



Original Article

Comparison of lea symbols and snellen visual acuity charts in school aged children taking etdrs as gold standard

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OBJECTIVE: To compare results obtained by Lea symbols and Snellen visual acuity charts taking ETDRS as a gold standard.

PATIENTS AND METHODS: This study was conducted in the month of October and November 2015. It was an institution based study, conducted on 69 patients (including patient of age 5-10 years) visiting Orthoptic Clinic (Mayo Hospital Lahore). Each child had right eye and left eye visual acuity tested with Lea symbol chart, Snellen chart and ETDRS chart. Visual acuity was scored as the smallest optotype size at which the child correctly identified 3 of a maximum of 5 optotypes.

RESULTS: Correlation between Lea symbols visual acuity and Snellen visual acuity was 0.68 ($p < 0.001$). Mean Lea symbols visual acuity was eight letters (0.16 logMAR) better than mean Snellen visual acuity ($p < 0.001$), and three letters (0.5 logMAR) better than the mean ETDRS visual acuity ($p < 0.001$). While ETDRS visual acuity was five letters (0.11 logMAR) better than mean Snellen visual acuity chart.

CONCLUSION: Visual acuity scores were significantly better on Lea symbols charts compared to Snellen charts, and ETDRS chart. The difference was great between ETDRS and Snellen charts, while the difference was small between ETDRS and Lea symbol.



INTRODUCTION:

Vision is a crucial sense for the development of children both physically and intellectually. Motor development and the ability to communicate are often affected in children with visual deficits because signs and social behaviors are learned through visual response. Early diagnosis of disorders, actual treatment, and visual stimulation programs can let the child achieve good communication with their surrounding environments.¹

The eye is the main sensory structure for vision, accountable for gathering light, concentrating it, and programming the first neural signs of the visual path. In order to converge on to the retina, light must pass through the ocular media, containing of the tear film, lens, cornea, anterior chamber, and the posterior-chamber vitreous humour.² When light reaches the retina, its energy is converted by retinal photoreceptors into an electrochemical signal that is then relayed by neurons.³ The visual pathway carries out the message collected by retina to the brain.⁴

The most essential things for vision to develop normally are good physiologic and anatomic conditions. Seeing is very important for children in order to develop their vision, but any mishap occurring during their development like Strabismus, anisometropia, palpebral occlusion and cataract can result in abnormal visual development, which can continue throughout their life if not treated at the appropriate time. Amblyopia is good example of the consequences of vision obstacle during development of vision. From the age of 9 months to 2 years, the children are prone to develop this abnormality, and sensitivity declines between 2 and 8 years of age.⁵ In early childhood amblyopia together with strabismus are the two most functional abnormalities for the age group.⁶

Visual acuity is the most important test which if done perfectly can tell the condition and integrity of visual system. Traditionally, there has been a discussion over how to utilize letters of the alphabet for finding visual acuity. The children need to recognize letters cognitively, and that may be difficult for them. All optotypes utilized to for the evaluation of visual acuity should subtend 5 minutes of an arc, in all section of the optotype, subtending one minute of arc. Even though many different optotype targets have been produced, the most regularly utilized are Allen picture chart, Tumbling E and Snellen letter. Majority of letter charts including Snellen chart need a grade of knowledge or reading ability and expression skills. The Allen picture and Tumbling E can both be done on similar ways. Deciding which optotype can give the best visual acuity assessment in each individual is the technicians work. Mostly Snellen chart is done as a part of complete examination of literate grown-ups and children. Some of the individuals with cognitive disability can be checked by using Allen pictures and Tumbling E for visual acuity assessment.⁷

Lea symbol chart is widely accepted tool for measurement of

visual acuity around the world and it is used to test visual acuity in juveniles especially for those who are too young to be tested with Sloan letters and Landolt rings. It was first established by Finish pediatric ophthalmologist Lea Hyvarinen in 1976.⁸ It uses four symbols (square, house, circle, and heart) and it is based on the logarithm (LogMAR) standard with lines that develop in 0.1 log unit phases and optotypes that are set apart correspondingly.^{9, 10} The Snellen chart is the most commonly used chart for measurement of visual acuity in clinical practice because it is commonly available as well as rapid and measurement is stress-free to accomplish. The chart has letters of dissimilar sizes organized from main at the upper to tiniest at the lowest, which are read one eye after the other, and is viewed from a distance of 6 meters (20 feet). Each one letter on the graph subtends an angle of 5 proceeding (min) of arc at the suitable analysis space, and each letter portion subtends a viewpoint of 1 min of arc.¹¹ On the other hand ETDRS chart has become the standard for assessing visual acuity in eye care technology forum proceedings and best standard for research of vision. The ETDRS is known to be a good option for its accuracy in both low and high levels of acuity.^{12, 13, 14} Basically the ETDRS can also be used in very low level of visual acuity (like counting finger), by altering only the viewing distance from four meters to one or two meters.¹⁵

METHOD:

SUBJECTS:

Subjects were 69 children ages 5 to 10 years who were visiting Orthoptic clinic Mayo Hospital Lahore during the months October and November of the year 2015. Thirty (43%) of them were male while thirty nine (57%) of them were female. All study participants underwent an eye examination with right eye and left eye visual acuity tested with Lea symbol chart, Snellen chart and ETDRS chart. Visual acuity was scored as the smallest optotype size at which the child correctly identified three of a maximum of five optotypes. The study was approved by the Institutional Review Board of the College of Ophthalmology. We had taken an informed consent from parents prior to the child's participation.

Vision testing started with top line of the Snellen, Lea symbol and ETDRS (20/200). The child was asked to tell or to match to symbols of the card by their hands on the Lea symbol chart. Once the child correctly identified at least three of the five symbols or letters in a line, he was asked to begin identifying the next smaller line. The smallest line in which the child was able to identify at least three symbols was taken as acuity value.

DATA ANALYSIS:

Acuity scores of the Snellen chart were transformed into log values for data analysis. While For scoring of ETDRS and Lea symbols results based on the child's reading of all letters or symbols, the following formula, which assigns a value of 0.02

log unit to each letter or symbol identified, was used to transform scores to logMAR values LogMAR acuity score = $1.10 - 0.02 * T_c$, where T_c is the total number of letters or symbols identified correctly.

RESULTS:

The data was shown in tabulated, graphical and diagrammatic form for different variables.

Measures	Number	Mean	Std. Deviation
Snellen OD	69	0.6	0.36
Snellen OS	69	0.68	0.36
Lea symbol OD	69	0.44	0.33
Lea symbol OS	69	0.52	0.35
ETDRS OD	69	0.49	0.36
ETDRS OS	69	0.58	0.37

Table 1: shows the differences between mean scores on Snellen and Lea symbols along with SD.

	t	Df	p-value
Snellen OD	13.76	68	0.001
Snellen OS	15.29	68	
Lea symbol OD	10.81	68	
Lea symbol OS	12.3	68	
ETDRSOD	11.4	68	
ETDRSOS	13.18	68	

Table 2: t-test of Comparing the Snellen, Lea symbol and ERTDS

The table shows that there are significant differences between Snellen and Lea symbol for measuring visual acuity of children. Lea symbol is better in measuring visual acuity for children then Snellen and ETDRS.

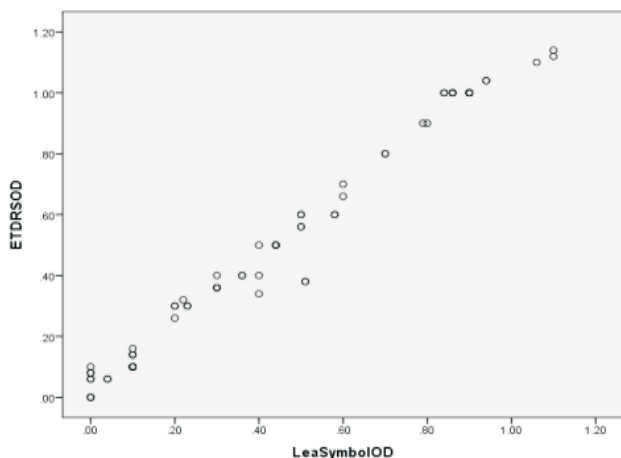
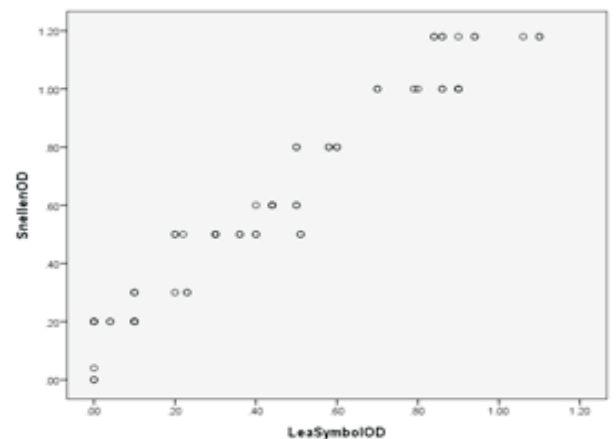
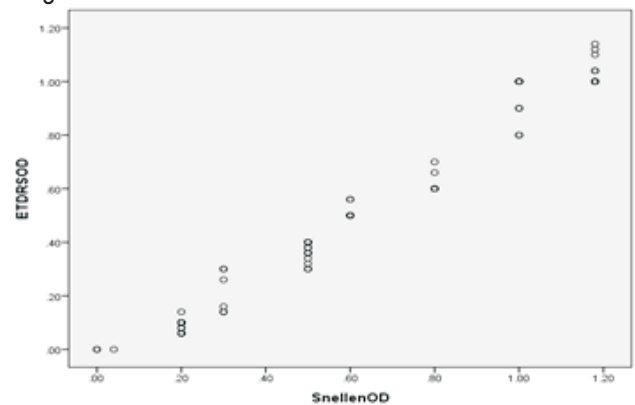


Table 3: Correlation between Snellen, Lea symbol and ETDRS

Measures	Snellen OD	Lea symbol OD	ETDRS OD
Snellen OD	---	.96**	.98**
Lea symbol OD	---	---	.98**
ETDRS OD	---	---	---

Table 3: Correlation between Snellen, Lea symbol and ETDRS

Table 3 specified that there is highly positive correlation among all the measure with that Snellen and Lea symbol being .96 and that of ETDRS with both of the other charts being .98 factors of the scale.



DISCUSSION:

The current research offers the first extensive association of Lea symbols and Snellen VA charts in school aged kids. The outcome of this study shows that VA results achieved with the Lea symbols chart are significantly correlated with VA results achieved from Snellen charts $r = .96$, and those with ETDRS $r = .98$. Lea symbols VA scores on usual are, one and half line (0.16 log unit, $p < 0.001$) better than VA scores achieved by Snellen charts and One-half line (0.6 log unit, $p < 0.001$) better than ETDRS chart. The discovery that children show better VA when checked with Lea symbols than with other non-logMAR



charts is in contrast with earliest data from nearly comparable age group. Secondly, the result have contact with earlier studies that have discovered better VA when patients being checked with Lea symbols than when they were checked by ETDRS chart.^{16,17}

A probable description for the superiority of VA results achieved by the Lea symbols chart than by that of the ETDRS charts is the result of lea symbol being containing only four optotypes, different from that of ETDRS which contains ten optotypes. This means that the single person has already 25% chance of predicting the accurate symbol for lea symbol chart, while just a 10% chance for ETDRS. This can give the credit to the lea symbol for its easy of predicting and good visual acuity.

Another definition for the difference in visual acuity achieved in Snellen, Lea symbol and ETDRS can be the difference of optotypes utilized by each test, (letters vs. symbol). It is probable that in kids, and in patients with ocular anomalies, the visual acuity results from the two types of optotypes are not equal. In addition, it is probable that the kids' interest in the testing was well sustained by a chart comprising familiar figures than by a chart composed of less familiar letters.¹⁸

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