# A Study on the Validity of the Test of Visual Perceptual Skills-Revised

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***Abstract***
Two years ago, senior interns from the Michigan College of Optometry at Ferris State University studied the validity of the Test of Visual Perceptual Skills. The TVPS is a test designed to measure a child's visual-perceptual strengths and weaknesses based on non-motor visual perceptual testing. The seniors compared the test with several other standardized tests of visual information processing and perceptual skills. The result of this study was that the TVPS did not correlate with the other standardized tests (3 and 4).

Since the completion of this study, the TVPS has come out with a revised edition, which includes some new items and deletes some old items. The revision has also been re-standardized and the norms have been expanded, including standard scores, scaled scores, T-scores, percentiles, stanines, and visual-perceptual ages for each subtest, along with perceptual quotient and median age for the total of all seven subtests (1). It was our intention to repeat the previous study using the revised test, TVPS-R, to again test its validity. It was found in our study that all of the subtests seemed to correlate significantly with age and the other standardized tests that we compared them to, with the exception of the visual sequential memory subtest.

***Introduction***
The purpose of the TVPS-R is the same as the original TVPS; to determine a subject's visual-perceptual strengths and weaknesses based on non-motor visual-perceptual testing. It is designed to be used as an instrument to help professionals learn more about how a subject perceives various forms within a specific category and the way these forms are interpreted. This series of tests is normed for children age 4 years through 12 years, 11 months.

Like the TVPS, the TVPS-R measures the following seven visual-perceptual skills:

1. Visual Discrimination
2. Visual Memory
3. Visual Sequential-Memory
4. Visual Spatial-Relationships
5. Visual Closure
6. Visual Figure-Ground
7. Visual Form-Constancy

A discussion follows to further describe the subtests of the TVPS-R:

1. Visual Discrimination- Identify which of five forms exactly matches a sample form.

2. Visual Memory- Identify which of five forms are identical to a form exposed for a short period of time and then taken away.

3. Visual-Spatial Relationships- Identify one form or part of a single form of five shown which is arranged differently than the others.

4. Visual Closure- Identify which of four incomplete forms would be identical to the presented form if it were completed.

5. Visual Form Constancy- Identify a form; regardless of size, rotation, or if it is hidden among other forms, which matches the form presented.

6. Visual Sequential Memory- Identify a sequence of forms (exposed for four or five seconds) among four sequences later presented.

7. Visual Figure-Ground- Identify a stimulus form hidden among other forms that is exactly identical to the presented form.

The benefit of the research results will prove or disprove the validity of the TVPS-R. Validity is defined as something that is well supported by facts. It is essential for a test to evaluate what it claims to. Four types of validity can be described; content validity, criterion-related validity, construct validity and concurrent validity.

Content validity is the appropriateness of the task demands of the TVPS-R for assessing characteristics of visual perception. Criterion-related validity is a technique of studying the relationship between test scores and independent, external criterion measures (2). Construct validity is described as the degree to which the test scores can be accounted for by certain explanatory constructs (2). All content and criterion-related validity evidence can be considered evidence for construct validity (2). Concurrent validity is that which compares between the TVPS-R subtests and other standardized tests given at the same time (1). The tests that the TVPS-R used to compare itself with were the following:

1) Test of Visual Motor Skills Revised
2) Test of Auditory-Perceptual Skills Revised
3) Test of Nonverbal Intelligence
4) Test of Academic Achievement Skills: Reading and Arithmetic subtests
5) WPPSI Revised: Vocabulary and Picture completion subtests
6) WISC-3: Vocabulary and picture completion
7) Wide Range Achievement Test

If the TVPS-R is proven valid, it will provide professionals with another test for determining the strengths and weaknesses of a developing child's visual-perceptual skills.

***Method***

The selection of subjects was based on the age groups 4 to 12 years 11 months. We wished to get a good sample from each of the different age spectrum and our target was to study 40 subjects fitting this criteria. Our study included 38 subjects with the age distribution as follows:

| Age (Years-Months) | Number of Subjects |
|---|---|
| 4-0 to 4-11 | 4 |
| 5-0 to 5-11 | 5 |
| 6-0 to 6-11 | 6 |
| 7-0 to 7-11 | 4 |
| 8-0 to 8-11 | 2 |
| 9-0 to 9-11 | 9 |
| 10-0 to 10-11 | 2 |
| 11-0 to 11-11 | 2 |
| 12-0 to 12-11 | 4 |

The first 20 subjects were administered the TVPS-R first and then the other comparative tests in a random order. The last 18 subjects were administered the comparative tests in random order first and then the TVPS-R battery. This was done so that effects of learning or fatigue with the subjects did not play a large factor in our results.

For our study, the TVPS-R was compared to the same tests that were used in the original TVPS study (3 and 4). The following is a list of the standardized tests which are numbered to correlate with the subtests (numbered in the introduction) that they were compared with.

1. Matching Familiar Figures Test (MFFT): a test of attention and visual discrimination

2 & 3. Detroit Test of Learning Aptitude - 2 (DTLA-2)- Letter Sequences: a test of visual memory

Woodcock-Johnson Psychoeducational Battery-Revised:

4. Spatial Relations subtest

5 & 6. Visual Closure subtest

Kaufman Assessment Battery for Children (K-ABC)

5 & 6. Gestalt Closure sub-test only

We were given written permission by the subjects' parents or legal guardians prior to test administration. All of the subjects were tested by the same researcher. The other researcher scored the results. No diagnoses was made nor were any test results discussed with the parents or subject. The results were combined and analyzed as a whole for research purposes only.

***Results***

All of the seven subtests of the TVPS-R correlated significantly with age. Visual sequential memory was the lowest correlation with an r = .480 and p = .002. See Table 1 for the other correlation scores. When compared with the other standardized tests, 5 of the 6 subtests correlated significantly with the test that they were compared to. Again, the subtest that seemed to fall short was the visual sequential memory. See Table 2 for r and p values. The negative r-value given with the MFFT Errors is due to the fact that with age, errors in this test decrease in number. By the design of the test, it is an inverse relationship to the TVPS-R visual discrimination, of which scores increase with age.

**TABLE 1**

**CORRELATION OF TEST VS. AGE**

| **Subtests** | **r** | **p** |
|---|---|---|
| *TVPS* | | |
| Visual Discrimination | .526 | .001 |
| Visual Memory | .643 | <.001 |
| Visual Spatial Relationship | .681 | <.001 |
| Visual Form Constancy | .656 | <.001 |
| Visual Sequential Memory | .480 | .002 |
| Visual Figure-Ground | .661 | <.001 |
| Visual Closure | .529 | .001 |
| | | |
| *Comparison Tests* | | |
| K-ABC | .846 | <.001 |
| W-J Visual Closure | .782 | <.001 |
| W-J Spatial Relations | .742 | <.001 |
| MFFT Errors | -.738 | <.001 |
| MFFT Latentcy | .187 | .261 |
| DTLA-Letter Sequences | .821 | <.001 |

**TABLE 2**

**Correlation of TVPS-R Subtests to Comparison Tests**

| *TVPS-R Subtests* | *Comparison Test* | r | p |
|---|---|---|---|
| Visual Discrimination | MFFT Errors | -.654 | <.001 |
| Visual Memory | DTLA Letter Sequence | .739 | <.001 |
| Visual-Spatial Relationships | W-J Spatial Relations subtest | .644 | <.001 |
| Visual Sequential Memory | DTLA Letter Sequences | .360 | .040 |
| Visual Figure-Ground #1 | K-ABC Gestalt Closure | .616 | <.001 |
| Visual Figure-Ground #2 | W-J Visual Closure subtest | .550 | <.001 |
| Visual Closure #1 | K-ABC Gestalt Closure | .475 | .003 |
| Visual Closure #2 | W-J Visual Closure subtest | .539 | <.001 |

***Discussion***

The only area of concern with the TVPS-R is the visual sequential memory portion of the test battery. It consists of several symbols in a row that the child is supposed to remember in order. They are to then pick the exact order from a choice of four. It doesn't force the child to repeat each symbol individually, so all the child really needs to do is remember a small portion of the sequence and they can usually choose correctly. It seems to be more of a visual gestalt type of test than sequential memory test.

For the most part, the test is easy to administer and the kids seem to enjoy the tasks. It would make it even easier to use if the instructions/ answers were printed on the opposite side of the easel from where the subject is looking. This way the subject can be sitting across the table from the tester and the tester can give the instructions and score it more efficiently.

Beyond the original intentions of this study, we further evaluated statistics on the standard score data. We also looked at correlations between the standard scores and age, standard scores and specific subtests, and between specific subtests and raw scores. The following is a discussion of what our data suggests.

- Analysis of the standard scores resulted in numbers that were consistently high. For example, the visual closure subtest scores from our subjects were greater than one standard deviation above the means. Two possibilities could explain this, either our sample happened to perform extremely well, or the normative data of the test is flawed. Another sample may allow one to distinguish which of the two possibilities is most likely.

- It is known that the standard scores should not correlate with age, however some of ours did. A tendency to have a lower standard as the child got older was observed with the sequential memory and visual closure subtests. This occurred to a lesser extent with visual discrimination and memory subtests. This is demonstrative that the older the subject was, the worse they performed.

- A significant difference should not be noticed in the correlations between raw scores and standard scores. In our study there were some differences noticed. The closure subtest correlated at r = .475 (p= .003) as raw scores but only r = .207 (p=.192) as standard scores.

- A large amount of variability was observed in the subtest standard scores for each individual subject. The range of variance between low and high for each subject is 13 to 61 with a mean difference of 30.868 (median 30). This would indicate an average of greater than 2 standard deviations of difference in the visual perceptual skills of every subject.

Collectively, these findings make us question the normative data of the TVPS-R.

***Conclusion***

Although it appears from our study that more work may need to be done on the normative data, the TVPS-R is a much-improved battery of tests than the original. It still doesn't have as high of a correlation with age as the other standardized tests. In spite of this, it is still a useful tool for professionals to use to determine the visual - perceptual strengths and weaknesses of a developing child.

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