

Introduction

The Saginaw Valley Special Needs Vision Clinic is a non-profit organization housed at the Millet Learning Center in Bridgeport, Michigan. The Clinic provides services for individuals with special needs, including those with physical, mental, emotional, and sensory disorders. Many of these patients cannot identify standard Sloan letters and therefore reliance upon other acuity symbols is necessary for visual acuity measurements. The purpose of my study is to determine how well these illiterate symbol acuities correlate with Sloan letter acuities. A battery of acuity tests was administered to fifteen TMI (Trainably Mentally Impaired) young adults, ages sixteen to twenty-five, all of whom were able to identify Sloan letters. Stereoacuity tests were also compared in an attempt to assess their reliability and consistency.

Visual Acuity-Methods

Visual acuity measurement involves determination of a threshold; therefore, the importance of the physical stimulus cannot be overstated. The differences in optotype configuration, level of knowledge required to identify the optotype, and the number of optotypes per test all play a central role in threshold determination. The following are the acuity tests which were administered:

- 1) Goodlite (Sloan letters)-this test was used as a standard in which to compare the other distance visual acuity charts. As with the other distance acuity tests, subjects were simply asked to monocularly identify letters at the distance of ten feet.
- 2) Broken Wheel Test-subjects were asked to point to the car with the "broken wheels" as opposed to the car without the "broken wheels". Four correct choices out of four presentations were required for successful completion of each acuity level. This is a forced choice test.
- 3) Lighthouse Flashcards-subjects were asked to identify the picture presented (apple, house, umbrella). Again, four correct choices out of four presentations were required. 20/20 is the best attainable acuity at ten feet by design of the test.
- 4) Reduced Snellen-this test was used as a standard by to compare other near point tests. Near point tests were administered at 40 cm.

5) Tumbling E-subjects were asked to tell the examiner which "direction" the E's point at 40 cm.

6) AO Child's Recognition-subjects identified pictures at twenty-six inches. The test distance was increased from the recommended thirteen inches thus decreasing the visual angle of the figures by half. This made it possible to measure VA's as acute as 20/15.

Stereoacuity-Methods

Horizontal retinal image disparities give rise to stereopsis, an important form of binocular depth perception. Three different stereoacuity tests were administered:

1) Titmus Stereo-performed at 40 cm, subjects were asked to "pinch the wing on the fly". If the subject showed the typical stereoscopic response, the examiner continued by asking the patient to identify those figures that were closest to him/her starting with the animals.

2) Randot-subjects were first asked to locate the circle, square, cross, etc., and then identify the stereoscopic Wirt rings. This test was also performed at 40 cm.

3) Random Dot E-after explanation of the test via the demonstration card with the raised E, subjects were asked to point towards the stereoscopic E which was on one of the two test cards presented. The test was first performed at two feet, then at five feet, and finally at ten feet. Four correct responses out of four presentations were required for the lowest stereoacuity attained. The reader is referred to the manufacturer's literature for absolute stereopsis values.

Conclusions

The data indicate that the acuity is generally overestimated in tests requiring picture identification, e.g. child's recognition and, most notably, lighthouse flashcards. The broken wheel test and the tumbling E test are inconsistent when compared with standard Sloan letters. Randot stereoacuity is consistently greater than titmus stereoacuity. If randot stereoacuity is 40" or greater, random dot E's are usually correctly identified four out of four times at ten feet. Measurements of stereoacuity with the random dot E is often inconsistent with randot, otherwise.

Comment

Several reasons may be proposed for the overestimation in acuity which is common with the lighthouse cards. First, there is obviously a large difference between the pictures. The apple and the umbrella are difficult to confuse. Secondly, there are only three optotypes in this test thus significantly increasing the "guess factor". The data show the acuity is, in general, overestimated by one Snellen acuity level.

The difference in optotypes is marked in the AO child's recognition test. For example, subjects rarely confused the jeep for the birthday cake. The acuity may or may not be overestimated by one acuity level. Please note that the testing distance (twenty-six inches) may have influenced the results to a minor degree.

The broken wheel test is an excellent test in theory; however, with our population, inconsistent acuities are often found. This appears to be the result of impulsive or unmeditated responses. Having subjects wait several seconds before responding often improves reliability.

The tumbling E test acuities were often inconsistent with reduced Snellen acuities. This is most likely due to the difficulty TMI individuals have with directionality and the difficulty of recording an acuity based on their responses.

It is not possible to state with certainty, in our limited sample, how much grosser the randot test is than the titmus test. Occasionally, subjects with no measurable titmus or randot stereopsis will easily identify the random dot E. This is presumably due to flaws in the cards themselves e.g., scratches, bends, or other identifiable markings. Turning the cards sideways is a good way to screen for spurious responses. By doing so, no stereopsis should be elicited.

Remarks

I feel that if a Snellen acuity is unobtainable, lighthouse flashcards are viable in assessing visual acuity in a TMI population. When the overestimation in acuity is considered, the lighthouse cards offer the most reliable results.

The AO child's recognition cards would be my first choice after a reduced Snellen at near.

Stereoacuity appears more reliable with the Titmus and the Randot tests than with the random dot E test.

A COMPARISON OF VARIOUS VISUAL AND STEREOACUITY TESTS

IN A DEVELOPMENTALLY DISABLED POPULATION

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VISUAL ACUITY

Subject	Snellen	Broken Wheel	Light-House	Tumbling E	Child's Rec.	Reduced Snellen
1	20/25 20/25	20/40 20/25	20/30 20/23	20/20 20/20	20/15 20/15	20/15 20/15
2	20/50 20/30	22/40 20/40	20/40 20/30	20/30 20/25	20/30 20/15	20/30 20/40
3	20/60 20/80	20/80 20/60	20/40 20/60	20/40 20/50	20/50 20/50	20/40 20/40
4	20/20 20/25	20/20 20/25	20/20 20/20	20/15 20/20	20/15 20/15	20/15 20/15
5	20/50 20/50	20/60 20/40	20/30 20/30	20/20 20/20	20/15 20/15	20/15 20/15
6	20/20 20/20	20/20 20/20	20/20 20/20	20/20 20/20	20/15 20/15	20/20 20/15
7	20/20 20/20	20/20 20/20	20/20 20/20	20/20 20/25	20/15 20/15	20/15 20/15
8	20/20 20/20	20/20 20/20	20/20 20/20	20/20 20/20	20/15 20/15	20/20 20/20
9	20/70 20/30	20/60 20/60	20/60 20/20	* *	20/50 20/20	20/50 20/20
10	20/40 20/40	20/40 20/40	20/40 20/40	* *	20/15 20/15	20/15 20/15
11	20/25 20/25	20/25 20/25	20/20 20/20	20/20 20/20	20/15 20/15	20/15 20/15
12	20/25 20/25	20/25 20/20	20/20 20/20	20/20 20/15	20/20 20/15	20/20 20/15
13	20/40 20/80	20/40 20/80	20/30 20/60	20/40 20/40	20/30 20/30	20/40 20/30
14	20/30 20/40	20/40 20/40	20/20 20/30	20/30 20/30	20/30 20/20	20/25 20/20
15	20/20 20/20	20/25 20/20	20/20 20/20	20/20 20/25	20/15 20/15	20/15 20/15

OD/OS

STEREOACUITY

Subject	Titmus	Randot	Random Dot E
1	80"	40"	10 ft
2	*	*	10 ft
3	*	*	*
4	800"	500"	5 ft
5	400"	160"	*
6	40"	40"	10 ft
7	40"	40"	10 ft
8	fly	30"	10 ft
9	*	*	10 ft
10	140"	70"	2.5 ft
11	*	250"	10 ft
12	400"	80"	10 ft
13	*	*	*
14	200"	140"	*
15	800"	400"	*