THE VALIDATION OF A CONCENTRATION TEST FOR COLLEGE AND HIGH SCHOOL USE.

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Introduction.

STATEMENT OF THE PROBLEM.

The purpose of this study is to present a test, the construction, evaluation, and conclusions of which will help students discover how they rank in ability to concentrate, and to give educators and teachers a device which should prove useful in educational guidance.

IMPORTANCE OF THE PROBLEM.

Concentration as a factor in the study procedure is a subject that is much discussed but little investigated, yet its importance cannot be overlooked in dealing with problems of study. With it there can be complete attention; without it there is little learning. In this respect it is related to interest; but it is not interest. It is a part of the study habit, coming into action only through effort to attend, or with interest.

When concentration is looked upon as a special ability within itself - when it becomes an obsession for study's sake, then it loses its value, for it is neither of these things, but a co-function of interest. This should be kept in mind when we study it.

The problem of measurement of concentration is an important one in the light of present ideas of study habits. Will not the educator be better equipped to teach efficiently if he knows more about the manner in which the student works? Will not a more intelligible under-
standing of the habits of the student tend to throw more light on the methods by which they should be taught? Will the student not be a better student if he knows what his weak points are? These are some of the questions that justify the efforts of one in setting up a study such as the one outlined in this thesis.

In interpreting the scores of educational and psychological tests we find that the scores are often inadequate for educational diagnosis. Mental tests, for example, are designed to classify students according to their capacity to learn, yet such classification does not account for some of the cases of students entering college, working hard and getting little out of it, even though they do rate exceptionally high on the psychological examination. What about these students? Should we not make some provisions for further testing them so that we will have more adequate means of helping them in their problems? These questions are pertinent to practices in present day teaching.

An illustration of this point can be cited with the case of a student at Oregon State College who, on taking the American Council on Education psychological examination, was classified in the lowest quartile. Since entering, this student has made better than average success as indicated by the grades received. In the class of "Methods of Study" a research problem on the amount of
study done by the class* showed this student not to be enough above the average to explain the difference.

The psychological score was evidently inadequate for diagnosis in this instance. This might be explained by consideration of any one or a combination of such measures as those of natural ability, interest, objectives in college, previous training, health, and application, which would affect the study process. Since concentration is a significant element in every one of these measures, with the possible exception of health, knowledge of its quality and quantity should certainly be considered valuable.

The case cited is not an exceptional one, but is a common example found among students. The opposite case of the student who has a brilliant record on the psychological test and poor scholastic record is also common, and is probably more prevalent than the first type. Could we not do a better job of teaching if we knew how and why these students progress as they do? This investigation aims to throw some light on such unusual cases.

A distinct value of this study will be found in the data which should help meet the need that has been expressed by various authors and educators. "The measurement of attention," says E.B. Titchener, "is one of the most pressing problems in experimental psychology.

* The "Methods of Study" class is a course offered in the
If we could measure man's capacity of attention, and discover at any moment what proportion of that capacity he is using; if, that is, we could determine the greatest possible height of the attention wave and could find out its actual height in the case before us; then we should have a result of the greatest scientific importance and of the most practical value."

The measurement of concentration is an important problem if we realize what functions are developed in the act of concentrating. The four functions which appear to be predominant in concentration are:

1. focusing attention.
2. comprehending.
3. cultivating interests.
4. disciplining the mind to a specific study.

The place of these functions in concentration has been emphasized by various authorities. E.S. Jones (17) says: "That which we are truly interested in is immediately attended to; that which we readily attend to absorbs our interest. They are two aspects of the same process. Interest has been called the feeling side of attention. Concentration we may think of merely as a particularly high level of attention. The simplest and most direct way of stirring up one's interests, there-
fore, is to try hard to attend for some period of time. If attention grows up to this high level of concentration, our interests are assured." That the mind is focussed to attention is the belief of J. A. O'Brien (19) who says: "It is the experience of most readers that the rapidity of reading bears a direct relationship to the degree of concentration. Other things being equal, the greater the concentration the faster the reading." L.A. Headley (14) expresses the belief that: "to concentrate is to determine by a controlling purpose what shall come to the mind.", thus implying that the ability to concentrate is also the ability to discipline the mind.

A discussion of the four factors of attention will enlighten the reader upon their value in practical situations.

FOCUSSED ATTENTION. Study demands attention focussed upon a particular point and not spread or diffused over a large range of materials. How is this accomplished? Purpose or objectives enter the situation at this point. Focussed attention is accomplished in a manner similar to that of setting up the destination of an automobile trip. There must be a goal, an end-to-be-striven-for, a purpose, or an objective. Without such an end point the automobile driver would never attain a desired destination. The destination itself would not be desired, nor would it be known. The student finds a similar
situation in his study habits when there is no particular objective to be attained by the accomplishment of a study. He becomes inattentive to his lessons, wandering to more accessible, more purposeful thoughts, even though such thoughts be a fantasy of the mind. The study with an objective may be the path of least resistance. Without its objective it may become the path of most resistance and be avoided for more accessible material in the mind. Inattention is really attention to the stronger stimulus, which is usually undesirable for the accomplishment of a specified reaction. Purpose being strong enough will insure directed and focussed attention, providing other factors are normal.

COMPREHENSION. Study implies more than rote memorization and reading of words. These things can be done in a mechanical way with little thought. Comprehension in study can be assured through a certain degree of concentration.

Discriminative and associative adjustments to our surroundings and to our knowledge are implied in the meaning of comprehension. Both discrimination and association are closely related to focussed attention, which in turn, is definitely related to concentration. If we are to attempt a measurement of concentration these factors must be considered for valid results.

INTEREST. In his book on "How to Study and Work Ef-
fectively in College" W.F. Brooks suggests a rule for the development of interests which concerns us in studying concentration: "He must apply himself fully and vigorously to his task." This rule implies that interest comes as the result of a gain in knowledge. Breese (4) substantiated this viewpoint by saying: "—that it is a thing which we respond to in spite of ourselves, and also a thing that can be developed with practice in gaining knowledge about a thing."

DISCIPLINE. This act of the mind to a particular study can be accomplished by focusing the attention through force. The elemental facts in a field in which there are no outside connections have to be obtained by use of forced attention. No interest can be had for a thing which has no background or connection with other things, unless through forced attention some knowledge is obtained upon which to build a foundation for interest's development.

The foregoing discussions suggest the importance of this investigation. The specific values of this study, as have been outlined in this section, are:

1. to add to research in the field by furnishing more objective data.

2. to fulfill a need that has been expressed by various writers in the field of education and psychology.
to aid students, educators, and teachers in the diagnosis of study procedure.

4. to aid educators and teachers in the improvement of their teaching ability.

PROCEDURE.

Definitions. A specific explanation of the terms used in this study will help to give the reader as well as the writer a unity of thought in interpreting this study.

"Concentration" as used in this study will be thought of as a peculiarly high level of attention, the degree of which may be measured by the amount of work accomplished on a specific problem in a given period of time. This definition incorporates the opinions of such authorities as Headley (14), Ruckmick (22), Breese (4), Crawford (6), Pillsbury (21), all of whom maintain that forced attention is an important phase of the study procedure.

"Attention" as will be defined for this study is the narrowing of the consciousness to a desired or specified reaction. Into this process will fall three types of attention:

1. non-voluntary.
2. voluntary.
3. involuntary.

The writer has drawn for the above analysis, upon following: Angell (1), Breese (4), Burnham (5), Dewey (10),
James (16), Pillsbury (21), Ruckmick (22), and Titchener (24), all of whom divide the attentive process into similar divisions.

"Non-voluntary attention" is that attention which is given without direction or control. We might say that it is attention without will. It is the type of attention we give before we have developed a conscious purpose in life, or before we determine the trends that our thoughts will take upon a stimulus. It is initiated by a strong odor, a loud noise, extreme temperatures, moving objects, and other novel types of stimuli. That these attentive forces have to be controlled by educational adjustments if there is to be a coordinate learning process in the individual is the problem of education. We could hardly imagine what the mind of the human being would be if every stimulus entering it were to be attended to. Knowledge, instead of being focussed into an intelligible pattern, would be diffused into an unintelligible, uncipherable conglomeration. This process has to be avoided by the individual in his learning if he is to cope successfully with the frustrative factors of life. The psychological factors such as personal recognition, pugnacity, accumulative instinct, self preservation, and reproductive capacity are part of the "drives" which tend to force the individual to focus his attention for more effective mental powers to cope with the difficulties
which confront him in his development. From these early forms of non-voluntary attention the individual, through a selective process, forms voluntary attention to cope with his problems.

"Voluntary attention" is the attention which we think of as accompanying interest. B. B. Breese referring to this type of attention says: "Voluntary attention is the attention we give as the result of some conscious purpose or plan which we wish to carry out, and is always attended by feeling of effort or strain. It is attention with will. Plainly, voluntary attention is possible only where mental development has reached a certain degree of perfection, for it involves the presence in the mind of purposes and desires which are the result of past experiences or activities. Voluntary attention is evidently an outcome of non-voluntary attention. Conscious purpose and choice can arise in the mind only as an outcome of conflict in non-voluntary attention."

"Involuntary attention", as Breese states it is: "the attention we give to any object or topic of thought in spite of, or in direct opposition to our desires to attend to something else. It is the attention in opposition to the will. The thing we attended to forces itself upon us even though we strive to keep it out of our minds. The stimuli for such distractions (as these
types are called) are the same as for the non-voluntary type of attention. We should not confuse these two types of attention. Involuntary attention is strived against while non-voluntary attention offers no resistance to the incoming stimulus.

The student at his study desk is confronted with distracting elements; he tries to dismiss them, but they persist in spite of his efforts. This attention that comes into the student's mind in spite of the efforts he makes to keep it out is an example of involuntary attention. Now, if a gun is shot close by, the student has a conscious change in attention from one of study to one of alertness to a novel sound. This is non-voluntary attention. When he finally tries to get back to his work he experiences involuntary attention, and, on becoming absorbed in his work, he uses voluntary attention.

In this study the test is designed primarily to measure a type of voluntary attention. This measurement of voluntary attention was chosen since it is a type of attention that is commonly used in the study situation. It is the one which can be trained and modified to a point of significant importance in the study process, as is pointed out by Headley who says: "to concentrate is to determine by a controlling force what shall come to the mind."

As a method of improving the attentive powers, J.A.
O'Brien suggests fast reading. On the other hand, C.C. Crawford stresses novelty, competition, learning, self-measurement, good physical condition, emotional contribution, manipulation, variety, and concreteness as means of promoting interest and attention. "Concentration, like other forms of skill, develops out of doing actively the duty immediately at hand."

Charles Bird says, "An investment of ten minutes each day in reading against time will earn good dividends."

E.S. Jones gives the following list of modifiable elements as the cause of lack of concentration:

1. Poor physical condition.
   a. excessive use of stimulants.
   b. fatigue.
   c. worry.
   d. overeating.
2. Poor general orientation in the field.
3. Poorly learned elements.
4. Vocabulary deficiencies.
5. Impractical nature of the study.
6. Competing interests and irregularity of attention.

These opinions, then, all imply that concentration is modifiable under specific conditions; that the type which appears to be the most modifiable is the voluntary, or the type commonly used in the educational process.
Hence, a test designed to measure a phase of specific voluntary attention should prove valuable in the understanding of study habits for personal use as well as for objective analysis by the teacher and educator.

PREVIOUS STUDIES.

That previous studies in the field of concentration are few in number is evidenced by the fact that the psychological index for the last seven years has carried only three articles on this subject. In as much as this is true, in this section we will review studies in closely related fields of attention and distraction as well as those pertaining to concentration.

The most comprehensive study on concentration that was made on an objective basis was carried on by H. Easley on 68 college students in a psychology class at the George Peabody College for Teachers in Nashville, Tennessee. In his studies he attempted to find the relationship between some tests of attention and the functions which they were designed to measure. He used the following nine factors:

1. Cancellation test.
3. Woodrow test (distractor test - consists of taking one measure of a certain performance under optimum conditions of attention, and
another measurement of the same performance under unfavorable conditions of attention.)

4. Mean reaction-time (which was pointed out not to be an adequate measuring tool because conditions other than reaction-time affected the reaction.)

5. Equation test.
6. Otis test.
7. Army Alpha.
8. Whipple's word building test.

The results showed that the correlation between various factors ranged from .50 to -.17. In other words, the study indicated that if these tests actually measured concentration, they measured a specific type of it. Otherwise, the correlations would have been higher.

The conclusions of the study were as follows:

1. There is little relationship between the measures of attention.

2. There is little relationship between the measures of attention and the other mental functions which we should suppose to require a high degree of attention.

3. There is no evidence of any group factors of attention involved in any combination of the
attention tests.

4. If attention is involved in all the measures to any extent, then the intelligence tests are at least as good a measure of it as are the attention tests.

5. The direct and indirect method of measuring attention do not measure the same thing, even in the same function, namely, reaction-time.

In the study of distraction the two problems of elements of distraction, and their effect of distraction upon the higher mental processes have been worked upon by H.B. Hovey and H. Weber.

In his study, Hovey attempted to find:

1. Effects of distraction upon certain higher mental traits.

2. The relationship between susceptibility to distraction and intelligence as measured by the Army Alpha.

3. Individual differences in ability to overcome distraction.

4. How much distraction affects the reliability of a mental test.

The subjects, consisting of all sophomores in general psychology, were of two groups: (1) 171 in the experimental group, and (2) 123 in the controlled group. The
The distractors used were noises, lights, phonographs, whistles, students performing stunts, etc., each being presented both simultaneously and successively. The results showed that there was an increase in the mean test scores for the controlled group of 6.4 points, and for the experimental group of 10.1. The variability of the amount of improvement under distraction was less than normal.

It was concluded (1) that the higher mental processes are comparatively unimpeled by distraction, (2) that intelligence is not related to susceptibility to distraction, (3) that there are no individual differences in susceptibility to distraction, and (4) that the true measure of mental ability is more nearly approximated under distraction than under normal conditions.

H. Weber made a study in which he wished to find the relative importance of certain distracting elements. Sixteen subjects were given the following tasks to perform: computing, cancelling, learning nonsense syllables, solving picture puzzles, thought problems, answering simple questions, defining, composing essays. Distraction was of three types, namely, interesting anecdotes, lively music, and pictures. Controlled and test performances were alternated. The distracting stimuli became effective by changing the situation, by inducing another mood, or by evoking associated ideas. Variations in distractibilit-
ty displayed by different subjects with a decrease in efficiency ranging from 8-57% were noticed. It was concluded that any given act of attention was, therefore, like a system of forces in which both subjective and objective factors operate. A general attentive factor appeared to be present in the various tests as the average intercorrelation is .80. Music was found to be less of a distractor than anecdotes, probably because of the lower mental activity required to apprehend it. The nature of the mental set or mood was all important, as was shown by the percentage of decrease in efficiency of performance under different attitudes. The least decline in the achievement occurred when the subjects were positively directed in their work.

Glanville and Dallenbach working on the range of attention through the use of the tachistoscope on a group of 30 subjects in five series of experiments found:

1. That the number of stimulus objects exposed is not a compulsory condition of the two-level experience of the exposure field.

2. That in the cognitive series of experiments, the range, defined as the value of the stimulus which has a 50% probability of being correctly reported, varies:

   (a.) inversely with the degree of cognition required for the test.
(b.) with the kind of material exposed.
(c.) inversely with the degree of assurance or certainty of the subject's report.
(d.) with the duration of the memory after-image.
(e.) with the facility of verbal association and the freedom from associative inhibitions.

In his summary Dallenbach says: "The attentive consciousness is an integrated whole, and as such the range is always 'one'."

This report is contrary to the accepted conclusions on the range of attention. An experiment carried on at the University of Oregon by Dr. Crosland, which is as yet unpublished, finds that the range of attention is more than unity. This experiment shows that attention can be placed on as high as six things at once.

These conflicting reports in the field of attention indicate that it is a promising field for further research. As yet no absolute data are available about it, other than the fact that we know that there is attention as an element in the study process. When we arrive at some standard of conclusions based upon a large number of tests we may feel assured that we have contributed something to the meager knowledge of concentration.
A Concentration Test.

CONSTRUCTION OF THE TEST.

The test used in this study has been built upon a modified plan of the Munsterberg test, which consists of a page of letters arranged in such a way that some of the adjacent letter combinations form words, but the majority do not. These words were of an isolated nature in the original test, having little or no relationship to each other. The problem of the student taking the Munsterberg test was to underline all the adjacent letter combinations which formed words. A three minute period was given for the test, aside from giving the directions. The score which was called the index of accuracy, was found by dividing the number of words underlined by the total possible score. The following line illustrates the original Munsterberg test:

"brloeyldmpykecatholpiurhdzauntimortmoxkrytsaoobm"

N.L. Hoopengarner of New York University suggested in a recent article the use of the Munsterberg technique in a new form. He believed that concentration could be more adequately measured by forming sentences of the words found in consecutive order in the test. The following is a sample of the technique as he suggested it
In his article:

In this study both the Munsterberg and Hoopengarner techniques were employed, but extended to use only sentences in the test which would call for a simple response. The test is much more adequate in that it is more extensive, and also in that it gives a check on the student's comprehension as well as concentration. The following sample will illustrate the technique used in this study:
The test was lengthened from the original three minute test of Munsterberg's to a standard twenty minute test, containing 79 lines of letters and 143 words. This was done to give more reliable results. The test used in this study includes four pages of material. The title page has space for general information thought to be useful in the tabulation of the scores, and for later research; given also are directions and a sample of the type of response desired of the student. The other three pages, which are devoted to the test proper, contain 79 lines of letters in which 143 words are placed. The test is divided into seven units or exercises, each of which calls for a specific response. In the process of standardization the test has been found to require about 20 minutes for the best students, hence, that time-limit has been set as the standard for the test. For all relationships discussed in this study, this time-limit has been the one used.

One of the first problems of the test construction was the difficulty encountered in eliminating all superfluous words. This was accomplished with the help of members of the staff of the School of Education, as well as a group of graduate students.

Another important problem encountered was that of

*This test, as well as others used in this study, will be found in the appendix.
the proper spacing of the words in the various exercises in the test. Eye-fixations were liable to occur excessively if too many of the words were grouped closely together, so in order to reduce the possibility of such a situation, the words were spaced at irregular intervals throughout the test. This procedure was followed so as to prevent having the words equally spaced, as such a process would tend to decrease the validity of the test.

The next problem was to evaluate the probable difficulty of the seven exercises and to arrange them in order. Accordingly, a set of the tests was prepared and submitted to a group of graduate students who took the test and criticised it from this standpoint. The scores of each of these students were then tabulated by exercises* and the order changed to the correct evaluations of the performances and criticisms of this group of judges of the test.

ADMINISTRATION.

In this study the test was administered to 501 students for their criticisms and help toward standardization. The tests were passed out, face up, with the directions for the student to fill in the following information on the title page: name, sex, age, date of birth, name of college attended, location, and year in school.

* The tabulations for this procedure will be found in the appendix.
The following instructions were given by the examiner:

"Do not turn the page until you are told to do so. This is a test that will enable you to find out how well you can concentrate. In order that you will be able to work effectively, it is desirable that you remove all distracting elements from your desks. Now, will you please read the directions to yourselves as I read them to you. 'In each of the numbered lines of letters found on the following pages, underline each combination of two or more consecutive letters which spell a word. Make each word contain as many letters as possible. There will be a complete sentence formed in each exercise. These sentences will be in the form of questions or statements that are to be answered in the space at the end of each exercise.' Study the sample below, and, if there are no questions, turn the page when the signal is given.

Are you ready? ....Go!........Stop!* Hand in your papers without making any more marks upon them."

SCORING.

In the preparation of the scoring key two purposes were kept in mind: (1) economy, and (2) objectivity. In order to have economy in scoring, yet retain the objectivity, provisions were made to have a scoring sheet

* Note: Between the words "Go" and "Stop", exactly 20 minutes must elapse. After the word "Go" nothing more must be said until the signal "Stop" is given.
which would have the correct words to be underlined on the edge of the paper. These are to be matched with the student's responses. This simplifies the scoring to the extent that the entire test can be scored in less than two minutes.* By having this objective score, there will be a fairly standardized practice and comparable results in the hands of different examiners.

The scoring of this study was done entirely by the writer. Responses of the test exercises were more varied than was first expected. An example of this may be cited in the fifth exercise, the answer of which is: "Mark two crosses in the space at the end of this exercise if Tuesday is the day following Monday." If the student left out the word "two" but marked two crosses or more in the space, then his response was correct, and he was given credit for answering it in such a manner. But if he left out the word "two" and only underlined "cross" instead of "crosses", then he was not given credit for a correct response. In like manner were other responses interpreted as either correct or incorrect. The expression of the score was then found by dividing the number of correct responses by the total score. This result was placed upon the title page for recording and tabulation.

*A form of this scoring key will be found in the Appendix.
CHAPTER III
Interpretation and Results.

VALIDITY.

There are various methods of determining the validity of a measuring device. Ruch and Stoddard* mention a wide variety of methods:

2. Analysis of courses of study.
3. Analysis of final examination questions.
4. Pooled judgement of competent persons.
5. Use of rating scales in setting up criteria.
6. Correlations with school marks or other measures of school success.
7. Increase in percentage of success with successive ages or grades.
8. Correlation with previously validated materials.
9. Differential scores shown by two groups known to be widely separated upon a scale of ability.
10. Determination of social utility.
11. Logical or psychological analysis.
12. Correlations with tests of other intellectual non-intellectual, or educational abilities.

The validity of this test has been determined by methods 6, 8, 9, and 10 of the mentioned list of measures.

Correlation with school marks. As a predictive measure of scholastic success as indicated on the correlation of 112 student's grade average for two terms picked at random from the files of the School of Education, the test showed a relationship of .20. When the factor of intelligence was partialled out of the correlation of the test this value increased to .32, thus indicating that probably the less intelligence the student possesses, the more he will have to be able to concentrate if he is to succeed in his school work. When the factors of intelligence, with a coefficient of .56 for the 112 students, and concentration are combined, the predictive correlation for scholastic success is raised to .62. Thus, by using these two criteria alone, we have been able to approach the highest predictive correlations that have been developed which involve many more criteria. With the expenditure of only 20 minutes in giving the concentration test to an individual, or to a group, and less than two minutes per test on clerical work in scoring and interpreting, we are able to predict the academic success of the student almost as well as by using far more intricate and time consuming devices that are better known.

The correlation of the concentration test to schol-
astic success of .32 gives us an instrument with which we are able to get a partial measure of application. It has been pointed out that intelligence has a negative correlation with concentration, probably due to the fact already mentioned that the more intelligent individuals do not have to learn to concentrate, while the less intelligent students have to in order to keep up with their work. If this conclusion is true, we then have a test which not only measures concentration, but also measures the amount of application made by the student. Hence, we have a valuable instrument to use in educational diagnosis.

Differential scores of two groups of students known to be widely separated on the scale of ability. One of the strongest points of validity for this test is its correlation with the American Council on Education psychology examination. This correlation shows that the students in the lower range of mental ability (that is, by students we mean students of college age.) actually have more developed ability to concentrate than the more intelligent students. This is shown by the correlation that we get between the concentration test and the mental test. This conclusion, which at first appears to be contrary to popular opinion, is the logical result of study procedure. The highly intelligent student has no need for developed ability to concentrate
when he is placed in the average atmosphere, while the student with low native mental ability compensates to a certain extent for his lack by the use of concentration. This is the relationship of this test of concentration to mental ability.

**Correlation with previously validated material.** It has been shown that by the use of this test of concentration, reading comprehension is closely related to the ability to concentrate. The correlation between these factors is .42 when the factor of intelligence is partialed out, thus indicating the close relationship of these two factors in the educational process. With such relationships known, we have a more valid reason for using this test in diagnosing educational problems.

**Determination of social utility.** The validity of this test might be further established through its general social utility, in that it presents data, the use of which should prove useful for further research. For example, it could be used to advantage in determining the relationship of various types of distraction to study, or it could be used to give a measure of the span of attention. With its development, there are probably many new studies that it might be used in as an aiding factor.
By reliability of a test is meant the degree of consistency of performance. The extent of this agreement is usually found by finding the Pearson coefficient of correlation between the scores of the first application of the test and those of the second. However, the exact conditions of this study do not permit the use of such procedure. Time did not permit two applications of the test at sufficiently wide intervals to bring desirable results, nor were the classroom conditions under which the test was given held constant. The testing program was given in the period of a few weeks, which did not allow for a re-test, as the students would retain much of the material for this length of time. If it had been given over a period of months, classroom conditions might have been changed to such an extent as to affect the reliability of the results. Consequently, the reliability of the test was determined by a method of self-correlation, that is, by numbering the words of the test and then correlating the even items with the odd ones. This is done on the theory that by splitting the test into halves, we have two tests of equal difficulty, each of which is half the length of the original one. By applying the Spearman-Brown formula to the reliability of the two halves we arrive at the theoretical reliability of the whole test.*

* cf., p. 30.
The reliability of this test is based upon 418 cases representing eight different classes on the campus, seven of these were in the School of Education, while one was in the School of Science. The resulting coefficient of correlation for the test based upon these cases was found to be .94 with a probable error of .029, which is considered extremely high by authorities in the field of testing. As a matter of fact, it is probably sufficiently high to warrant its use as a measure of individual diagnosis.

This reliability was obtained from the two halves of the test by the application of the Spearman-Brown formula thus: In the formula

\[ r_x = \frac{n(r)}{1 + (n-1)r} \]

\( r_x \) = the reliability coefficient to be obtained for the whole test, that is, for the first half plus the second half.

\( r \) = the correlation actually obtained between the two halves of the test - in this particular case, .89.

\( n \) = the number of times the test is given; here considered as two as the test was broken up into two parts.

Substituting in the formula we get:

\[ r_x = \frac{2(.89)}{1 (2-1) .89} = .94 \]

That is, the coefficient of reliability of the entire test was found to be .94. The probable error was later found to be .029.
Due to the fact that concentration is an independent element in the study process, there can be no norms of value set up that will tell the relationship of concentration to age. But, if a student wishes to know how well he compares with the average student in ability to concentrate, he may be able to find out by comparing his score with those of a number of students who have taken the test. 326 students have been used to find the approximate norm deciles 1-10. This table is as follows:

**NORMS OF THE CONCENTRATION TEST.**

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<th>DECILE</th>
<th>SCORE</th>
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USE OF RESULTS.

The results of this test could be used in:

1. predicting scholastic success and failure.
2. diagnosing students' study habits.
   a. from the students' standpoint.
   b. from the teachers' standpoint.
3. measurement of progress in this important skill.
4. giving valuable data for further research.

Predicting scholastic success. Knowing that this concentration test has a negative correlation with intelligence and a positive correlation of .32 with scholastic success, we are able to set up a simple predictive table for use in educational guidance and diagnosis:

<table>
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<th>Concentration</th>
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Diagnosing students' study habits. Such a device as the above table would also be valuable in the "Methods of Study" class where students go who wish to find their
faults and work toward correcting them. Such a table would show the student how and why some of his grades are as low as they are. And, the ability to concentrate, being modifiable under the right guidance, could be improved to the extent of rendering a definite aid to the study process of the individual.

Measurement of progress in this important skill. The instructor in the "Methods of Study" class, on giving this test of concentration, would have some tangible evidence for giving instructions in the development of concentration in study. At the end of the instruction, a second testing over this ability would reveal to the instructor if his directions were being carried out, or if they were valid for the development of concentration.

Giving valuable data for further research. Research in the field of attention, distraction, and interest would be expanded by the use of this concentration test. The span of attention in relation to the ability to concentrate, the relationship of distraction and concentration, and also the relationship of interest to concentration could be investigated by the help of the materials found in this study. With these problems known, there probably would be more intellectual and efficient teaching methods employed.
CHAPTER IV
Summary and Conclusions.

SUMMARY.

This investigation had for its purpose the construction and evaluation of a concentration test that could be used in educational diagnosis in high school and college. After constructing the test on a modified plan of the Munsterberg technique, it was given to 501 students in eight different classes at Oregon State College for purposes of criticism in construction and for use in validating the test. Correlations were run between this test of concentration and other measures of scholastic success for the purpose of obtaining the relationship of this test to the study procedure. In this process, correlations between grades, the Whipple reading test (both comprehension and rate), and the scores of the American Council on Education psychology examination were made. The relationship of these elements of study were found and explained.

The most significant result of this study was found to be that this test of concentration had a negative correlation to the psychological test of -.11, and that it also had a positive correlation of .32 with scholastic success as measured by the average of two terms grades. The Whipple reading test comprehension correlated .45 with this concentration test when the factor of intelli-
gence was partialled out, while the rate of reading had a coefficient of correlation of .11 to concentration. These correlations were run on 112 students picked at random from the files of the School of Education.

From this study a simple prediction table has been made to aid in the educational guidance of students, validity and reliability established for the test, and norms made for interpretation of scores for use in educational guidance.

CONCLUSIONS.

1. Concentration, as used in the study process, can be measured and constitutes an essential type of skill in diagnosing scholastic success and failure.

2. That this specific type of concentration is possessed to a greater degree by those college students in the lower ranges of mental ability than the brighter ones.

3. That concentration measured in this study is negatively correlated with intelligence, as measured by the American Council on Education psychology examination.

4. That freshmen possess on the average a higher degree of concentration, as discussed in this study, than do students in the more advanced years of
5. That the type of concentration measured in this study is an important element in comprehension in silent reading.

6. College students in a single class vary markedly in their ability to concentrate.
Bibliography


Gradation of Exercises.

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Total number of mistakes = 21

### Exercise No. 4

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**Total number of mistakes = 21**

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**Total number of mistakes = 112**

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**Total number of mistakes = 125**
CONCENTRATION TEST FOR
HIGH SCHOOLS & COLLEGES

SERIES A
Name __________________________; Sex ________
Last name ______ First name ______ Middle initial ______
Age last birthday ______; Date of birth ______

If you are in high school, fill out this section:
Name of high school __________________________
City __________________________; State ___________
Grade in school: (Draw a circle around one)
Freshman Sophomore Junior Senior

If you are in college, fill out this section:
Name of college or university __________________________
City __________________________; State ___________
Year in college or university: (Draw circle around one)
Freshman Sophomore Junior Senior Graduate

DIRECTIONS:
In the numbered lines of letters found on the following pages, underline each combination of two or more consecutive letters which spell a word. Make each word contain as many letters as possible. There will be complete sentences formed in each exercise. These sentences will be in the form of questions or statements that are to be answered in the space at the end of each exercise.

Study the sample given below; then, when given the command, turn the page and work as rapidly as possible.

SAMPLE:
1. H G N A R E O D S Q Y F Y O U A R V M P S U R E L
   (Yes)

Score: ______________________
52. R O Q U T H A N K S G I V I N G E O Z E N A R O M I U
54. E B U Z B R E A B X T H E I Q F I R S T I M G E A C Y
55. G M A C Z P U E B L I C N D A Y E Z E S M O F R Q H U
57. E Q A R Q M A K E I G L E C Y U T W O A Z Q Y P O M J
58. E S E C R O S S E S S E S Q U Y E H E R E O P U
59. U B A Q S A Z U B U T Q M R R A D U I F O I T T Q C E
60. K W E R U E D A C O M E S U M U I N Q C R E Z T I O M
61. P E R M N A N O T H E R Q T H O Z P M O N T H U C T Y
63. X O M R Z O I D R A W I N G U O M Q O N E M H R H I Q
64. I R L C E S E R C E L M H Q C I R C L E E Y I N U
65. M T H E A E S D E S P A C E U I R Y U O Q V Y T P K I
67. I M X E D H M G I L I N E Q Y O Z E N A R I Y U N G A
68. __________________________
69. P U Z U M Z O M F R O M Q H U D E Y O U R S T Q D E I
71. A D G R A V I T A T I O N A L I B X O D R O M R F Z Q
73. N R C O J R S I W O U L D E S G Z S T E F A O Y O U M
74. C J R Q E W A Q T E M I B M R E Q Z E W A I X L U I Y
75. A E X P E C T U R O M T U T O Q I M Q S E E H P I B U
76. O A Z R E I W A T E R I O M U C I Z I R U N E Z O E A
77. F R A C U O J U T H I U P H I L L O S Z P R I N U X A
78. F O S L S H A N Y E B O P A R T U M G A O F U D R E Z
79. E Y P O T H E H T R E T Y U O W O R L D I Z E O
THE SCORING KEY.

LINE:
1. WHEN EIGHT
2. AND
3.
4. SEVEN ARE ADDED
5. TOGETHER THE
6. ANSWER WILL
7. BE WHAT
8. NUMBER (15 )
9. PLACE ANY
10. LETTER IN
11. THE BLANK SPACE AT
12. THE END OF THIS
13. SENTENCE AND
14. YOU WILL HAVE
15. STARTED THIS TEST ___
16. IF YOU
17. BELIEVE THAT
18. BIRDS USUALLY FLY
19. BACKWARD PLACE
20. THE WORD YES
21. ON THE LINE
22. FOLLOWING
23. THIS
24. STATEMENT ________
THE SCORING KEY

LINE:
25. IF YOU
26. ARE SURE
27. THAT
28. THREE PLUS
29. FOUR
30. ARE EQUAL
31. TO
32. 
33. EIGHT PUT
34. THREE
35. QUESTION MARKS
36. AT THE END
37. OF THIS
38. SENTENCE __________
-----------------------
39. MARK
40. TWO
41. CROSSES
42. IN THE
43. SPACE AT THE
44. END OF
45. THIS EXERCISE
46. IF TUESDAY
47. IS
48. THE DAY
49. FOLLOWING MONDAY
50. XX
THE SCORING KEY

LINE:
51. IF
52. THANKSGIVING
53. COMES ON
54. THE FIRST
55. DAY OF
56. JANUARY
57. MAKE TWO
58. CROSSES HERE
59. BUT IF IT
60. COMES IN
61. ANOTHER MONTH
62. INDICATE BY
63. DRAWING ONE
64. CIRCLE IN
65. THE SPACE
66. FOLLOWING THIS
67. LINE
68. (O)

---

69. FROM YOUR
70. STUDIES IN
71. GRAVITATIONAL
72. FORCES
73. WOULD YOU
74.
75. EXPECT TO SEE
76. WATER RUN
77. UPHILL IN
78. ANY PART OF
79. THE WORLD (No)
1. This is a test of rate and comprehension in reading. Its object is to determine how rapidly you read and comprehend materials such as you encounter in your college work.

2. When the signal 'begin' is given, you are to open this paper and read to yourself the passage printed on the following pages.

3. Read as fast as you can and understand, but don't skip or skim. On the other hand, don't stop to study or memorize; this is not a memory test.

4. Inserted in the material to be read are numerous questions or directions. Answer these questions or carry out these directions as you come to them. Do as much as you can in the ten minutes allowed.

5. Pay no attention to the figures in the left margin.

EXCLUSION OR QUOTA FOR JAPANESE?

(Read this straight through to the end, and do what it says to do at various places.)

I. Two objections are urged by Secretary Hughes against the clause in the proposed immigration law that would bar out "aliens who are ineligible to citizenship." In plain English, contends Mr. Hughes, this is aimed at the Japanese, and would violate our Treaty with Japan in the first place, and, furthermore, would exasperate the Japanese Government, and end their present friendly efforts to keep their people from coming here, resulting in a seepage of Japanese across our borders that can be more easily imagined than described. Underline the name of the people Secretary Hughes contends are referred to as "aliens who are ineligible to citizenship" in the proposed immigration law. Instead, Mr. Hughes suggests what he believes will be a better method of regulating the number of little brown men coming into this country by placing Japanese on the same quota basis as other nations, namely, 2 percent of the number of their national already here according to the census of 1890, plus 200, which is the minimum quota for any nation. This, Mr. Hughes points out, would allow the Japanese a quota of 246 a year—"an insignificant number," in
the opinion of the Mobile Register. And Mr. Hughes be-
lieves that arrangement would be much more effective than
the exclusion clause. Indicate in the margin by a numer-
al the percentage basis Secretary Hughes proposes for re-
gulating the number of Japanese coming into this country.

II When you come to the name of the Chairman of the
House Immigration Committee underline it. "Regarding the
subject of immigration," remarks the Philadelphia Public
Ledger, "there is room for argument. Regarding the man-
er in which the Johnson immigration bill seeks to ex-
clude Japanese, there is none." Representative Johnson,
Chairman of the House Immigration Committee, we are re-
minded by a Syracuse Post-Standard," comes from Washin-
ton. He has the antipathy of the Pacific Coast states to
Japanese. But he is writing a bill for all the states,
not the Pacific Coast alone! "Our hearts go out to Jap-
an--and so do our salesmen," sagely observes the Ledger's
evening namesake. Does the Syracuse paper mean that John-
son comes from (1) the State of Washington or from (2)
Washington, D.C.? Write the answer here ( ) The notes to
Representative Johnson, in which Secretary Hughes set
forth the administration's attitude toward the Japanese
immigrant, closely followed an Associated Press interview
with the Japanese Foreign Minister said, in part: "Natur-
ally, Japanese are disturbed over the increasing restric-
tions upon Japanese residents by the United States, and
the proposals now before Congress for exclusion of Japan-
ese. Sentiment apart, we fully realize that an accord and
understanding with the United States would be of incal-
culable value to Japan." If the Japanese are sanguine re-
garding the attitude of Congress toward them, at the end
of this paragraph write the 'sanguine', if they are dis-
turbed concerning it, write the word 'disturbed'.

III Earlier in this article you were told how many Japan-
ese would enter the United States in a year if the quota
basis were made the same for them as for other nations,
namely, two percent of the number of their nationals al-
ready here according to the census of 1890 plus the 200
which is the minimum quota for any nation. Write the to-
tal annual quota in the margin here.

IV Less than a week later Secretary Hughes replied to
Mr Johnson's request for any representations the State
Department might care to submit regarding the proposed
bill. When you have read this reply, if you think Secre-
tary Hughes approves of the clause in the bill which re-
fers to the Japanese, write 'yes' just at the end of his
communication; if you think he does not, write 'no'.
While you are reading the reply, underline the adjectives
by which Secretary Hughes describes the Japanese people.

V "In my opinion the restrictions of the proposed mea-
sure, in view of their application under the definition of
'immigrants' are in conflict with treaty provisions. The
practical effect of Section 12 (b) is to single out Japan-
ese immigrants for exclusion. The Japanese are a sensitive people and unquestionably would regard such a legislative enactment as fixing a stigma upon them.

VI "Permit me to suggest that the legislation would seem to be quite unnecessary, even for the purpose for which it is devised.

VII "I regret to be compelled to say that I believe such legislative action would largely undo the work of the Washington Conference on Limitation of Armament, which so greatly improved our relations with Japan. The Japanese Government has already brought the matter to the attention of the Department of State, and there is the deepest interest in the attitude of Congress with respect to this subject. It is to be noted that if the provision of sub-division (b) of Section 12 were eliminated and the quota provided in Section 10 of the proposed measure were to be applied to Japan, there would be a total of only 246 Japanese immigrants entitled to enter under the quota as thus determined." This is the end of Mr. Hughes' reply: remember you have a question to answer here.

VIII What work did Mr. Hughes think would be set at naught by the proposed action? Underline the phrase in his reply that answers this question. It is surprising in light of the strict laws of California regarding the Japanese who are now living in that state to find such sentiments concerning this question as are set forth by the Los Angeles Express: "Secretary Hughes is wholly right in his protest against exclusion." This is a human question, rather than a legal one," declares the Japanese-American News, of San Francisco. "Certainly," notes the Sacramento Union, "Mr. Hughes has given the country something to think about,"

Some of the widely read newspapers of the midwest and the east agree that the Hughes suggestion that Japan be placed on the same quota basis with other nations should receive "serious and unprejudiced consideration," to quote a Chicago paper. "For," points out the New York Journal of Commerce, "Mr. Hughes proposed solution of the Japanese immigration problem promises to make disarmament and peaceful co-operation in the Pacific a reality." If Secretary Hughes' proposed solution of Japanese immigration problem should be adopted, would disarmament and peaceful co-operation become--hopeless, assured, dubious, unaffected, or unnecessary? Underline the one of these five adjectives that is the correct answer.

IX From that part of the Pacific near the Golden Gate and as far North as the Columbia, however, there comes protest after protest. "America should be for Americans," is the burden of the San Francisco Bulletin's objections to the Hughes' proposal, while the Sacramento Bee maintains that "if this treaty is such a document as Hughes makes it out to be, then the sooner it is abrogated, the better it will be for the self-respect and integrity of the United States." The California American Legion, the State Fed-
eration of Labor, the Native Sons of the Golden West, and the State Grange agree in a public protest that "the Japanese Foreign Minister's appeal is an extraordinary attempt on the part of a foreign nation to influence the electorate of this country on a purely domestic question--immigration." Indicate by a numeral in the margin how many California organizations protest against the influence of any foreign nation upon the electorate of this country. Place a check mark before the one or ones of the following five statements that properly describe the feeling of the Pacific Coast relative to Secretary Hughes' opinion: ( ) The feelings of the Japanese should be considered. ( ) The opinion of a foreign country should influence our electorate. ( ) The self-respect and integrity of the United States must be maintained regardless of all else. ( ) America should be a country for Americans, or those capable of becoming Americans. ( ) The Japanese should be given admission on the two per cent basis. "May Congress have as much backbone as Chairman Johnson when it takes up the immigration bill." is the prayer of the Sacramento Bee. Said Mr. Johnson recently, in commenting upon Japanese immigration: "This is an internal, domestic problem. It is a vital problem. It concerns the future of our country. It must not be controlled by foreign-language newspapers and other alien influences." Does Mr Johnson consider this a national or an international problem? Write your answer here.

X Congressman Raker, of California, apparently fears a Japanese invasion for he declared on the same day that--Mr. Hughes' first step to put the Japanese under the quota arrangement would mean the abandonment of our policy that they could not be admitted to the United States under such circumstances. "The next step would be the negotiations of a treaty abrogating the land laws of our Western States relative to land ownership by aliens. The third and final step in the proposed complete surrender of the West to the Japanese would be to naturalize them into full citizenship. If they were put under the quota law, there would be no argument against the other steps." If congressman Raker agrees with Secretary Hughes write 'yes' on the margin here; if he does not, write 'no'.

XI Apparently, there is also some anti-Japanese sentiment in the East and the Central West, for we find the New York Tribune pointing out that "in barring all Japanese the framers of the new immigration bill have unquestionably responded to the powerful national sentiment against racial mixture." Moreover, asserts the Louisville Times, "to say that a bill must be changed lest it ruffle the feelings of Japan is to timidly suggest that Americans let Japan dictate American legislation.

XII Underline for whom the Cincinnati Enquirer would have us remember the immigration laws should be made when
it says: "What ever reasons there may be for foreign interests to charge discrimination, it must be kept clearly in mind that immigration laws are made to protect the interests of the United States, and that entrance of foreigners into this country is a privilege to be granted, not a right to be demanded." Not many lines before this one there was a 'split infinitive'. Underline it.

XIII "It is no more disrespectful to the Japanese than to the Chinese to exclude them by name," says the San Francisco Chronicle. This opinion is upheld substantially by the position taken by the Supreme Court for the United States in the instance of the Japanese of Hawaii who applied for citizenship to the United States District Court for the Territory. This case was appealed to the Supreme Court and denied under the law; the naturalization of aliens is limited to free white persons and Africans. The court held that the words "white persons" are synonymous with the words, a person of the Caucasian race. Neither the opinion of the Court nor the law which it interprets implies any idea of racial inferiority or superiority. Was the District Court of Hawaii upheld in its opinion by the Supreme Court of the United States? Write the answer on the margin. It is obvious, that the application of this law to the Japanese are proud of being Japanese, why should their pride be hurt by our assertion that they cannot become Americans?" asks the Portland Oregonian, which goes on to say that the entire basis of the Japanese protest is the assumption that Japanese are singled out exclusively. That assumption is false. The rule is general, applying to a number of nations, comprising one-half the human race, of which the Japanese are but a fraction. One other race excluded on a similar basis has already been named in the article. Write the name on the margin here. Immigration is strictly a domestic question, and Japan so regards it, for it has imposed restrictions on immigration and ownership of land by foreigners without considering the wishes of other nations. Does Japan expect the United States to follow a different policy for Japan than she follows for her own immigration restrictions? Write your answer at the end of the reading.