of the experiment, projector A is used first. So the projector A will be threaded with the orientation section and the projector B will be threaded with a print of the testing section. As A comes to the end of the testing section, the cross-hatch impression begins to appear. At this moment, the projectionist turns the lamp off from the projector A and at the same time turns the

motor of the projector B on. Thus the cross-hatch impression of the film on the projector A will fuse with the cross-hatch impression of the film on B and gives the impression of continuity to the subjects. As the projector B is running, the projector A is threaded with the second print of the testing section. This work is repeated until the sixth repetition of the testing section is complete.

The briefing of a group of subjects is shown on Plate IV. The alternate projector system becomes apparent from Plate V.

6. The Test Instrument

This study presented a special problem in recording the response of each subject in that the test instrument had to meet certain requirements. Firstly, the experimenter desired to use a method of recording the response that will register the S's score for a film repetition, at the same time as the repetition is in progress. In the past instructional film research, the so-called learning score was strictly speaking only a retention score, since the tests were administered after and not during the film showing.

A second requirement that the test instrument had to meet in this study was that it should be sensitive to such possibilities as cheating, or unintentional confusion on the part of the subject. From the test instrument, it should be easy to detect any discrepancy between the performance of one subject and others in the same group.

A third requirement that it had to satisfy was that it should be easy for the proctors to "tell" from a distance of about eight to ten feet in a comparatively dark room whether the subject is keeping the same

Plate IV

Plate IV. A group of subjects (Psych. 2 students) being briefed before the beginning of a testing session. The test booklets are seen to the right of each subject.

Plate V

Plate V. Another group of subjects in the actual testing situation. The alternate projector system is apparent from this picture.

pace as the other members in his group.

A fourth requirement was that it should preclude as effectively as possible any chance of review by the subjects.

All these factors were taken into consideration, and it was decided to design a special test booklet for this study (See Plate VI). It was made of about 200 pages of 3" x 3½" size. The pages were alternately pink, white and blue in that order so that the proctors could "tell" from a distance, that the S is or should be using a pink page, a white page or a blue page, etc. This booklet was punched with two holes so that it could be easily inserted in or removed from the No. 1 calendar stand manufactured by Stark calendars, Inc., Joliet, Ill. The subjects were warned in the instruction period, to write one Russian word on each page, as and when the film required them to do so and to flip it over to the left side, as soon as the bright light on the screen gave way to the cross-hatch impression. They were warned against looking backwards through the pages they might have already turned over. In fact, the main responsibility of the proctor was to establish a certain rhythm in the test-behavior of the group. This rhythm could be styled as "think-write-and-turn-the-page," "think-write-and-turn-the-page" and so on. If a subject was "out of step" with the rest of the group, either deliberately or otherwise, the proctors corrected the subject. But generally few of the subjects were un-cooperative.

7. The Scoring Method

The S's score for any repetition consisted of the number of correct Russian words which the S writes during that repetition. It was decided that in order to get a score-point, the spelling written by the subject

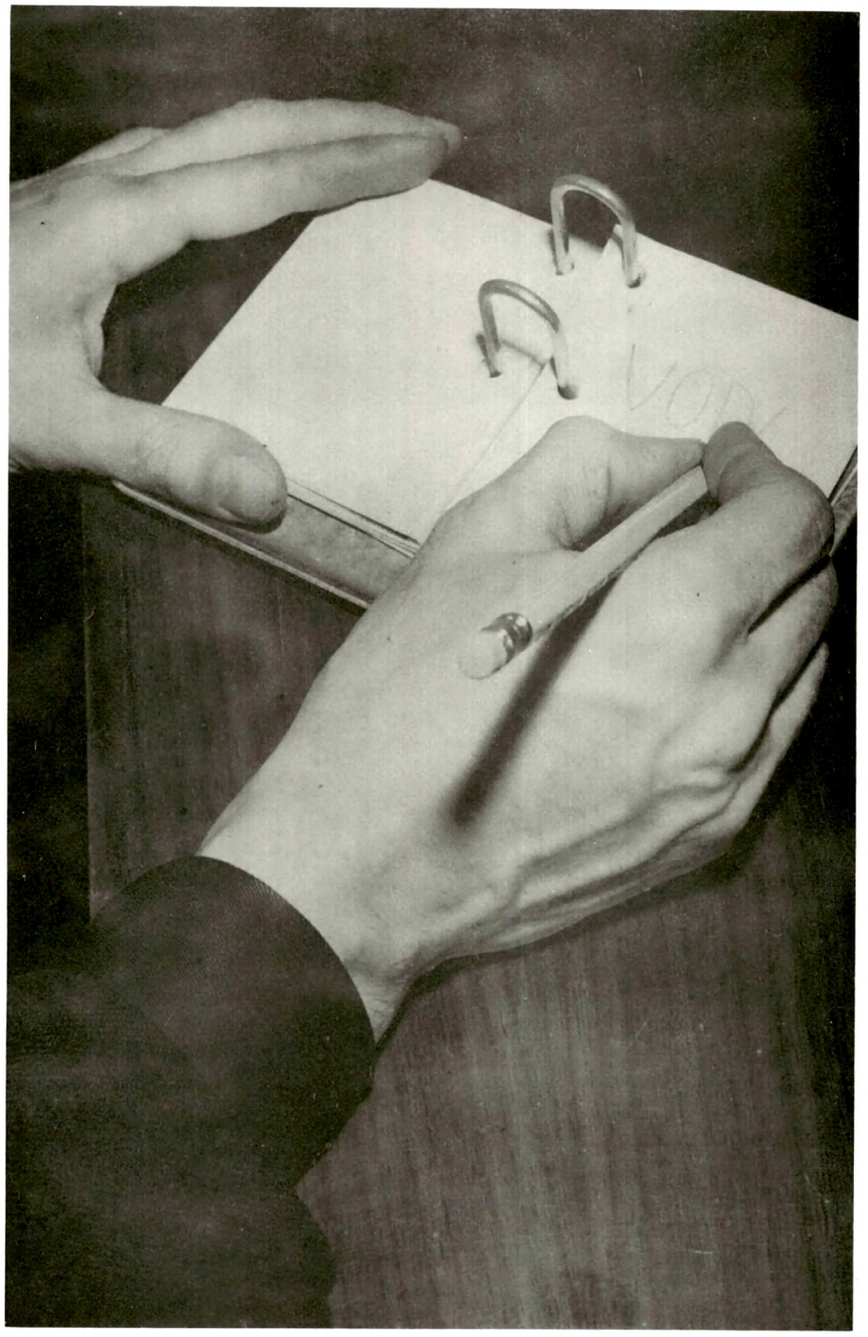

Plate VI. A close-up of one subject using his test booklet to write the Russian word -- "Voda".

must be an exact reproduction of the spelling of the Russian word in the film. Thus, the maximum score of a S for any repetition is 20 and the minimum is 0.

The scoring method for the reversal test was the same.

The raw scoring had to be done manually. In other words, one had to turn each one of the 120 pages (20 x 6) of a test booklet to decide the S's score for each one of the six repetitions. This process was lengthy and laborious, because with three test booklets for each subject, about 1200 booklets for 400 subjects had to be inspected in order to assign learning or retention scores to each subject.

Generally, on the first page of each test booklet, the subjects were asked to write some relevant personal information - such as name, age, sex, major subject, address, etc. The next two pages were used up for the practice examples. The material that could be scored generally began from the third or fourth page.

8. Instructions

The problem of brief and yet efficient instructions was a complicated one. The instructions of the final experiment were revised several times to their present form. The unique situation, in this study, was that the instructions differed considerably from film version to film version and from one stage to another in the final experiment. Thus, the instructions to be used for the motion picture method differed from those of the sound motion picture methods. Similarly, the instruction for the second stage of the experiment differed from those of the third stage. The common point in all instructions were:

(i) There was a deliberate effort in the first paragraph to

attract or sustain as much interest and motivation of the subjects as possible;

(ii) Since the crucial point of the experiment was the different combinations of pictorial and auditory channels, reference to the pictorial and auditory elements was kept to a minimum in the experiment. Naturally, they had to be told more about the auditory elements because of the subjects' participation in hearing or pronouncing from it;

(iii) Before the experiment started, at any session, the students were asked to write down some personal information about themselves on the first page of the test booklet;

(iv) They were also given two practice examples in order that they get used to the experimental procedure; and

(v) In a sense, the instructions did not end at the beginning of the experiment, as the proctors tried to remind them at least a few times, of the necessity to establish the "think-write-the-Russian-word-and-turn-the-page" rhythm.

The instructions for the "dry runs" in August 1952 are reproduced fully in Appendix V. Appendix VI gives the instructions used for the control version in the first phase of the experiment (November 17-20). Instructions for experimental film versions 1, 2, 3, 6, 7, and 8 are fully reproduced in Appendix VII (A); while Appendices VII (B) and VII (C) give the instructions for Versions #4 or #9, and #5 or #10 respectively. These were used in the second phase of the experiment (December 1-4). Lastly, Appendix VIII gives instructions for the third phase of the experiment, in which retention scores for all groups were obtained (December 8-11). It may be pointed out that the instructions for the pilot-testing

sessions and the third phase of the final experiment also included a set of questions to be asked to the students, if there was enough time left. This procedure was adopted to get an idea of what the subjects themselves thought of the experiment in general. The analysis of these questions does not form part of the present investigation.

9. The Procurement of the Personnel to Conduct the Experiment

As this was a group-experiment, and at least two or three groups were tested at any time, the experiment needed the help of experienced test-administrators, proctors, and projectionists. On any evening of testing, at least nine persons had to be made available, excluding the experimenter himself. Three of these had to be head-proctors, especially experienced in test-administration and skilled in establishing "rapport" with the class. The senior members of the staff of the Instructional Film Research Program kindly made themselves available for this work. Then, there was a need for at least three proctors and three projectionists, each evening, who checked on the test-behavior of the subjects. The graduate assistants of the Instructional Film Research Program and in the Department of Psychology of The Pennsylvania State College offered their co-operation in this work. As far as possible, an attempt was made to rotate the three-man personnel in each classroom for each week, with one exception. This exception was made for the experimental film Versions #5 and #10. As these versions involved learner participation, the head-proctor had to pronounce each word-pair along with the class as a sort of model or class-leader. It was decided to use the same head-proctor through the last two stages of the final experiment for Versions #5 and #10.

10. Subjects

(i) Subjects for the pilot tests. The preliminary experimentation in this study was done with the cooperation of six groups of 104 female and male students who were enrolled for the 1952 summer session at The Pennsylvania State College. Table 1 gives the number of female and male subjects in each group of the six pre-test films. The experimenter secured the cooperation of these subjects as volunteers, after visiting their respective classes and requesting them to sign up as subjects during their spare time. As these tests were more or less dry runs, no attempt was made to match the subjects on age, educational background, or similar criteria. The age-range varied between 20 and 53 years in females. The same varied between 20 and 45 years in males. Most of them were graduate students majoring in different fields in Education.

TABLE 1

THE NUMBER OF FEMALE AND MALE SUBJECTS USED FOR THE PILOT TEST

The film used	Females	Males	Total
Film #1	18	6	24
Film #2	16	7	23
Film #3	12	3	15
Film #4	6	3	9
Film #5	17	5	22
Film #6	8	3	11
Totals	77	27	104

(ii) Subjects for the Main Experiment. The subjects for the main experiment were 11 groups of male and female college undergraduates (mostly sophomores) who were enrolled in ten sections of the Psychology-2 course

(corresponding to the G. S. Psy. 1 at Columbia University) at The Pennsylvania State College during the fall semester of 1952. Each subject contributed a total of 5 hours of time for this experiment - two hours in the first stage of the experiment, two hours in the second phase and one hour in the last phase of the experiment. Table 7 gives the number of female and male subjects who attended each of the three phases of the experiment. The age range of females was 17-43 years, with a mean of 18.17 and a standard deviation of 1.95. The age range of males was 17-31 years, with a mean of 19.84 and a standard deviation of 2.01. Some instructors made it compulsory on their students to participate in this experiment by asking them to write a term paper in lieu of the experiment and some did not. But all the six instructors who taught those students agreed to increase the grade of their students by five points if they took part in the experiment. The experimenter promised, in return of this favor, to visit each class after the experiment was complete and explain the results of the experiment to the subjects. The percentile ranks of each subject in his or her group were also posted on the bulletin board three weeks after the experiment.

The incentive involved in 5 grade points partly explains why the drop in attendance from the first to the second stage in the experiment was only 5% and that from the first to the third stage was only 7%.

The eleven groups into which the total of 409 students were divided were formed more or less by voluntary choice of the students themselves. And yet eleven groups of 30-40 students in each group were obtained when the experiment started. The number of females and males was also almost equal (202 females and 207 males). This ratio changed only slightly during

the second stage (196 females and 193 males) and the third stage of the main experiment (195 females and 184 males). One week before the experiment, each instructor handed to the experimenter a list of names of students who would agree to take part in the experiment. At this time each student also indicated the three most convenient days on which he or she could come, with the understanding that once a particular day is chosen by the student and assigned to that student by the experimenter, the student undertook to come three times on the same day, at the same time, for three weeks (week of November 17th, week of December 1st and week of December 8th). The first choice, the second choice, and the third choice were also indicated by the student, at the time when this information was obtained. The experimenter assigned the students to the day of their first choice, as far as possible. The assumption was that the selection of days by a number as large as 409 students would be more or less at random, as the convenience of one individual is likely to differ from the convenience of other individuals considerably. The only exceptions to this procedure were made if it became apparent that a particular group would be more crowded than other groups. The second consideration was that the ratio of men and women who have been assigned to a particular day should be fairly constant through two or three sub-groups (experimental projection rooms) to which they were assigned. A third consideration in the assignment of subjects to groups was that the first choices from the classes for whom the experiment was made compulsory, should be given priority over the first choices of those classes of students for which the participation in experiment was left optional by their instructors. These three considerations were the guiding factors in assignment of subjects to a particular day, and to a particular

experimental projection room on that day.

The method of sending reminders to each student about the time and day of the next testing session by post-cards was also adopted to ensure greater attendance of subjects.

In spite of these precautions, some subjects did not remember the room to which they were assigned - more so in the second week of testing than in the first week. Whether this be intentional or unintentional, it was necessary that the students who went to a different classroom than the one assigned to them, should be made to come to the room to which they changed than the room to which they were assigned. This was made possible by taking a roll call at the beginning of the third week and sending "the lost sheep" back to their proper fold.

One difficulty arose in the last phase of the experiment (the fourth week). Wednesday (December 10, 1952) was not convenient to many students (about 19) who were assigned to this day. In order to keep the number of subjects in each group intact, as much as possible, these students were asked to come on Thursday (December 11, 1952). Thus whereas the retention scores of all the other students were obtained exactly seven days later, the retention score of 19 students were obtained eight days later. This difference was <u>not</u> taken into account, in the final analysis of the data, and the different groups were compared as planned before.

When the experimenter later visited the classes to explain the experiment, he found that many students did not know anything about the film-versions, other than the one he or she had seen. From this, it can be assumed that there was not much communication between students about

the nature of the experiment.

As the method of analysis was one of covariance, no attempt was made to match the groups initially. The covariance method is used to adjust individual differences which were not controlled at the beginning of the experiment.

11. The Proposed Method of Statistical Analysis

(a) Method of analysis for the main experiment. At the end of the Section 10, it was mentioned that the subjects in the main experiment were not matched. This is because it would have been a doubtful assumption to suppose that, because the subjects who have the same score on a test of verbal ability like the Moore-Castore test, are, therefore, of equal ability when it comes to learning Russian words. A special measure of each subject's capacity of learning and retention of Russian words was, therefore, obtained by showing all the eleven groups a common film version - the control version. The analysis of covariance is a powerful tool of psychological research in that it helps the researcher to adjust the final measure (Y) of performance of a subject or a group of subjects, by taking into account the regression of the final measure (Y) on the initial measure (X) of the same subject or group of subjects. The nature of the covariance method has been fully discussed by Garrett and Zubin (29), McNemar (61, chap. 14), and Edwards (22, chap. 17).

The statistical analysis of the data of this experiment was unique in certain respects. Six scores for each of the 30-40 subjects in a group, with ten groups for each one of the ten experimental film-versions led to the possibility of analysis of variance with six repeated measurements on a subject.

This problem has been discussed by Edwards (22, pp. 288-301) and by Kogan (53). But a further complexity in the total picture of the data was introduced in that the experimental design proposed the use of the analysis of covariance. There have been practically no studies in the recent past (42), where the analysis of covariance was combined with the presence of repeated measurements on the same subject. This led to the adoption of three types of covariance analysis - each involving more complexity than the previous one. These three methods of analysis are as follows:

The Covariance Method A - In this method, the score of a subject on control or experimental version was assumed to be the sum of all the six repeated measurements of that subject on the control or experimental version. The initial measure of a subject's performance is the sum of six scores of that subject on the control version. The final measure of a subject's performance is the sum of the six scores of that subject on the experimental version.

The second feature of the covariance method A was that the ten experimental film versions were regarded as just ten conditions, irrespective of the fact that some versions were made of the nouns-list and the other versions were made of the verbs-list.

The Covariance Method B - In this method of covariance analysis, the score of a subject was not obtained by summing over all the film-repetitions. But each of the six scores of a subject either on the initial or final measure was regarded as a separate score. The change made by the method B necessitated the computation of regression equations for any given score on the final measure (i.e., on the experimental versions).

The regression equations were obtained by getting the beta-weights of Y on X, for any given film repetition over all the groups. Thus six regression equations for men and six regression equations for women were used to get the predicted Y-scores for any film-repetition. The analysis of covariance here takes the form of another analysis of variance of the deviations of the final measures (Y-measures) from the predicted Y-scores. The analysis of variance of the deviations of Y-scores took the form suggested by Kogan (52,53).

The common point of the covariance methods A and B is that both of them treat ten experimental film versions as ten conditions, irrespective of the fact that some versions were made from the nouns-list and some were made from the verbs-list.

The Covariance Method C - The common point between the covariance method B and the covariance method C is that both involve analysis of the deviations from regressed Y measures. For the same reason, this covariance method is different from the covariance method A. The covariance method C differs both from A and B in that it takes into account the fact that the ten experimental versions really amounted to five methods of presentation - varied in two ways on account of two lists, i.e., the nouns-list and the verbs-list. Thus the variance due to "lists" is recognized as a component of the total variance, which is not the case in the covariance methods A and B. Method C is a combination of covariance method and factorial design.

(b) The method of analysis for the pilot testing: The object of the pilot tests was three-fold. Firstly, to decide the number of film-repetitions that are practically feasible. This decision was taken on the

basis of the average score for each film repetition (# of words right) of a group for the film to which that group was assigned. The second object was to compare the different rates of presentation - such as 5 seconds, 6 seconds, etc. This was done by selecting a sub-group from each group which had an age-range of 22-26 years and obtaining "t"-ratios for the differences between mean total scores of any two sub-groups. The "t"-ratios were computed with due regard to the fact that all the six sub-groups in these tests were small samples. The third object was to test the general smoothness of the testing procedure.

For reasons to be explained in Chapter V, the data for men and women were treated separately throughout this study. See page 79, Chap. V.

12. Decisions about the Rate of Presentation and the Required Number of Film Repetitions and Other Procedural Matters

(a) The rate of presentation. The first object of the pilot tests held in August 1952 was to determine the satisfactory rate of presentation (i.e., exposure time). For nonsense syllables usually a very fast rate of presentation is used. Two or three seconds is the most commonly acceptable rate. But this becomes rather unpractical in an instructional film, because the aim in the latter is to help the learner and not to put the learner under restrictions due to short exposure time. Lumsdaine (59) reports studies in which exposures of various kinds - half a second to thirty seconds - were used. For our purpose, there was one very practical consideration. The action sequence in any motion picture version required five seconds. The narration and time for learner participation took another three seconds. Thus, the only rates of presentation left for genuine choice by the experimenter were eight seconds, nine seconds, and ten

seconds. The maximum length of many sequences left after editing was just about 10 seconds.

Table 2 gives the full data for the six groups and all the subjects in each group, for the six films. It becomes clear from this data that real increase in learning does take place from one repetition of the film to the other. Table 3 gives the mean number of correct words scored by female and male groups of subjects during successive repetitions of the film.

Table 4 gives the significance of "t"-ratios for the six film-groups of female subjects, compared two a time. It shows that while there is no significant difference between 5, 6, and 7 seconds as exposure time, the 8-seconds-group does significantly better than 5-seconds-group at .01 level. Also, while, there is no difference between 9 and 10 seconds as exposure time, the 9-seconds-group does significantly better than 8-seconds-group. From Table 5 no differences in male groups are significant except the one in which the 6-seconds-group does significantly better than the 5-seconds-group at .05 level. From Table 6 no differences in the means for combined groups (males and females) are significant, for any of the films. This leads to the conclusion that there are very few significant differences between increasing or decreasing the exposure time between the limits of 5 and 10 seconds. If anything, so far as instructional film is concerned, the longer exposure time increases the mean score of the group seeing the pairs at a slower exposure rate. Similarly, the 10-seconds-group does as well as the 9-seconds group. There are two possibilities. One is that the slower exposure rate may lead to loss of interest. On the contrary, it may also increase learning by the addition

TABLE 2

THE INDIVIDUAL SCORES OF SUBJECTS ON THE RESPECTIVE FILMS SHOWN TO THEM IN THE PILOT TEST

Females

Film #1 Exposure time - 5 sec.								Film #2 Exposure time - 6 sec.								Film #3 Exposure time - 7 sec.								
Number	Age	Number of words correct for each film repetition						Number	Age	Number of words correct for each film repetition						Number	Age	Number of words correct for each film repetition						
		1	2	3	4	5	6			1	2	3	4	5	6			1	2	3	4	5	6	7
1	46	0	3	4	6	8	10	1	42	1	7	11	7	10	8	1	53	0	2	4	5	6	8	9
2	46	0	3	5	7	7	8	2	40	0	0	4	7	7	8	2	50	1	0	4	7	8	10	11
3	36	0	0	2	4	5	7	3	39	0	3	5	6	7	8	3	48	0	2	5	6	9	12	12
4	31	3	8	13	15	16	18	4	38	1	2	6	5	9	8	4	48	1	1	5	7	10	13	11
5	29	2	4	10	15	15	16	5	24	0	2	3	5	4	7	5	48	0	1	1	2	5	5	6
6	26	9	11	15	17	--	--	6	23	1	7	7	9	12	14	6	41	0	0	3	6	5	10	11
7	25	2	3	5	6	5	5	7	23	1	1	3	4	8	10	7	28	0	3	5	10	15	12	13
8	24	1	1	0	2	4	5	8	23	2	5	7	11	16	18	8	41	4	9	12	18	18	19	19
9	24	0	0	0	0	2	3	9	23	1	6	15	18	19	20	9	24	0	2	5	8	9	10	16
10	24	4	4	9	11	12	14	10	23	2	3	4	6	11	11	10	24	0	4	6	10	15	15	19
11	23	4	9	12	16	19	19	11	22	0	1	8	9	12	14	11	24	2	4	7	8	12	13	13
12	23	0	3	5	6	8	9	12	21	4	11	15	16	16	16	12	23	0	0	3	5	9	12	12
13	23	0	2	5	6	10	10	13	21	1	10	13	16	17	20									
14	22	1	5	10	9	12	12	14	21	1	3	6	10	10	11									
15	22	7	7	12	--	--	--	15	21	2	7	6	8	11	11									
16	22	3	4	9	12	17	19	16	20	2	2	6	8	12	15									
17	22	0	5	6	11	13	19																	
18	20	0	1	5	10	15	18																	

Males

1	44	0	0	0	1	2	2	1	40	1	1	2	5	5	8	1	40	1	1	5	8	8	9	9
2	36	1	1	5	7	8	11	2	39	1	4	8	9	13	13	2	34	1	2	3	5	6	8	7
3	32	0	2	3	7	8	10	3	38	2	5	10	10	13	16	3	26	2	1	2	4	5	7	11
4	26	1	4	10	10	14	17	4	32	1	3	7	10	12	13									
5	26	0	1	3	10	11	11	5	27	2	11	15	20	20	20									
6	24	2	2	2	5	3	3	6	27	1	2	5	7	9	9									
								7	26	0	4	10	11	12	14									

TABLE 2 - continued

Film #4 Exposure time - 8 sec.								Film #5 Exposure time - 9 sec.								Film #6 Exposure time - 10 sec.							
Number	Age	Number of words correct for each film repetition						Number	Age	Number of words correct for each film repetition						Number	Age	Number of words correct for each film repetition					
		1	2	3	4	5	6			1	2	3	4	5	6			1	2	3	4	5	6
Females																							
1	27	1	3	10	8	12	13	1	50	2	3	8	9	11	10	1	43	4	6	10	13	15	18
2	26	1	5	9	12	13	15	2	47	0	6	9	11	12	13	2	43	0	0	0	0	2	2
3	25	2	3	7	8	12	15	3	45	2	7	9	13	15	18	3	43	4	9	13	16	16	18
4	24	-	2	3	6	6	9	4	43	1	4	8	10	10	--	4	39	4	6	13	17	20	20
5	22	3	4	8	14	15	19	5	42	1	8	11	16	18	--	5	35	3	7	10	14	17	20
6	22	3	5	9	14	15	19	6	40	1	4	7	12	15	16	6	26	1	1	4	5	5	6
								7	39	1	3	4	5	8	9	7	24	1	3	7	11	14	17
								8	38	1	1	4	6	7	9	8	22	0	1	9	10	12	18
								9	38	0	3	5	8	9	9								
								10	36	3	6	6	8	8	10								
								11	34	4	5	10	11	15	16								
								12	30	0	4	10	11	17	16								
								13	28	1	1	5	8	11	13								
								14	28	3	6	12	17	18	19								
								15	27	2	8	10	12	13	14								
								16	27	3	9	13	15	18	19								
								17		0	0	2	4	6	6								
Males																							
1	45	-	0	4	8	10	11	1	36	0	2	3	5	7	--	1	36	5	9	9	13	12	14
2	42	3	6	8	8	8	--	2	30	1	5	11	13	19	19	2	30	1	4	5	9	11	12
3	36	3	9	9	15	17	18	3	29	0	4	6	9	11	15	3	28	0	0	2	5	--	--
								4	28	2	4	5	9	10	9								
								5	20	2	4	8	9	12	--								

TABLE 3

MEAN NUMBER OF WORDS CORRECTLY ANSWERED BY FEMALE AND MALE SUBJECTS DURING SUCCESSIVE REPETITIONS OF THE PILOT-TEST FILMS

	Females						Males					
# Film Repetition	Film #1 (N=18)	Film #2 (N=16)	Film #3 (N=12)	Film #4 (N=6)	Film #5 (N=17)	Film #6 (N=8)	Film #1 (N=6)	Film #2 (N=7)	Film #3 (N=3)	Film #4 (N=3)	Film #5 (N=5)	Film #6 (N=3)
1	1.89	1.23	.67	1.67	1.42	2.12	.66	1.12	1.33	2.00	1.00	2.00
2	3.84	4.41	2.33	3.67	4.95	4.12	1.67	4.25	1.33	5.33	3.80	4.33
3	6.89	7.41	5.00	7.67	8.10	8.25	3.83	8.75	3.33	7.00	6.60	5.33
4	8.83	9.00	7.66	10.33	10.95	10.75	6.67	11.12	5.67	10.33	9.00	9.00
5	10.41	11.29	10.08	12.67	12.95	12.62	7.67	12.87	6.33	11.67	11.80	7.67
6	11.99	12.53	11.58	15.00	12.58	14.87	9.00	14.00	8.00	9.67	8.60	8.67
7	-----	-----	12.67	-----	-----	-----	-----	-----	9.00	-----	-----	-----

TABLE 4

SIGNIFICANCE OF "t"-TESTS BETWEEN MEANS OF FEMALE GROUPS FOR DIFFERENT PILOT-TEST FILMS

Film	1	2	3	4	5	6
1	—	NS	NS	S_{xx}	NS	NS
2	—	—	NS	NS	NS	NS
3	—	—	—	NS	NS	NS
4	—	—	—	—	S_x	NS
5	—	—	—	—	—	NS
6	—	—	—	—	—	—

NS = Not significant
S_{xx} = 8 sec. film group mean significantly better than 5 sec. film group mean at .01 level
S_x = 9 sec. film group mean significantly better than 8 sec. film group mean at .05 level

TABLE 5

SIGNIFICANCE OF "t"-TESTS BETWEEN MEANS OF MALE GROUPS FOR DIFFERENT PILOT-TEST FILMS

Film	1	2	3	4	5	6
1	—	S_x	NS	NS	NS	NS
2	—	—	NS	NS	NS	NS
3	—	—	—	NS	NS	NS
4	—	—	—	—	NS	NS
5	—	—	—	—	—	NS
6	—	—	—	—	—	—

NS = Not significant
S_x = 6 sec. film group mean significantly better than 5 sec. film group mean at .05 level

TABLE 6

SIGNIFICANCE OF "t"-TESTS BETWEEN COMBINED (MALE AND FEMALE) GROUP MEANS FOR DIFFERENT PILOT-TEST FILMS

Film	1	2	3	4	5	6
1	—	NS	NS	NS	NS	NS
2	—	—	NS	NS	NS	NS
3	—	—	—	NS	NS	NS
4	—	—	—	—	NS	NS
5	—	—	—	—	—	NS
6	—	—	—	—	—	—

NS = Not significant

of practice effects (some students used in the pilot-tests and in the main experiment reported that they could repeat a pair about three times mentally, while the pair was on the screen). The practical decision arrived at concerning the rate of presentation was that it did not make much difference for the purpose of this study, whether a film showed a pair for nine seconds or for ten seconds. It should be noted that these findings not very generalizable to other situations because of the diversity of the groups used as subjects.

(b) The number of film repetitions. Table 3 shows that the female groups reached a level of 60% to 74% of the maximum possible learning, while males reached a level of learning which ranged from 40% to 70%. There was no consistent relationship between the rate of exposure time and the level of learning from the film in either female or male groups. Taking any single group, improvement in learning did not quite reach the ceiling level at the end of the sixth repetition and only three male groups (8 seconds, 9 seconds, and 10 seconds groups) showed a tapering-off in the improvement of learning. All the women groups showed consistent improvement from one film repetition to the next. One film repetition takes about 12 minutes of time. This means that each one of the six pilot-test groups underwent about 72 minutes of exposure to the film material. Adding to this, the 15 or 16 minutes taken for giving instructions, it was estimated that 90 minutes is about the maximum time that any group of subjects could be expected to give to a psychological experiment, voluntarily. On the basis of the pilot tests, therefore, it was decided to use six film repetitions for the final experiment.

(c) Decisions about other procedural matters on the basis of pilot

tests.

(i) The object of the pilot-test was also to get a feel of the testing situation and to improve the administrative procedure, if necessary. It was found by actual experience that it was possible to administer and proctor the test in such a way that dishonesty or cheating on the part of students could be detected by the arrangement of the pink-white-blue sequences of the test-booklet. It was noted that it is possible to notice the color of a given test page, even though all the screens are pulled down, because the bright light on the screen during the answering period reflected enough light in the room. The decision to put the students on the rhythm of "think-write-and-turn-the-page," and to tell them occasionally what type of page (pink, blue or white) they should be using at a particular time was also taken. (This helped the elaborate scoring system, which would have been much more complicated and unreliable but for the three-color-page system adopted.) By means of a stop-watch, the lengths of time for which the S's look at the stimulus word, the time which they require to write down the Russian word, and the time for which they attend to the knowledge of results (the correct answer) were noted and found quite within the limits allowed by the film.

(ii) It was decided that the Paired Associate method in Psychology needs certain appropriate changes, when it is to be transformed into the form of a test-film. In the traditional Paired Associate method, the stimulus-item first appears alone in the aperture of the memory drum. Then, in the next turn of the drum it appears again with the response-item. The same is true with our films. There are, however, some obvious and some intricate differences between the memory drum and the sound motion picture. Instead of the S telling

the experimenter the anticipated response-item here, the S writes it down on the test booklet, when the screen is white. Secondly, the knowledge of results (correct English-Russian pair) is given by the visuals of the film (when the film version uses only titles or pictures) or by the narrator's pronunciation added to the visuals while the knowledge of results in a memory-drum experiment is given by the experimenter. Besides the features in which the films of this experiment resemble or differ from the traditional Paired Associate method, it should be noted that in the testing section of any film-version, the narration or participation is introduced only after the S writes down the answer. The other features such as the use of clear films and the graph-like impression have been already mentioned earlier in this chapter.

13. The Testing Schedule for the Final Experiment

Table 8 outlines the full testing schedule of the final experiment. The assignment of experimental film versions to different groups was at random.

During the first week of testing, owing to a technical fault in the setting up of the projectors on Tuesday, November 18, 1952, the groups for this evening saw the control version at silent speed instead of at sound speed. This increased the exposure time for each pair by 4 seconds, creating a serious problem whether conditions of the experiment had been radically altered. The statistical analysis mentioned in the next chapter indicated that these doubts were not substantiated.

TABLE 7

NUMBER OF FEMALE AND MALE SUBJECTS
IN THE FINAL EXPERIMENT

	First Week		Second Week		Third Week	
Version	Women	Men	Women	Men	Women	Men
1	18	21	18	22	18	20
2	17	24	16	24	16	23
3	19	18	17	15	15	14
4	14	17	14	16	14	15
5	20	19	17	19	17	18
6	17	20	17	19	17	19
7	23	18	21	18	21	17
8	34	35	33	33	34	31
9	20	21	21	17	21	19
10	20	14	22	10	22	8
Totals	202	207	196	193	195	184
Grand Totals	409		389		379	

TABLE 8

TESTING SCHEDULE OF THE MAIN EXPERIMENT*

Day	First Week - November 17-20, 1952 (During this week, each group learned the words from the control version)		
	202 Willard	209 Willard	216 Willard
Monday 7 p.m.	(1) Checov (2) Soloyanis (3) Radlow	(1) Watkins (2) Caine (3) McNiven	(1) Greenhill (2) Tear (3) Jodon
Tuesday 7 p.m.	(1) Watkins** (2) Shipman (3) Hurst	(1) Stein** (2) Bradley (3) Rimland	(1) McCoy** (2) Caine (3) Stover
Wednesday 7 p.m.	(1) Scollon (2) Schnitzer (3) Hurst	(1) Stein (2) Greenberg (3) Tear	
Thursday 7 p.m.	(1) Torkelson (2) Schnitzer (3) Kale	(1) Checov (2) Bradley (3) Stover	302 Willard (1) McIntyre (2) Radlow (3) Hontz

*The experimenter assumed the work of general coordination of these testing programs. He was present for each test and sometimes worked as a projectionist, if there was a shortage of personnel.

For each room, the person mentioned after (1) was the head-proctor; the person or persons mentioned after (2) were the proctors; and, the person mentioned after (3) was the projectionist.

**Due to wrong adjustments in the projector, these groups were shown the control version at silent speed, instead of at sound speed.

TABLE 8 (Continued)

Third Week - December 1-4, 1952
(During this week, each group learned a new set of words from an experimental film version randomly assigned to that group.)

202 Willard	209 Willard	216 Willard
(1) Watkins	(1) Greenhill	(1) Checov
(2) Caine	(2) Blair	(2) Soloyanis
(3) McNiven	(3) McNiven	(3) Hontz
Version 4	Version 5	Version 9
(1) Rimland	(1) McCoy	(1) Soloyanis
(2) Montessi	(2) Caine	(2) Greenberg Henckman
(3) Hurst	(3) Kale	(3) Manino
Version 7	Version 6	Version 8
(1) Checov	(1) Scollon	
(2) Greenberg	(2) Schnitzer Shipman	
(3) Tear	(3) Kale	
Version 3	Version 2	
		302 Willard
(1) McIntyre	(1) Greenhill	(1) Scollon
(2) Tear	(2) Reevy	(2) McNiven
(3) McNiven	(3) Manino	(3) Hurst
Version 1	Version 10	Version 8

TABLE 8 (Continued)

Fourth Week - December 8-11, 1952
(During this week each group was tested for retention on control version and on experimental film versions.)

202 Willard	209 Willard	216 Willard
(1) Watkins	(1) Greenhill	(1) McIntyre
(2) Caine	(2) Blair	(2) Soloyanis
(3) McNiven	(3) Hontz	(3) Rimland
Version 4	Version 5	Version 9
(1) McIntyre	(1) Rimland	(1) Watkins
(2) Soloyanis	(2) Caine	(2) Shipman Bradley
(3) Radlow	(3) Hontz	(3) Hurst
Version 7	Version 6	Version 8
(1) Stein***	(1) Scollon***	
(2) Greenberg Schnitzer	(2) Hurst	
(3) Tear	(3) Manino	
Version 3	Version 2	
		302 Willard
(1) McIntyre	(1) Greenhill	(1) Scollon
(2) Tear	(2) Reevy Blair	(2) Hurst
(3) Radlow	(3) Stover	(3) McNiven
Version 1	Version 10	Version 8

***Some subjects in these two groups were tested for retention on Thursday, December 11, 1952 instead of on Wednesday, December 10, 1952, because they had to take an English reading examination given by the College, on Wednesday, December 10, 1952. They were tested on Thursday, December 11, 1952, in 308 Willard Hall.