# Test-Retest Reliability Study of the Frostig Developmental Test of Visual Perception

by

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B. A., Gonzaga University, 1958

A Thesis submitted in Partial Fulfilment of the
Requirements for the Degree of
Master of Arts
in the Department of
Psychology

We accept this thesis as conforming to the
required standard

The University of British Columbia
Aug. 1963

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# TEST - RETEST RELIABILITY STUDY OF THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION

## Abstract

The present study was designed to investigate the reliability of the Frostig Developmental Test of Visual Perception with retarded subjects. The Frostig test is divided into five subtests involving visuo-perceptual tasks and measurements. This study computed reliability coefficients on all the subtests as well as on the total scores. The Peabody Picture Vocabulary Test and the Frostig Developmental test of Visual Perception were also correlated in an attempt to assess an aspect of Frostig validity.

The sixty retarded subjects used in this study were divided into groups on the basis of both chronological and mental age, and the test-retest method of reliability assessment was used.

The results of this study indicate that the total test scores of the Frostig Developmental Test of Visual Perception are reliable when dealing with the perceptual performance of retarded subjects. The stability of the subtest shows greater variation than does that of the total scores. The subtests of Eye-Motor Coordination and Form Constancy yielded the most variable results and it is evident that with the population studied, these subtests cannot be considered stable enough to be individually, diagnostically, useful. The Peabody Picture Vocabulary correlation with the Frostig Developmental Test of Visual Perception of .537 was significant at the .01 level.

ACKNOWLEDGMENT

The writer gratefully wishes to express her appreciation to Dr. Edro Signori for his direction and guidance in the completion of this thesis. Also the writer wishes to thank Dr. Charlotte David for her invaluable assistance. Appreciation is also extended to Dr. Lionel Kerwood, Medical Superintendant of The Woodlands School for making available for this study, facilities and services of the School.

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# CHAPTER I

## INTRODUCTION AND STATEMENT OF THE PROBLEM

This study attempts to remedy some of the deficiencies of the reliability data available on the Frostig Developmental Test of Visual Perception. In this case a retarded population is studied.

There has been insufficient reliability research done to establish the test as a consistent psychometric measure. This study adds to the research data and increases the scope of the test by adding the dimension of a retarded sample. The upper and lower ends of the theorized perceptual continuum have been omitted in the previous studies. The present study controls for sex, age and M. A. in the population sampled and gives more complete data on the subjects and the Subtest reliabilities than has been reported previously. The omission of such information has been pointed out as a serious defect in earlier literature (Technical Recommendations, 1954).

Further reliability study is needed because of the newness of the test and it is particularly necessary because of the instruments apparent utility with retarded subjects. Because the test is developmental and it is assumed to be sensitive to changes brought about by increasing age, control for age must be incorporated into reliability studies. This can be done by using the scaled scores available in the test norms or by controlling for the age factor. Previous studies used scaled scores. The use of scaled scores is questionable because the norms were derived from a much younger population than that

used in the present research. Raw scales are therefore used and the age factor is controlled. Control for M. A. is also employed as there may be an overlap of I. Q. and perceptual factors which could "contaminate" the results.

One of the difficulties of dealing with unspecified samples is the fact that information about factors other than perception may be lost. For example, we have no information on the Frostig test concerning a possible relationship between performance on this test and intelligence. Although there was not a significant correlation between the Frostig and the Goodenough it is possible that the Frostig taps some other aspects of intelligence than those measured by the Goodenough. Studies by Bensberg (1952), Feldman (1953), and Baroff (1957) with the Bender Gestalt suggest that performance on the Bender Gestalt is closely related to M. A. levels. Although the present study is essentially a reliability investigation, an apsect of validity will also be investigated by seeking out the correlation between the Peabody Picture Vocabulary test and the Frostig Developmental Test of Visual Perception.

# CHAPTER II

## BACKGROUND OF PROBLEM AND RELEVANT RESEARCH

In March of 1961 a new test of visual perception was published. The Frostig Developmental Test of Visual Perception, which will be described in a later chapter, represents the first standardized effort to measure, psychometrically, certain operationally defined aspects of visual perception in children. The rationale for the test closely parallels the theory utilized in the construction of intelligence tests. Tasks that were operationally defined as perceptual were administered to large groups of kindergarten and school children and norms for the test were thus established for comparison and interpretation of deviations in perception in similar populations.

The Frostig Developmental Test of Visual Perception is only part of an ambitious program which is being undertaken by the Marianne Frostig School of Educational Therapy in Los Angeles. The program as a whole is aimed at fostering and devising special training techniques for the abnormal learner. Many of the problems of the aberrant learner, it is theorized, stem from underlying perceptual defects, particularly in the visual sphere. The Frostig Developmental Test of Visual Perception attempts to measure some of these defects and to contribute to the diagnostic data used in the selection of remedial training programs. Both the Frostig Developmental Test of Visual Perception and the training materials, which are now available for clinical use, afford promise in the field of special education, but further research with the test and

in a wider sphere. For example, because of its learning problems, the retarded population is one for which the test would seem particularly useful.

In past years, psychological research in retardation has been concerned with the diagnosis and description of etiological groups such as the brain injured (Sarason, 1958). Perception has been one of the focal areas. However, these studies have not resulted in teaching or training programs for the retarded, and in addition they have been criticized on methodological grounds (Meyer, 1957; Wortis, 1956). The extensive studies of Strauss and Lehtinen (1947) and Strauss and Kephart (1955), by way of contrast, have shaped the development of training programs. But their efforts have also been questioned because of methodological imperfections (Clarke and Clarke, 1958). Even more to the point is a commentary made by Sarason (1958) who suggests that Strauss et. al. are to be commended for their unique formulations but that there is no indication that their specialized teaching techniques would not also be beneficial to any child suffering from severe learning problems. A significant, tightly controlled study by Gallagher (1957) indicated that the differences between endogenous and exogenous retardates were not nearly as marked as one would expect: both groups manifested some perceptual difficulties, and the similarities of the two groups on various psychometric measures far outweighed the differences. Wortis (1956) sums up the theoretical

position of many today, "There is in short, I believe, no brain injured child, but only a variety of brain injured children..." In practical terms this trend has the effect of causing clinicians to look more critically at the qualitative aspects of the behaviour of the individual child. A normative test of visual perception, such as the Frostig Developmental Test of Visual Perception, is designed to help describe this aspect of a child's development.

Studies in perception have comprised a core in psychological literature for decades. Interest and investigation in this area have vacillated from vague philosophical formulation to highly specific laboratory studies of body organs involved in perception. Increasingly, partly as an outgrowth of the laboratory studies, and partly as a separate movement, psychologists and others working in the field have developed clinical testing techniques which attempt to integrate developmental, personality and intellectual factors in perception.

Most prominent among the clinical perceptual tests are the Rorschach, the Bender Gestalt, the Goldstein Sheerer Sorting test and the Kohs blocks (used separately and as incorporated in the Weschler tests.) Archimedes Spiral, Flicker Fusion, and Witkin's Rod and Frame test are others. None is strictly standardized and each derives from a highly specified orientation in perception. The Goldstein series (1941) seeks to differentiate between abstract and concrete behaviour. He hypothesized that the brain damaged individual exhibits abnormal responses when

stimulated as a result of underlying perceptual defect. Subsequent studies by Halstead (1940), Pollack and Bender (1953) and Werner and Strauss (1940-1941) have to some extent supported Goldstein's claim, but Meyer (1957) in a summation of the psychological effects of brain damage, indicates that none of these findings can be considered conclusive because of inherent defects in methodology and control.

The Bender Gestalt test is likely the most well known and widely used paper and pencil test of perception. Originally, this test was constructed to identify the visual perceptual defects of the brain-injured child. It was thought that the test figures exemplified principles of "gestalt" such as proximity, continuity, and closure and that defects in these areas would be manifest in test responses. The focus of the test has changed since studies by Billingsea (1948), Hutt (1945) Gobetz (1953) and many others have shown that such factors as motivation and experience alter the gestalt productions of subjects. Today, particularly with the recent scoring system of Pascal and Suttell (1951), interest in the Bender Gestalt is focused on its effectiveness as a projective test of personality.

In both the 1937 and 1960 standardizations of the Binet perceptual tasks are included at different developmental stages. Thus a normal 3 year old child is expected to draw a circle; a 7 year old, to copy a diamond. At best, the inability of the individual child to cope with these tasks can only give a clinician a rough estimate of the child's level of perceptual functioning.

When the Weschler series of intelligence tests were first published, much research was carried on in the direction of establishing its usefulness in diagnosing perceptual difficulties. In a summation of many of these studies, Yates (1954) indicates that such effort has not produced statistically significant results.

The salient points in this brief history are: 1. Most of the psychometric techniques which have dealt with perception have their origin in Gestalt psychology. This particular approach to perception takes a narrow view in assuming that perception is innate. 2. The area of concern has been almost completely restricted to the study of the abnormal individual as a starting point. Thus accurate, developmental comparisons with the normal cannot be drawn.

In direct contrast, the underlying hypotheses of the Frostig Developmental Test of Visual Perception provides a much broader approach to visual perception. They state that perception is normally distributed, that it is developmental, that it can be affected by learning and, lastly, that certain aspects of it can be measured. Publication of the Frostig test is apposite for, if the test demonstrates strength as a psychological instrument, our knowledge of both normal and abnormal perceptual functioning will be enhanced.

Although the theoretical ramifications of the Frostig test are inviting in terms of formulating research hypotheses, the area of most immediate and practical concern is the psychometric aspects of the test itself. So far, because of the recency of

its publication, the only validity and reliability data available on the Frostig are the original standardization figures. Generally, the validity data offered in the Frostig test manual suggest that one could advance with some confidence in using the test clinically but the reliability data are not nearly as comprehensive.

Restated, the specific problem for investigation in this study is this: a new test of visual perception has been published which, seen in the context of other similar measures, offers considerable promise in the field of special education. However, reliability data for the test are insufficient, and for the retarded population, non existent. It will be the purpose of this study, therefore, to investigate the reliability of the Frostig Developmental Test of Visual Perception using a sample from the population for whom this test would seem very useful, namely, the retarded.

Since the Frostig Developmental Test of Visual Perception is a very new technique, certain problems other than those just specified must also be recognized. With well-established clinical techniques like the Weschler or the Stanford Binet, research is immediately justified on the basis of the extensive practical use to which the instrument is put and description of the test itself can be minimal. Since the Frostig test cannot claim such familiar acceptance, this reliability study must follow a somewhat different format. In the previous section an attempt has been made to indicate the need for such a test of perception and

a short critique of several salient psychometric tests of perception has been given. In the following chapters, normative data will be presented on the Frostig Development Test of Visual Perception in order to establish the meaningfulness of this reliability study. This method follows in the tradition of the Buros Mental Measurements Yearbooks when new psychological instruments are introduced and reviewed.

Description of Test and Standardization.

Work on the Frostig Developmental Test of Visual Perception was initiated early in 1958. The test is essentially a paper and pencil one and can be administered individually or to groups. It is divided into five subtests: Eye-Motor Coordination, Figure Ground, Form Constancy, Position in Space, and Spatial Relations. Age norms for the test extend from 3 to 9 (plus) years. Administration and scoring are objective and raw scores, scaled scores, or derived perceptual quotients can be used statistically. From the technical aspects of ease of administration, objective scoring, interest to the subject and other general face validity criteria the Frostig Developmental Test of Visual Perception easily meets the objectives of a good psychological test.

In selecting the aspects of visual perception the author submits that these are not the only dimensions of visual perception but, "are important parts of the process... and seem to have particular relevance to school performance." (p. 3, manual).

Each subtest requires performance of some behaviour which

operationally defines an aspect of visual perception. In subtest 1, Eye-Motor Coordination is defined as an ability to draw straight or curved lines between increasingly narrow boundaries. Figure Ground, Subtest II, requires the ability to distinguish intersecting figures such as triangles, squares and intersecting stars and to isolate specified figures from a confusing and distracting background. Subtest III, Form Constancy, consists of two pages of different figures such as circles, squares, and rectangles with an accompaniment of distracting lines, "squiggles", etc. Here, the object is to pick out the circles and squares by drawing around them with different coloured crayons. Position in Space, Subtest IV, is defined as the ability to differentiate pictorial similarities and differences in rows of simple line drawings. This subtest is similar in structure to items found in most reading readiness tests. The last Subtest, Spatial Relations, requires the subject to link up series of dots by copying from increasingly complex patterns.

As the author indicates (p. 3, manual), three of the subtests (II, III, IV) are strictly perceptual as they involve simple recognition of stimuli. The inclusion of Eye-Motor Coordination, not wholly a perceptual test, was justified on the basis of experimentation by Hebb (1949) who found that sensory motor behaviour is an essential pre-requisite and complement of veridical perception. Spatial Relations, Subtest V also involves some motor coordination but, unlike Subtest I

the subject is not penalized for poor motor performance.

In establishing the validity of the Frostig Developmental Test of Visual Perception, the authors utilized several methods of construct validity (p. 32, manual). Internal correlations were run between the different subtests and for different groupings. Control was maintained for sex, age, and mental age level. A positive but low correlation was recorded between subtests and somewhat higher correlations occured with older age groups. As the Frostig is a developmental test the latter trend would be expected. On the face of it these results look promising. One would not expect a test designed to measure specific abilities to have a high intercorrelation but as perceptual abilities are presumed to be parts of a continuum, some relationship is to be expected. A factor analytic study by Corah and Powell (1963) lends weight to the position taken by the authors of the Frostig test as they report subtest intercorrelations ranging from .18 to .57 with a group of kindergarten children.

Further validity evidence was offered by correlation of teacher ratings of classroom adjustment and scores on the Frostig test (p. 33, manual). All values derived were significant beyond the .001 level. Correlations between Frostig scores and Goodenough, Draw a Man test, drawn from large samples of Kindergarten, First Graders, and Second Graders indicated that in each grouping (with significance levels ranging from .01 to the .001) the Frostig test was measuring something distinct from the Goodenough (p. 37, manual).

Results of several treatment studies are also presented in the Frostig manual. One investigation with a group of "preschoolers" between the ages of $4\frac{1}{2}$ - $6\frac{1}{2}$ hypothesized that pupils with perceptual quotients below 90 would not attempt reading because of their perceptual difficulties. The hypotheses were borne out in all cases. Unfortunately the finding lacks power because the sample size in this study was small (p. 38, Manual).

Generally, the validity data offered in the Frostig manual suggests that one could advance with some confidence in using this test clinically. A major weakness, as pointed out by Frostig, lies in the narrowness of the standardization population. Certain biases, which are clearly stated, exist in the socio-economic stratification of subjects. Also a geographic prejudice occurs, as all subjects were drawn from the Southern California area.

The reliability data offered by the Frostig Developmental Test of Visual Perception are not nearly as comprehensive. Only two reliability studies were conducted by the author. The earlier study, published in the Journal of Perceptual and Motor Skills (1961), was part of a larger study investigating the general utility of the Frostig test with both normal and neurologically handicapped children. Test-retest coefficients for the test as a whole were reported as .98 and for the subtests .80. The reliability coefficients of the subtests were composite of all subtest correlations. However, this study was conducted with one of the first editions of the Frostig Developmental Test

of Visual Perception and cannot therefore be accurately utilized for the 1961 version.

The only reliability study specifically applicable to the present test is published in the manual (p. 32), and was conducted with two groups of first and second grade children. Test-retest coefficients ranged from .418 to .802 for the subtests but scores for individual subtests were not reported. The test-retest coefficients for the total sample were reported as .80.

With the above observations in mind the following hypotheses were generated:

Hypotheses

1. The Frostig Developmental Test of Visual Perception will yield a sufficiently high reliability coefficient with retarded subjects to be considered diagnostically dependable.
2. Each of the 5 subtests of the Frostig Developmental Test of Visual Perception will yield a sufficiently high reliability coefficient with retarded subjects to be diagnostically dependable.
3. The Frostig Developmental Test of Visual Perception will demonstrate a sufficiently high reliability coefficient to be dependable with retarded subjects of varying chronological ages (11-19).
4. Each of the subtests of the Frostig Developmental Test of Visual Perception will demonstrate a sufficiently high reliability coefficient to be dependable with retarded subjects of varying chronological ages (11-19).

5. The Frostig Developmental Test of Visual Perception will demonstrate a sufficient reliability coefficient to be dependable with retarded subjects of varying mental ages.
6. Each of the Frostig Developmental Test of Visual Perception subtests will demonstrate a sufficiently high reliability coefficient to be dependable with retarded subjects of varying mental ages.
7. The Frostig Developmental Test of Visual Perception will not correlate significantly with the Peabody Picture Vocabulary test.

# CHAPTER III

## METHOD

### Subjects

The 60 subjects for this study were selected from the retarded population of The Woodlands School at New Westminster, B. C., and ranged in age from 11 years through 19 years. Although previous work with the Frostig Developmental Test of Visual Perception gave no indication of sex differences on the test, careful control for sex was maintained by having an equal number of boys and girls in the total group and in the sub groupings. In order to facilitate reliability comparisons on the basis of mental age and chronological age the 60 subjects were divided into three chronological age groups, 11-13, 14-16, and 17-19. Sub grouping was also established on the basis of intellectual level and the 60 pupils were divided into two groups of "high" and "low" intellectual levels.

The subjects were placed into a "high" intellectual level or a "low" intellectual level on the basis of scores achieved on the Peabody Picture Vocabulary test. A cutoff point of I. Q. 55 was used as the upper limit of the "low" intelligence group and an I. Q. of 56 and up group defined the "high" intelligence group. The particular I. Q. points were chosen for two reasons. 1. I. Q.s' below 55 cannot be computed on the basis of the Peabody Picture Vocabulary Test norms, thus all subjects who did not attain this level were automatically placed in the "low" category. 2. The two groupings of "low" and "high" would be commensurate with recent classification system (1961) of the

American Association on Mental Deficiency. These groupings would also facilitate repeat studies.

The Peabody Picture Vocabulary test (PPVT) is essentially a performance test of intelligence. It consists of 150 plates each containing four pictures, three of which are decoys. The test is particularly useful with retardates as a minimum of verbalization is required and the correct response can be pointed out. The test was chosen because it affords a valid and reliable measure on a single variable, vocabulary, which is known to correlate well with general intelligence. The sub groupings are more homogenous and there is no confounding of I. Q. scores by interest scatter as would occur on more conventional intelligence tests such as the Binet or WISC.

In selecting subjects, those individuals who were known to demonstrate considerable fluctuation in day to day behaviour were eliminated as this would most certainly have added an unnecessary bias to a test-retest situation. Because of this consideration severe epileptics and psychotics were not included.

Apparatus

All subjects were administered the test-retest series in the same physical surroundings from one situation to the other. Because of staff shortages and institutional routines approximately half of the subjects had to be tested on the wards instead of in one consistent room. Within practical limits the physical situation was kept uniform. Subjects that were not tested in the psychology office were tested in ward dining rooms. Ward

staff were most cooperative in keeping noise or interruptions to a minimum. Although rooms were not perfect from the viewpoint of presenting a conventional "testing atmosphere", physical conditions of lighting, ventilation, and space were satisfactory.

Procedure

The test-retest method of reliability investigation was used in this study. This method seemed particularly suited to the Frostig Developmental Test of Visual Perception on both theoretical and practical grounds, (Anastasi 1957; Chronbach 1960). The Frostig test involves essentially motor and sensory discriminative tasks in the visual sphere and, as such, performance on the test should not be appreciably affected by repetition; at least over short periods of time.

Practically, an alternate form of the Frostig Developmental Test of Visual Perception does not exist and at the present time insufficient information is available on specific test items or difficulty levels to make a split-half reliability study feasible.

A period of five days elapsed between test and retest. This allotment of time was chosen more for practical reasons than from a theoretical preference. Within a ten day span it was possible to plot the movements of 60 pupils and also to insure that they would remain on the premises. Scheduling on a longer interval would have incurred administrative problems such as children going home on week-ends, holidays, etc. Twelve children, in groups of three, were tested a day, and all subjects had a span of exactly five days between test and retest. With the

exception of one group, all subjects were administered the retest at the same time and place as the first administration.

Strict adherence to the administration instructions as outlined in the test manual was maintained in both test and retest situations. In addition, at the second session the following introduction was made:

"Now, you have all seen these booklets. We worked on some like this a few days ago. That doesn't mean that you didn't do a good job before. This is something special that we are going to do twice. Now I don't want you to bother to try and remember what you did the last time. Just pretend that this is something brand new and do the best you can. Listen carefully, I'll tell you exactly what to do."

Computational procedure

The test-retest reliability formula as outlined by Edwards (1954) was utilized in deriving all of the reliability coefficients. Separate coefficients were calculated for the total group and for each sub grouping of chronological age and mental age. As different N's were involved for different subgroupings, the Fisher z transformation was calculated between the two most disparate correlations as a check on significance between correlations.

In computing the correlation coefficient between the Peabody Picture Vocabulary test and the Frostig Developmental Test of Visual Perception, the Pearson Product Moment formula was used.

# CHAPTER IV

## RESULTS

Generally, the results of this reliability study indicates that the Frostig Developmental Test of Visual Perception and its subtest have varying degrees of test-retest stability. Reliability Coefficients ranged from .570 to .974.

In considering the results further, the different aspects of stability under scrutiny will be taken separately to facilitate clarity. In addition, tables 1 - 6 give in summary form all of the coefficients derived in this study.

Test-retest reliability with total population - Hyptheses 1 and 2:

Hypothesis 1 can be accepted. The Frostig Developmental Test of Visual Perception shows a high degree of stability when total scores are utilized with retarded subjects. Hypothesis 2, which deals with the reliability of the subtests, shows considerable variation in subtest stability. Three of the five subtests show good stability, Figure Ground (1), Position in Space (IV), and Spatial Relations (V). Individual coefficients ranged from .88 to .95. Least dependable is the subtest of Eye-Motor Coordination (1) with a coefficient of .68. Form Constancy (III) falls within the region of practicability with a coefficient of .77.

In summary, overall, the Frostig Developmental Test of Visual Perception shows good reliability with retardates of varying mental and chronological ages. The subtests are not as stable: their coefficients range from .68 to .95.

Test-retest reliability as a function of chronological age - Hypotheses 3 and 4:

Hypothesis 3, concerned with the reliability of total scores, can be accepted. As indicated on Table 1, the Frostig Developmental Test of Visual Perception is dependable with retardates ranging in age from 11 years through 19. With the age grouping of 17 - 19 a slightly lower coefficient, .866, is recorded than with the younger ages which both had coefficients in the .90 level. Hypothesis 4, dealing with the reliability of the subtest, can again only be accepted in special cases. Somewhat more variation occurs in the subtest reliability but, generally, the trend in the direction of high overall reliability and subtest variation, noted in the total population, is evident. Eye-Motor Coordination (1) shows again as the least stable of the subtests although, with the age group 11-13, a fairly high coefficient of .792 was obtained. Similarily, Figure Ground (11) shows good stability (.896) with the youngest age group but a falling off of dependability occurs with advancing chronological age. An unusual coefficient was derived in the Subtest Form Constancy (111) with the age group 14-16. This coefficient, .553, was the lowest recorded in the whole study.

In summary, the Frostig Developmental Test of Visual Perception, when total test scores are utilized, shows a high degree of dependability with subjects within the age range 11-19. Subtest stability is not as dependable as the overall reliability coefficient and some differences in performance do seem to occur as a function of chronological age. The trend evident in the

overall category of poor reliability on Eye-Motor Coordination is again apparent for all ages.

Test-retest reliability as a function of Mental Age - Hypotheses 5 and 6:

Hypothesis 5 can be accepted. High reliabilities were recorded for the "high" and the "low" intellectual level groupings, when the Frostig Developmental Test of Visual Perception is taken as a whole. Coefficients ranged from .918 to .954. However, hypothesis 6, dealing with the subtests, is only partially accepted. Figure Ground (11), Position in Space (1V), and Spatial Relations (V) showed acceptable coefficients within the range of .80 to .97. Eye-Motor Coordination (1) with this grouping showed a slightly different pattern from the previous ones. This subtest was reliable with the "low" intellectual group with a coefficient of .811 but unstable with the "high" group in which a coefficient of .57 was recorded.

In summary, The Frostig Developmental Test of Visual Perception shows adequate test-retest reliability with selected groups of "low" and "high" intellectual levels. Subtests show variation of stability and are in accord with previous patterns. Eye-Motion Coordination, however, seems to be more dependable with the lower intellectual levels.

Validity - Hypothesis 7

Hypothesis 7, which deals with the correlation of the Peabody Picture Vocabulary test and the Frostig Test, was not supported. The correlation of .537 proved to be significant at less than the .01 level.

Table 1

Test-Retest Means and Reliability Coefficients of the Frostig Developmental Test of Visual Perception With Retardates

| | Test mean | S.D. | Re-test mean | S.D. | Reliability Coefficient |
|---|---|---|---|---|---|
| Total Group: | 35.15 | 16.19 | 36.25 | 17.64 | .902 |
| Sub-Groupings | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 31.65 | 13.35 | 33.15 | 13.66 | .974 |
| 14 - 16 ..... | 31.10 | 11.58 | 32.60 | 12.26 | .919 |
| 17 - 19 ..... | 42.70 | 10.86 | 42.95 | 11.58 | .866 |
| Mental age: | | | | | |
| High ..... | 40.00 | 11.14 | 40.50 | 10.75 | .918 |
| Low ..... | 30.30 | 13.12 | 32.00 | 13.89 | .954 |

Table 2

Test - Retest Means and Reliability Coefficients

of Subtest 1 - Eye-Motor Coordination

| | Test mean | S.D. | Re-test mean | S.D. | Reliability Coefficients |
|---|---|---|---|---|---|
| Total Group: | 14.50 | 4.83 | 14.10 | 4.56 | .680 |
| Sub-Groupings | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 13.05 | 4.74 | 12.45 | 4.06 | .792 |
| 14 - 16 ..... | 14.05 | 4.20 | 13.55 | 3.67 | .675 |
| 17 - 19 ..... | 16.45 | 4.47 | 16.25 | 4.05 | .600 |
| Mental age: | | | | | |
| High ..... | 15.43 | 3.74 | 14.36 | 4.29 | .570 |
| Low ..... | 13.60 | 5.27 | 13.80 | 4.84 | .811 |

Table 3

Test - Retest Means and Reliability Coefficients

of Subtest 11 - Figure Ground

| | Test mean | S.D. | Re-test mean | S.D. | Reliability Coefficient |
|---|---|---|---|---|---|
| Total Group: | 6.65 | 2.97 | 7.27 | 2.86 | .880 |
| Sub-Groupings | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 6.00 | 3.84 | 6.85 | 3.81 | .896 |
| 14 - 16 ..... | 5.95 | 3.15 | 6.25 | 3.09 | .626 |
| 17 - 19 ..... | 8.00 | 1.77 | 8.70 | 1.74 | .754 |
| Mental age: | | | | | |
| High ..... | 7.57 | 2.42 | 8.30 | 2.12 | .810 |
| Low ..... | 5.90 | 3.16 | 6.23 | 3.20 | .810 |

Table 4

Test - Retest Means and Reliability Coefficients of Subtest 111 - Form Constancy

| | Test mean | S.D. | Re-test mean | S.D. | Reliability Coefficient |
|---|---|---|---|---|---|
| Total Group: | 4.52 | 4.10 | 4.95 | 3.95 | .770 |
| Sub-Grouping | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 4.10 | 3.70 | 4.80 | 4.08 | .850 |
| 14 - 16 ..... | 2.85 | 3.08 | 4.30 | 3.91 | .553 |
| 17 - 19 ..... | 6.60 | 4.67 | 5.75 | 3.78 | .810 |
| Mental age: | | | | | |
| High ..... | 5.77 | 4.57 | 6.23 | 4.31 | .789 |
| Low ..... | 3.67 | 3.24 | 4.37 | 2.99 | .636 |

Table 5

Test - Retest Means and Reliability Coefficients

of Subtest IV - Position in Space

| | Test mean | S.D. | Re-Test mean | S.D. | Reliability Coefficient |
|---|---|---|---|---|---|
| Total Group: | 5.28 | 1.93 | 5.57 | 2.12 | .909 |
| Sub-Groupings | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 4.95 | 2.16 | 5.10 | 2.33 | .937 |
| 14 - 16 ..... | 4.75 | 2.29 | 4.95 | 2.03 | .797 |
| 17 - 19 ..... | 6.15 | 1.45 | 6.65 | 1.34 | .802 |
| Mental age: | | | | | |
| High ..... | 6.20 | 1.78 | 6.36 | 1.53 | .834 |
| Low ..... | 4.37 | 1.93 | 4.77 | 2.25 | .847 |

Table 6

Test - Retest Means and Reliability Coefficients

of Subtest V - Spatial Relations

| | Test mean | S.D. | Re-test mean | S.D. | Reliability Coefficient |
|---|---|---|---|---|---|
| Total Group: | 4.18 | 2.56 | 4.37 | 2.39 | .950 |
| Sub-Groupings | | | | | |
| Age: | | | | | |
| 11 - 13 ..... | 3.55 | 2.60 | 3.95 | 2.54 | .956 |
| 14 - 16 ..... | 3.50 | 2.91 | 3.55 | 2.50 | .950 |
| 17 - 19 ..... | 5.50 | 1.79 | 5.60 | 1.66 | .845 |
| Mental age: | | | | | |
| High ..... | 5.00 | 2.15 | 5.23 | 1.85 | .823 |
| Low ..... | 3.33 | 2.78 | 3.50 | 2.60 | .972 |

Table 7

z Transformation of Two Most Disparate Correlations of Subtests

| z' | z' | z | Level of significance |
|---|---|---|---|
| .648 | 1.127 | 1.78 | .075 non significant |

# CHAPTER V

## DISCUSSION

Since individual reliability coefficients have already been reported in the results and, since the utility of the coefficients are evident upon inspection, this discussion will be given over to examining some of the subtests on which relatively low correlations were derived. Although there is statistically no significant difference between the highest and the lowest reliability coefficient obtained from these data it is obvious that some of the coefficients failed to meet the .80 level which is regarded as clinically useful (Chronbach, 1960; Anastasi, 1957).

Throughout the study, some of the lowest coefficients obtained were on the subtest of Eye-Motor Coordination (1). It will be remembered that in this task the subject is required to draw lines between increasingly narrow and curved boundaries. When the results are scored, points are lost if the individual "bumps" the line or otherwise strays outside the given boundaries. It can be seen, therefore, that this subtest would be most susceptible to alterations in psychological and physical states. In fact, in some of the previously cited studies on the Bender Gestalt, this phenomenon is made use of in the rationale of authors devising scoring systems for this test (Pascal and Suttell, 1951). Although undetected anxieties of neurotic proportions may account for the instability of this particular subtest, it would seem more parsimonious to think in terms of some of the apparent fluctuations of behaviour which occured

during the administration of the Frostig test. It was noted, for example, that in the group testing situation subjects frequently had to be reminded to do their best on this particular subtest. The tendency of the subjects, more marked with the older ones, was to be taken in by the apparent ease of the subtest. That this subtest is affected in some way by increased chronological age and by mental age is supported to some extent by the individual reliability coefficients. The lowest chronological age group (11 - 13) overall did better on Eye-Motor Coordination than did the older age groupings. The "low" intellectual group performed more accurately on this subtest.

In summary, it would seem that the Subtest of Eye-Motor Coordination is not in itself a stable enough measure to be used diagnostically, and that it is most susceptible to alterations of motivation and mood in the subjects, particularly in retarded subjects.

The Subtest of Form Constancy (111) which also yielded low coefficients has some inherent scoring difficulties. The subjects are asked to trace only the squares and the circles and are given examples. It was observed that frequently the subject would follow the instructions and would correctly outline the prescribed figures only then to go on and trace the other (incorrect) figures. The resulting poor scores may not be as much a result of perceptual problems and distortions as a concomitant of impaired attention span and concentration level. The time factor may play an important role in this subtest. If the

subject is allowed only as much time as is necessary to outline the initial figures of his choice, then the scores might increase considerably. However, if these subjects are allowed unlimited time for the task they may contaminate the scores by tracing additional incorrect figures. This subtest, Form Constancy, requires further investigation before it can be safely assumed to actually measure perceptual abilities and disabilities.

Although the reliability coefficients were generally high in the present study, there are some testing factors to be considered. The physical conditions for examination were not always ideal nor were they always consistent from subject to subject. This setting afforded some distractions which, considering the instability and distractibility of retardates, might have affected the test performance in an unpredictable direction. This population has extreme difficulty with attention and concentration and it is possible that even higher coefficients would have been realized had the conditions been more conducive to stable test performance.

The Peabody Picture Vocabulary test has been used clinically with the retarded population because of the non-verbal nature of the tasks and because it provides lower-range norms. There are reported correlations with other tests of intelligence and these correlations are sufficiently high, that clinicians can assume that many of the same traits and capacities are being measured by the Peabody as by the standard verbal and performance I. Q. tests. The present study correlated the

Frostig with the Peabody and found that the .537 correlation was significant beyond the .01 level. It is apparent that these two instruments are measuring at least some of the same areas of performance, thus leaving the question of the ultimate superiority of one test over the other to further research.

The Frostig Developmental Test of Visual Perception does provide a variety of subtests which may offer the clinician and the experimenter more scope and a wider range of information. There are many components of visual perception involved in the Peabody test as well as in the Frostig and it is very difficult to "tease out" the perceptual organization from the intellectual organization of any individual subject. The earlier reported study which found a non-significant correlation between the Goodenough Draw a Man test and the Frostig Developmental Test of Visual Perception adds a new question when compared with the results of this study. Although these two instruments share the factor of motor expression, they apparently do not measure the same underlying areas. Further research in correlating the Frostig test with other tests of intellectual performance is needed in order to separate the more purely perceptual aspects of this test from its more global aspects as a measure of general intellectual functioning.

Generally, this study found sufficiently high reliabilities in the test and subtests to warrant ranking the test as a consistent measuring device. The theoretical and practical problems still to be explored are numerous. Precisely what the

test measures, and if it measures what it purports to assess, are areas requiring further investigation and research.

## Summary and Conclusions

This study investigated the reliability of the Frostig Developmental Test of Visual Perception, the reliability of the individual subtests and the correlation between the Frostig test and the Peabody Picture Vocabulary test. Sixty retarded subjects from an institution for retarded children were used. The test-retest method of assessing reliability was employed. Subgroupings of the subjects were established on the basis of both mental age and chronological age.

The results indicate that the Frostig Developmental Test of Visual Perception is a generally reliable instrument and that the subtests show varying degrees of test-retest reliability. Eye-Motor Coordination and Form Constancy are two of the subtests which show the least amount of stability with this population and this factor of unreliability is evident throughout the subgroupings of chronological and mental age.

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## Appendix 1

Test-Retest scores of Age Group 11 - 13 Including "High" and "Low" Mental Age Levels

| | Subjects | Sex | Mos. C.A. | Test M.A. | Test Subtests 1 | 2 | 3 | 4 | 5 | Test Scores Total | Retest Subtests 1 | 2 | 3 | 4 | 5 | Retest Scores Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "High" | 1 | F | 149 | 94 | 14 | 9 | 13 | 5 | 4 | 45 | 18 | 9 | 13 | 5 | 5 | 50 |
| | 2 | F | 147 | 85 | 18 | 10 | 11 | 8 | 8 | 55 | 17 | 10 | 14 | 8 | 7 | 56 |
| | 3 | F | 167 | 87 | 12 | 6 | 3 | 4 | 4 | 29 | 13 | 9 | 0 | 5 | 4 | 31 |
| | 4 | F | 164 | 92 | 17 | 3 | 0 | 5 | 4 | 29 | 11 | 8 | 5 | 6 | 4 | 34 |
| | 5 | F | 137 | 71 | 13 | 9 | 3 | 8 | 5 | 38 | 12 | 8 | 6 | 8 | 7 | 41 |
| | 6 | M | 159 | 80 | 17 | 9 | 9 | 7 | 6 | 48 | 14 | 10 | 6 | 7 | 6 | 43 |
| | 7 | M | 164 | 78 | 7 | 3 | 0 | 2 | 1 | 13 | 3 | 4 | 1 | 2 | 1 | 11 |
| | 8 | M | 158 | 107 | 10 | 8 | 9 | 8 | 6 | 41 | 13 | 9 | 10 | 8 | 7 | 47 |
| | 9 | M | 152 | 78 | 14 | 5 | 3 | 6 | 4 | 32 | 12 | 5 | 4 | 6 | 4 | 31 |
| | 10 | M | 135 | 71 | 11 | 7 | 3 | 6 | 1 | 28 | 12 | 9 | 3 | 6 | 3 | 33 |
| "Low" | 1 | F | 145 | 69 | 20 | 1 | 1 | 5 | 0 | 27 | 16 | 3 | 2 | 5 | 0 | 26 |
| | 2 | F | 146 | 38 | 9 | 2 | 4 | 2 | 0 | 17 | 9 | 2 | 4 | 2 | 1 | 18 |
| | 3 | F | 162 | 36 | 9 | 2 | 2 | 2 | 1 | 16 | 8 | 2 | 2 | 2 | 1 | 15 |
| | 4 | F | 141 | 36 | 7 | 2 | 2 | 1 | 0 | 12 | 9 | 2 | 1 | 1 | 1 | 14 |
| | 5 | F | 154 | 65 | 20 | 8 | 3 | 6 | 4 | 41 | 15 | 9 | 8 | 6 | 4 | 42 |
| | 6 | M | 140 | 62 | 2 | 0 | 0 | 2 | 0 | 4 | 6 | 1 | 0 | 1 | 0 | 8 |
| | 7 | M | 149 | 65 | 17 | 9 | 5 | 6 | 4 | 41 | 18 | 8 | 6 | 4 | 4 | 40 |
| | 8 | M | 153 | 62 | 17 | 10 | 2 | 5 | 7 | 41 | 17 | 9 | 0 | 6 | 7 | 39 |
| | 9 | M | 135 | 61 | 14 | 10 | 6 | 6 | 6 | 42 | 11 | 10 | 7 | 7 | 6 | 41 |
| | 10 | M | 165 | 67 | 13 | 7 | 3 | 5 | 6 | 34 | 15 | 10 | 4 | 7 | 7 | 43 |

Appendix 11

Test-Retest scores of Age Group 14 - 16 Including "High" and "Low" Mental Age Levels

| | | | | Test | | | | | | | Retest | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Subtests | | | | | Scores | | Subtests | | | | | Scores |
| | Subjects | Sex | Mos. C.A. | M.A. | 1 | 2 | 3 | 4 | 5 | Total | 1 | 2 | 3 | 4 | 5 | Total |
| | 1 | F | 171 | 75 | 20 | 10 | 3 | 6 | 7 | 46 | 16 | 10 | 5 | 7 | 7 | 45 |
| | 2 | F | 184 | 80 | 16 | 7 | 0 | 6 | 4 | 33 | 9 | 5 | 1 | 6 | 6 | 27 |
| | 3 | F | 171 | 92 | 17 | 6 | 3 | 5 | 6 | 37 | 14 | 8 | 10 | 5 | 5 | 42 |
| | 4 | F | 176 | 78 | 18 | 6 | 6 | 1 | 2 | 33 | 16 | 7 | 2 | 4 | 3 | 32 |
| "High" | 5 | F | 171 | 97 | 14 | 1 | 0 | 5 | 0 | 20 | 17 | 1 | 0 | 5 | 0 | 23 |
| | 6 | M | 183 | 85 | 15 | 10 | 1 | 8 | 7 | 41 | 20 | 10 | 2 | 7 | 7 | 46 |
| | 7 | M | 188 | 94 | 17 | 10 | 6 | 9 | 9 | 51 | 15 | 10 | 11 | 7 | 7 | 50 |
| | 8 | M | 179 | 80 | 17 | 7 | 12 | 8 | 7 | 51 | 16 | 10 | 15 | 8 | 6 | 55 |
| | 9 | M | 185 | 92 | 11 | 9 | 6 | 6 | 5 | 37 | 16 | 9 | 6 | 5 | 4 | 40 |
| | 10 | M | 168 | 90 | 9 | 7 | 4 | 5 | 4 | 29 | 10 | 7 | 4 | 5 | 4 | 30 |
| | 1 | F | 182 | 59 | 10 | 4 | 0 | 5 | 6 | 25 | 12 | 7 | 4 | 5 | 6 | 34 |
| | 2 | F | 189 | 75 | 23 | 6 | 3 | 5 | 3 | 40 | 18 | 5 | 3 | 5 | 3 | 34 |
| | 3 | F | 181 | 69 | 16 | 8 | 2 | 3 | 0 | 29 | 12 | 5 | 2 | 4 | 0 | 23 |
| | 4 | F | 187 | 49 | 16 | 7 | 0 | 3 | 3 | 29 | 16 | 7 | 3 | 6 | 3 | 35 |
| "Low" | 5 | F | 182 | 59 | 14 | 3 | 6 | 5 | 0 | 28 | 14 | 4 | 4 | 3 | 2 | 27 |
| | 6 | M | 188 | 56 | 8 | 4 | 1 | 3 | 0 | 16 | 9 | 4 | 2 | 2 | 0 | 17 |
| | 7 | M | 187 | 49 | 8 | 1 | 1 | 0 | 1 | 11 | 6 | 1 | 2 | 1 | 1 | 11 |
| | 8 | M | 184 | 55 | 10 | 2 | 2 | 4 | 0 | 18 | 10 | 3 | 0 | 5 | 1 | 19 |
| | 9 | M | 191 | 71 | 13 | 10 | 0 | 6 | 5 | 34 | 16 | 10 | 8 | 8 | 5 | 47 |
| | 10 | M | 199 | 67 | 9 | 1 | 1 | 2 | 1 | 14 | 9 | 2 | 2 | 1 | 1 | 15 |

## Appendix 111

Test-Retest scores of Age Group 17 - 19 Including "High" and "Low" Mental Age Levels

| | Subjects | Sex | Mos. C.A. | Test M.A. | Test Subtests 1 | 2 | 3 | 4 | 5 | Test Scores Total | Retest Subtests 1 | 2 | 3 | 4 | 5 | Retest Scores Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| "High" | 1 | F | 218 | 120 | 21 | 9 | 7 | 8 | 7 | 52 | 17 | 10 | 4 | 8 | 7 | 46 |
| | 2 | F | 217 | 103 | 19 | 7 | 12 | 6 | 6 | 50 | 16 | 7 | 8 | 7 | 5 | 43 |
| | 3 | F | 220 | 107 | 23 | 10 | 11 | 8 | 7 | 59 | 24 | 10 | 11 | 8 | 7 | 60 |
| | 4 | F | 227 | 149 | 15 | 9 | 5 | 6 | 5 | 40 | 7 | 9 | 3 | 7 | 5 | 31 |
| | 5 | F | 204 | 120 | 18 | 10 | 5 | 6 | 7 | 46 | 11 | 9 | 7 | 6 | 6 | 39 |
| | 6 | M | 216 | 149 | 21 | 8 | 12 | 6 | 7 | 54 | 20 | 9 | 11 | 8 | 7 | 55 |
| | 7 | M | 210 | 124 | 11 | 5 | 3 | 6 | 3 | 28 | 15 | 8 | 5 | 4 | 4 | 36 |
| | 8 | M | 225 | 130 | 16 | 10 | 7 | 8 | 6 | 47 | 20 | 10 | 9 | 8 | 6 | 53 |
| | 9 | M | 228 | 97 | 16 | 8 | 0 | 7 | 5 | 36 | 17 | 9 | 1 | 8 | 6 | 41 |
| | 10 | M | 203 | 145 | 16 | 9 | 16 | 7 | 4 | 52 | 10 | 10 | 10 | 7 | 7 | 44 |
| "Low" | 1 | F | 207 | 85 | 22 | 6 | 7 | 4 | 7 | 46 | 18 | 7 | 3 | 5 | 6 | 39 |
| | 2 | F | 230 | 67 | 15 | 9 | 6 | 7 | 7 | 44 | 14 | 10 | 4 | 8 | 7 | 43 |
| | 3 | F | 207 | 85 | 10 | 5 | 0 | 4 | 1 | 20 | 13 | 5 | 0 | 4 | 2 | 24 |
| | 4 | F | 213 | 90 | 23 | 8 | 0 | 6 | 4 | 41 | 23 | 10 | 6 | 6 | 3 | 48 |
| | 5 | F | 214 | 85 | 10 | 4 | 1 | 3 | 3 | 21 | 9 | 4 | 0 | 6 | 2 | 21 |
| | 6 | M | 204 | 61 | 15 | 9 | 4 | 4 | 4 | 36 | 14 | 10 | 1 | 5 | 5 | 35 |
| | 7 | M | 221 | 80 | 7 | 9 | 5 | 6 | 6 | 33 | 12 | 8 | 4 | 6 | 6 | 36 |
| | 8 | M | 221 | 71 | 16 | 9 | 12 | 6 | 7 | 50 | 23 | 9 | 9 | 7 | 7 | 55 |
| | 9 | M | 207 | 87 | 17 | 7 | 7 | 7 | 7 | 45 | 17 | 10 | 8 | 7 | 7 | 49 |
| | 10 | M | 209 | 73 | 18 | 9 | 12 | 8 | 7 | 54 | 25 | 10 | 11 | 8 | 7 | 61 |