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A PRELIMINARY REPORT ON THE DESIGN , PREPARATION , AND STANDARDIZATION OF A VISION SCREENER "E" CHART

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Key words : *Visual acuity , "E" chart , Screening , Methodology , Iran*

Abstract

To facilitate a comprehensive whole population visual acuity screening , a 1-meter vision screener "E" chart was prepared to be used in the person-by-person household visual acuity examination by non-expert health workers.

The chart is designed to be used in measuring visual acuity from a distance of one meter. The scaling is in terms of-log MAR (-logarithm of minimum angle of resolution) with a linear progression from a value of zero to one. It is just used in the Study of the Visual Disorders Project as part of the WHO/PBL prevention of blindness program in the city of Baft (Kerman province - Iran) and proved to be efficient. The initial standardization showed a sensitivity of 100% and a specificity of more than 56% with 27% false positive results as compared to classic 6-meter Senllen chart.

Introduction

Functional impairments of the body organs , such as low vision and

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blindness , usually have many different underlying disorders. In order to study the prevalence of visual disorders some of which are quite rare in the community in a short time period , one should screen the whole population. On the other hand screening the population by examining each individual by the means of a 6-meter Snellen chart is not practical (2). Use of the near vision screener " Rosenbaum " chart is not always possible because the characters used in those charts are in Latin. Such tools may not be used in non-latin language areas or in places where the illiteracy rate is high(5).

Material and Method

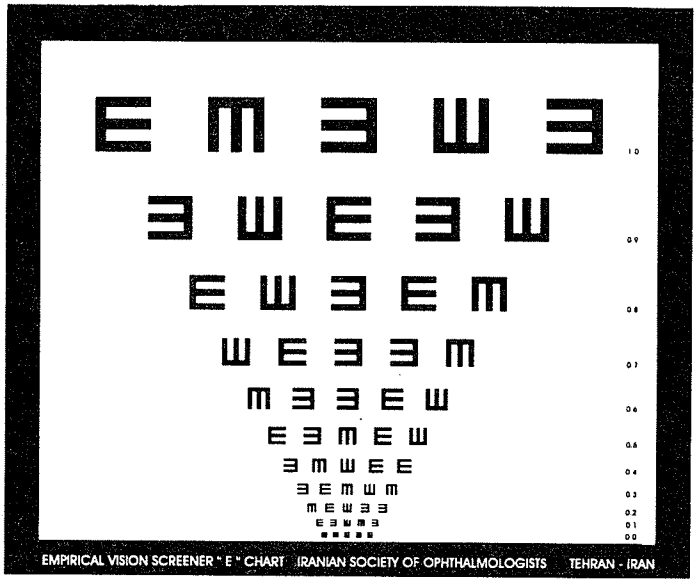
The design is based on a chart created by Bailey and lovie with the recommendation of ommittee on Vision of the National Academy of Science (NAS-NRC) (1). Our calculation to determine the sizes of characters in the chart was based on the MAR (minimum angle of resolution) of five minutes. The scaling is in terms of -logMAR. It has a linear progression from a value of 0.0 to 1.0 by a change of 0.1 for each line and scoring 0.02 per character (1,3).

There are five " " characters in each line. The orientation sequence of the characters are randomly selected so that no more than two identical symbols are found in each line. Two different patterns of orientation sequence are used on the two sides of the chart. Spacing of the characters corresponds the visual disparity threshold level.

The chart is 159.9 mm wide and 131.5 mm high. It is framed by an extra solid red margin of 1 cm width.

Two different patterns of sequences of characters designed on the two sides of the chart (fig 1) to examine the right and the left eyes removes the effect of the immediate memory on the results.

The original form of the chart is designed by the use of animation graphic computer programing. The final copies are screened by film and zinc photographic technique on to a nonreflective white cards.



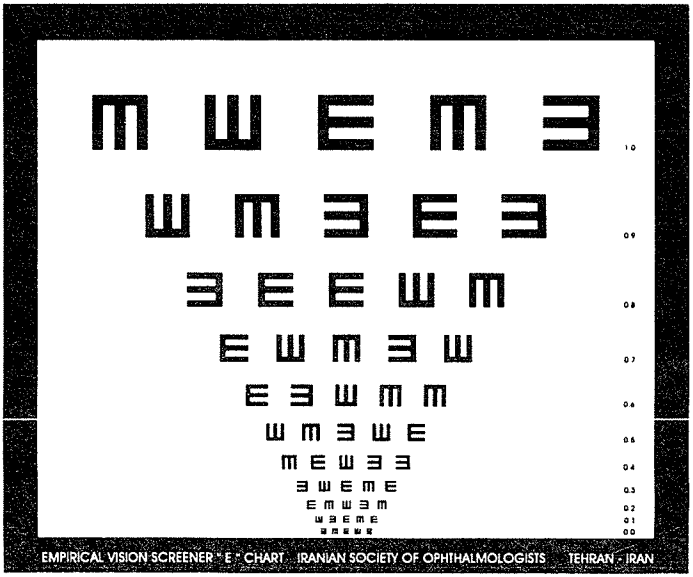


Fig. 1- Schematic representation of the two sides of the Vision screener "E" chart (reduced in size).

Results and Discussion

Table 1 shows the size of each character in height and width and the corresponding visual acuity scores in terms of -log MAR.

The most outstanding advantage of this chart over other similar instruments is that it is simple to implement and requires a minimum level of training for a non-expert health worker or even any other person. It was highly suggested by the top health authorities to be used as a personal proprietary for visual acuity self-examination.

Measuring visual acuity from a distance of one meter removes the intervening effect of light on the power of detection compared to the 3-meter, 4-meter and 6-meter settings of examination (4). This property together with the linear progression of measurements and equal number of characters per line , makes the chart superior to the illiterate 10-feet "E" chart. However , the chart is not very much suitable to be used in myopes without aid because of the increased stimulus to accomodation.

Having five characters in each line allows the examiner to evaluate the discrimination ability. Different orientations of the characters provide a means of testing the recognition component of visual perception in experimental psychology. Moreover , use of the optotype " " rather than the letter "E" eliminates the problem of similarity and difficulty associated with reading the alphabetic characters.

In the initial evaluation of the chart , it was compared with a 6-meter Snellen "E" chart on a sample of 112 individual eyes including 51 normal subjects. The relative sensitivity of the chart was 100% and its specificity was 57%. The positive predictive value came up to be 73% with a false positive of 27% (Table 2). The age of the group studied was in the range of 5 to 90 , the mean age was equal to 59 with a standard deviation of 21.5 years. This study was carried out under the screening conditions of the " Study of the Visual Disorders Project" in the city of Baft-Iran. The agreement in diagnosis of low vision between the two methods was 80.4% (p-value<0.001).

The standardization process including trend test of relatedness , concordance test of kappa , systemic bias test and expectation maximization best liklihood studies are in progress and the results will be reported.It is

under investigation to be used in screening amblyopia in school children in Iran.

Table 1. Size of the characters in the 1-meter vision screener "E" chart and the corresponding equivalent visual acuity measures.

Character Size(mm)	Decimal Fraction	Metric Scale	-log MAR
14.54	0.10	6/60	1.0
11.63	0.12	6/48	0.9
9.09	0.16	6/38	0.8
7.27	0.20	6/30	0.7
5.82	0.25	6/24	0.6
4.54	0.32	6/20	0.5
3.64	0.40	6/15	0.4
2.91	0.50	6/12	0.3
2.31	0.63	6/10	0.2
1.82	0.80	6/7.5	0.1
1.45	1.00	6/6	0.0

Tabel 2- Results of the low vision (visual acuity<0.3) diagnosis of the screening test chart compared to the 6-meter Snellen chart in a sample of 112 individual eyes - Baft Kerman - 1995.

Low Vision (Visual acuity<0.3)		Snellen chart (Goldstandard)		
		Positive	Negative	Total
Screening chart (Test)	Positive	61	22	**83**
	Negative	0	29	**29**
	Total	61	51	**112**

Aknowledgement

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The chart is liscenced under the number of 374011014 registration request in the Industrial Proprietary Office in Tehran and is dedicated to the Farabi Hospital Eye Research Center.

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