

Use of University of Waterloo Distance Visual Acuity Charts

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Abstract

Several versions of the University of Waterloo distance visual acuity chart have been in use for some time. This report summarizes the design features of these charts. Instruction on the use of a 4M and a 6M chart has been provided. The principal advantages of using this chart at various distances is also explained.

Résumé

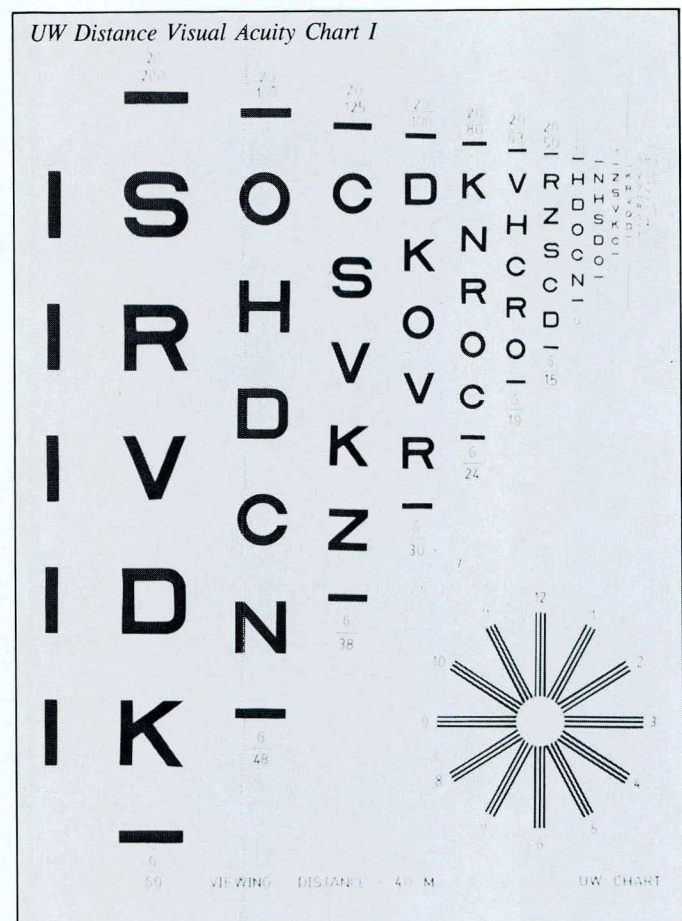
Plusieurs versions de la carte d'acuité visuelle à distance mise au point par l'Université de Waterloo sont en usage depuis plusieurs années. Ce rapport résume les caractéristiques de conception de cette carte. On y trouve des instructions sur l'emploi de la carte de 4M et de celle de 6M. On explique également les principaux avantages de l'emploi de ces cartes à diverses distances.

Metrication of visual acuity charts has been advocated for some time in Canada.¹ There is a national steering committee on SI units.² Most practitioners, however, continue to use Imperial Snellen acuity notations for distance vision. Hospital records on visual acuity are usually in metric notation probably due to directives issued by the authority. There is no formal survey on the adoption of metric visual acuities among optometrists. The School of Optometry Clinic at the University of Waterloo has recently adopted a policy that all distance visual acuities shall be recorded in metric notation. In the transition period, conversion charts are available in all clinic rooms. Manufacturers of acuity charts have not kept pace with the

change. An exception is the University of Waterloo distance acuity chart which has both Imperial and metric notations. Its design has been discussed in detail.³ The purpose of this note is to introduce some important features of this chart in addition to describing the use of several versions of this chart.

Version I of the University of Waterloo distance acuity chart is shown in Figure 1. Each vertical acuity row consists of five Sloan letters. The selection of these letters ensures equalization of interrow legibilities.^{3, 4} Interletter spacing is uniformly controlled for each acuity row. Contour interaction is controlled for all letters including those at the beginning and at the

UW Distance Visual Acuity Chart I



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end of each row. An in house clinical trial of this chart of normal subjects compares favorably with the established Bailey-Lovie logMAR chart. We have been using this chart in our low vision clinic for some time. Occasionally, some subjects tend to read the interaction bar as an alphabet as well. Our experience has been favourable. A reversal letter version has been used in conjunction with a mirror with similar success. Consistent and reliable visual acuities can be elicited from all types of low vision patients at different distances. Three versions of the distance chart have been in use for some time. A brief description of the use of these charts follows.

Use of the University of Waterloo Distance Visual Acuity Chart Versions I and II

The University of Waterloo Distance Visual Acuity Charts I and II are calibrated for use at 4.0m at which distance it measures acuities ranging from 6/3 (20/10) to 6/60 (20/200) in steps of 0.1 log unit. The difference between I and II is the arrangement of the Sloan letters of equal legibility. Recommended illuminances for the distance chart are between 130-215 lux.⁵

Acuities less than 6/60 (20/200) can readily be measured for low vision patients if they are walked up to discrete testing distances which are closer than 4.0m by a multiple of 0.1 log unit. Alternatively, the chart can be moved closer to the patient at specific intervals.

These distances are as follows:

No. of log units closer	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Distance (m)	4.0	3.2	2.5	2.0	1.6	1.3	1.0	.80	.63	.50	.40
(ft)	13'2"	10'6"	8'2"	6'6"	5'3"	4'3"	3'3"	2'7"	2'	1'8"	1'4"

These distances need not be memorized since their sequence is the same as the 6m (20 ft.) Snellen fraction denominators, but 10 times smaller. When denominators beyond the 6/3 (20/10) line are required (such as when the patient must be walked up to a distance closer than 1.0m), the examiner can refer to the denominators to the right of 20/100 for the continuation of the progression.

Each of these 0.1 log unit steps closer to the chart will enable the patient to read one further line. Therefore, the line read by a patient from a given number of log units closer than the 4.0m actually corresponds to an acuity which is that many log units poorer.

The progression of visual acuity values beyond 6/60 (20/200) is readily seen by referring to the 20 ft Snellen denominators to the left of the 6/6 (20/20) line.

Thus, the 6/60 (20/200) line read at a distance of 2.5m corresponds to an acuity of 6/90 (20/320) since 2.5m is .2 log units closer than 4.0m and 6/90 (20/320) is .2 log units poorer than 20/200. (Refer to 6/9 (20/32) which is two columns to the left of 6/6 (20/20).)

Alternatively, a conversion table may be used:

Visual Acuity Conversion Table for 4.0m Chart

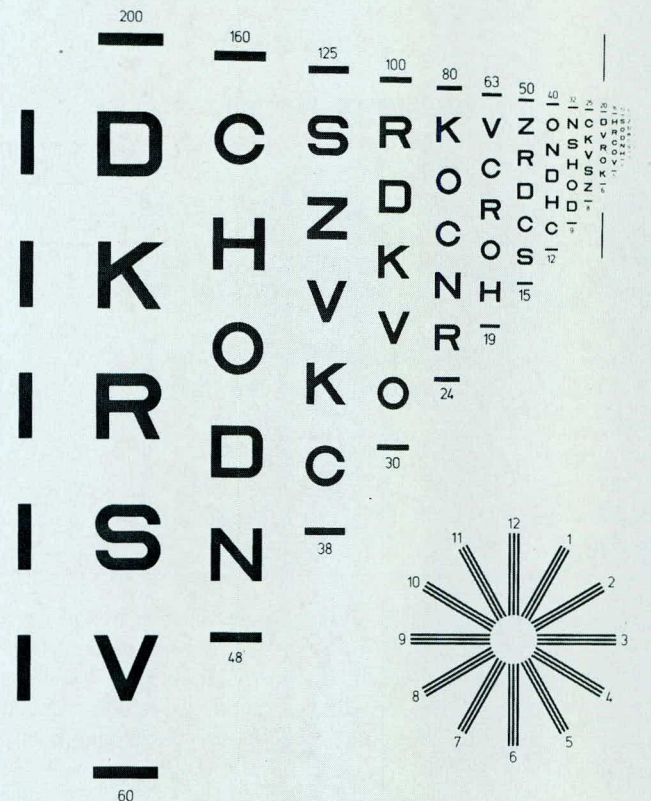
6m Snellen Denominators Testing Distances (m)

Smallest Line Read	4.0	3.2	2.5	2.0	1.6	1.3	1.0	.80
1 (6/60)	60	80	90	120	150	190	240	300
2 (6/48)	48	60	80	90	120	150	190	240
3 (6/38)	38	48	60	80	90	120	150	190

20 ft. Snellen Denominators Testing Distances (ft)

Smallest Line Read	13'2"	10'6"	8'2"	6'6"	5'3"	4'3"	3'3"	2'7"
1 (20/200)	200	250	320	400	500	630	800	1000
2 (2/160)	160	200	250	320	400	500	630	800
3 (20/125)	125	160	200	250	320	400	500	630

UW Distance Visual Acuity Chart II



Version III

The University of Waterloo Distance Visual Acuity Chart III is calibrated for use at 6.0m at which distance it measures acuities ranging from 6/38 (20/125) to better than 6/3 (20/10) in steps of 0.1 log unit.

Acuities poorer than 6/38 (20/124) can readily be measured by walking the patient up to distances which are closer than 6.0m by a multiple of 0.1 log unit.

The distances are as follows:

No. of log units closer	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Testing Distance (m)	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	0.9	0.8	0.6
(ft)	19'8"	15'8"	12'5"	9'10"	7'10"	6'3"	4'11"	3'11"	3'1"	2'6"	2'

These distances need not be memorized since their sequence is the same as the 6m Snellen denominators, but 10 times smaller.

Each of these 0.1 log unit steps closer to the chart will enable the patient to read one further line. Therefore, the line read by a patient a given number of log units closer than 6.0m actually represents an acuity which is that number of log units poorer.

The progression of the visual acuity values beyond 6/60 (20/200) is readily found by referring to the 6m (20 ft) Snellen denominators left of the 6/6 (20/20) line.

Thus the 6/38 (20/125) line read at a distance of 3.8m corresponds to an acuity of 6/60 (20/200), since 3.8m is .2 log units closer than 6.0m and 6/60 (20/200) is 2 lines poorer than 6/38 (20/125). Alternatively a conversion table may be used:

Visual Acuity Conversion Table for 6.0m Chart

6m Snellen Denominators Testing Distances (m)

Smallest Line Read	6.0	4.8	3.8	3.0	2.4	1.9	1.5	1.2	0.9
1 6/38	38	48	60	80	90	120	150	190	240
2 6/30	30	38	48	60	80	90	120	150	190
3 6/24	24	30	38	48	60	80	90	120	150

20ft. Snellen Denominators Testing Distances (ft.)

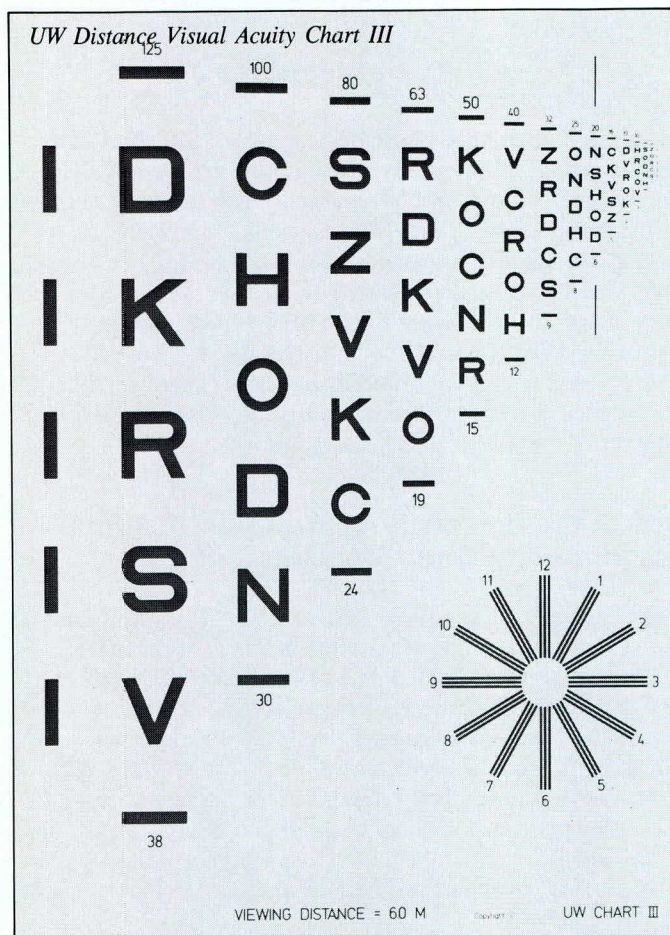
Smallest Line Read	19'8"	15'9"	12'6"	9'10"	7'10"	6'3"	4'11"	3'11"	2'11"
1 20/125	125	160	200	250	320	400	500	630	800
2 20/100	100	125	160	200	250	320	400	500	630
3 20/80	80	100	125	160	200	250	320	400	500

Versions IV and V are low contrast charts. It has been reported that some low vision patients who can discern high contrast letters cannot identify the same letters on a low contrast chart.⁶ Usually these findings are associated with reduced contrast sensitivity function and poor electrodiagnostic responses.

It has been reported that some low vision patients who can discern high contrast letters cannot identify the same letters on a low contrast chart.

A low contrast chart of approximately 0.09-0.1 has been screen printed and a clinical trial of the chart is being conducted at the Centre for Sight Enhancement. The specific low contrast is achieved by matching the diluted black ink visually with a

pre-selected grey sample. In this case, the eye actually serves as a photometer. The procedure to use the low contrast chart is identical to the regular high contrast (approximately 0.9-0.95) chart.



References

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