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## Visual Acuity Assessment Validation Study

In setting up the validation process for this test, RSA incorporated a four step validation model. It is well understood that the more validity that can be established, the better, and the more evidence that can be gathered for any one type of validity, the better.

1) Face Validity - theoretical, articles of existence, old ways of testing
2) Predictive Validity - how well it can be predicted using tests
3) Content Validity - does the content measure what it is supposed to
4) Construct Validity - performance measures on test are consistent with predictions

It is also understood that none of these validation models above are sufficient alone. In other words, all tests should be validated in as many ways as possible.

### 1) FACE VALIDITY

The first step used was Face Validity. This was determined using existing written material as follows: **For the purpose of this section, Form Blindness was the term used for visual acuity ability.*

The earliest reference to form blindness, as it applies to forensic science, appears to have been written by Albert Osborn, the "father of questioned documents." In his 1910 book, Questioned Documents, Osborn published the first form blindness examination on record. The test focused on the perception of handwriting forms and is still used today by experts in the field of questioned documents. The test was actually developed by Osborn, whose interest was stirred by a judge who could not see the difference in the items of evidence (handwriting) presented before him. This judge was, in effect, "form blind" and did not know it. The test was then given to Professor Joseph Jastrow of the University of Wisconsin to try to establish if in fact certain people could not see minute differences in form. Professor Jastrow came to the conclusion that there is "great variation in the quality, or interpretive ability, of human vision".

In the 1939-40 issue of the Journal of the American Institute of Criminal Law and Criminology, Osborn mentions form blindness again. In this article, along with the previously mentioned handwriting examination, was a new type of form blindness examination that focused on shapes, curves and angles.

Form blindness testing is a predictive element in screening applicants for fields in which visual perception is of utmost importance. Although form blindness only affects a small percentage of the nation, can our profession afford to hire someone with form blindness? Or better yet, if we had the means to eliminate that person with form blindness through testing, would

we? Although research on form blindness is ongoing and no formal tests have yet been established, no reason can be seen why screening procedures already available should not be utilized. If one high caliber recruit is selected, due to these screening procedures, wouldn't the effort be perceived as being worthwhile?

In the 1996 March/April issue of the Journal of Forensic Identification, an article appeared by Pat A. Wertheim, entitled "The Ability Equation." In this article the term form blindness appears under the subheading of Talent:

> "It is important to realize that talent, as related to latent print examinations, is a continuum. The artist is at one end of the spectrum and the form-blind dyslexic at the other. Most of us lie somewhere in between. But as a profession, we have to acknowledge that a line needs to be drawn somewhere, and persons lacking a basic level of talent must be discouraged from entering the field. To ignore this fact is unfair to those who can only be frustrated by the difficulty they encounter, and it is unfair to the agency which is paying them to do a job they simply lack the ability to do competently."

Wertheim goes on to say that form blindness to latent print examiners can be like tone-deafness to a musician. Although a tone-deaf person can learn to play a musical instrument he/she could never become a concert instrumentalist. The same is true of a form blind examiner.

**Conclusion**:

1) Literature contends that form blindness occurs in the brain, not the eye.
2) Literature claims that the majority of persons do not have form blindness.
3) Literature states that the ability to see minute differences in angles, shapes, and sizes is an ability not everyone possesses.

## 2) PREDICTIVE VALIDITY

The second step used was Predictive Validity. How well can these tests predict success in a latent print examiner training program? This was determined through the following studies:

### STUDY 1 (Pilot Study)

The primary purpose of this study was to determine if form blindness testing can be used as a predictor in determining if an applicant would be successful in completing a latent print examiner training program. The study also evaluated secondary elements such as race, age, and academic field to see if any correlations existed.

There were 111 students that participated in this study over a period of one year.

All students were given two form blindness tests at the beginning of the semester. None of the participants had any prior experience with fingerprints. The form blindness tests that they were given will be referred to as pretest 1 and pretest 2. Pretest 1 was a general form blindness test specifically designed to detect form blindness. This test assessed the ability of

the individual to distinguish differences in sizes and was limited to fifteen-minutes. It is important to note that time was not a factor in pretest 1 due to the fact that every student completed the test with time to spare.

The goal of these tests were to analyze and compare the two pretest scores taken prior to the start of the sixteen week fingerprinting course with the post test scores taken upon completion of the sixteen week training course.

To examine whether a correlation exists between pretest 1 and the post test, pretest 2 and the post test, or both pretests and the post test, the final analysis was a Pearson Correlation Test. According to the Pearson Correlation Test, there was a significant correlation between pretest 1 and the post test (Correlation is significant at the .01 level). There was also a significant correlation between pretest 2 and the post test. When looking at both pretests, the conclusion of the study shows that pretest 2 is a stronger predictor of the posttest than pretest 1. However, it should be noted that when both pretests are combined, they have a stronger predictive ability of success in training than when used by themselves.

**STUDY 2 (Full Study)**

Hypothetically, an applicant screened and found form blind may subsequently be excluded from being a trainee. But how does one know with reasonable certainty that a form-blind trainee could not successfully complete such training?

There were 327 students that participated in this study over a five year period (2003 to 2007).

Four hypotheses were tested in this study.

1) It was anticipated that students with fingerprint training would score significantly higher on the fingerprint comparison test than those who were not trained. **TRUE (35% higher)**
2) It was expected that students with lower form blindness scores would score significantly lower on the fingerprint comparison test. **TRUE**
3) It was projected that fingerprint comparison scores would not differ significantly along demographic lines. **MOSTLY TRUE (age was the only variable that showed any correlation with test scores)**
4) It was presumed that fingerprint comparison scores could be reliably predicted from performance measures. **TRUE (test scores indicate an ability level)**

**Conclusion:**
Form blindness testing does appear to be a bona fide screening tool for the recruitment and selection of fingerprint comparison trainees.

***Note:*** *The NFSTC teamed with RS&A on an accelerated latent print training program and used visual acuity testing as a prerequisite for gaining entry to the program. All students that passed the visual acuity testing did extremely well during the training and all students graduated from*

*the program. There were individuals that did not pass the visual acuity exam; however, they were not admitted to the program.*

**3) <u>CONTENT VALIDITY</u>**

Can the content of the test developed by RS&A determine the variability in visual acuity skills?

**<u>RS&A Testing and Validation (variance in visual acuity skills)</u>**

The same type of content, used in research, was utilized by RS&A when creating Visual Acuity Test #112. The only additional content added to the test was a color blind section based on the most common colors experienced in latent print processing. RS&A then set out to see if the test created in house could capture the same results as seen in the earlier research. This test was given to 118 high school students to check for the variability in visual acuity skills.

| ***High School Validation Results (Test #112)*** | | | |
|---|---|---|---|
| ***Score Range*** | ***Test Category*** | ***# of Incorrect Answer*** | ***#of Respondents*** |
| *100 - 90* | *Excellent* | *0 to 10* | ***18*** |
| *89 - 80* | *Average* | *11 to 18* | ***43*** |
| *79 - 70* | *Below Average* | *19 to 30* | ***39*** |
| *69 and below* | *Poor* | *31 +* | ***18*** |
| | | | ***Total - 118*** |

Likewise, this test was given to 85 college students majoring in forensic science to determine the variability in visual acuity skills.

| ***College Validation Results (Test #112)*** | | | |
|---|---|---|---|
| ***Score Range*** | ***Test Category*** | ***# of Incorrect Answer*** | ***#of Respondents*** |
| *100 - 90* | *Excellent* | *0 to 10* | ***36*** |
| *89 - 80* | *Average* | *11 to 18* | ***28*** |
| *79 - 70* | *Below Average* | *19 to 30* | ***10*** |
| *69 and below* | *Poor* | *31 +* | ***11*** |
| | | | ***Total - 85*** |

As you can see above, both validations support that not all persons have an equal ability to discern minute differences in angles, shapes, and sizes, which are common elements in friction ridge comparisons.

## 4) CONSTRUCT VALIDITY

Can the test being used, predict success in a latent print training program?

### RS&A Testing and Validation (predictive element)

This test was then given to forensic science majors at the beginning of a fingerprint class. All tests were given to the students as a test grade to make sure they were giving their best effort. Once the students completed the course, they were given a final comparison exam which they were told would count as 1/3 of their final grade (to make sure they gave their best effort). This was used to determine how well the visual acuity test score could predict their success in comparisons after being trained.

| *College Validation Results (Test #112)* | | | |
|---|---|---|---|
| ***Test #112 Score*** | ***#of Respondents*** | ***Final Comparison Score*** | ***#of Respondents*** |
| *100 - 90* | *36* | *100 - 90* | *32* |
| *89 - 80* | *28* | *89 - 80* | *30* |
| *79 - 70* | *10* | *79 - 70* | *15* |
| *69 and below* | *11* | *69 and below* | *8* |
| | ***Total - 85*** | | ***Total - 85*** |

As you can see from the above results, the visual acuity test not only predicts how well a student will do in the program, but more importantly, it accurately predicts their visual ability level which is of upmost concern when training someone in a comparative science.

Once this predictive element was determined, the test was sent to a few agencies who conducted their own validation studies which revealed very similar results.

This test was put into production and offered for sale starting in May 2014.

This test was also used for the RS&A National Latent Print Examiner Training Academy. Prior to accepting students in the academy there was a requirement to pass the visual acuity test #112.

Below are the results of these tests.

| *RS&A Academy Validation Results (Test #112) (through 2019/2020)* | | | |
|---|---|---|---|
| ***Score Range*** | ***Test Category*** | ***# of Incorrect Answer*** | ***#of Respondents*** |
| *100 - 90* | *Excellent* | *0 to 10* | *63* |
| *89 - 80* | *Average* | *11 to 18* | *18* |
| *79 - 70* | *Below Average* | *19 to 30* | *2* |
| *69 and below* | *Poor* | *31 +* | *0* |
| | | | ***Total - 83*** |

It should be noted here that all academy students were successful in completing the 20 week accelerated training program and thus graduated the academy; however, 7 of the 18 who

scored in the average range had some difficulty and the two who scored in the below average range experienced great difficulty.

Below are all results of all tests (as of 2016) sold externally, with feedback on the predictive element of success in a latent print training program being very positive.

| ***Product Results (Test #112)*** | | | |
|---|---|---|---|
| ***Score Range*** | ***Test Category*** | ***# of Incorrect Answer*** | ***#of Respondents*** |
| *100 - 90* | *Excellent* | *0 to 10* | *26* |
| *89 - 80* | *Average* | *11 to 18* | *11* |
| *79 - 70* | *Below Average* | *19 to 30* | *5* |
| *69 and below* | ***Poor*** | ***31 +*** | ***0*** |
| | | | ***Total - 42*** |

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