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Original Article

Validation of Smart phone Based Visual Acuity Charts for Community Outreach Programs.

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INTRODUCTION: Smart phones are gaining importance in all fields of health. If installed in these smart phones, these visual acuity charts could be of use in remote areas because these are handy and can be carried easily.

OBJECTIVE: Primary aim of this study was to find the accuracy of these charts in comparison to clinically used Snellen's visual acuity charts.

METHODS: Visual acuity of total of 100 patients was assessed on standard Snellen's visual acuity chart at a distance of 6 meter and results were compared by checking visual acuity through smart phone installed application of Snellen's chart at distance of 3 meters. Letter size for this chart was kept 44 mm and brightness of smart phone was maximum at time of testing.

RESULTS: Final comparison of Snellen's visual acuity chart named Rest vision chart with clinical Snellen's chart result no significant difference between these two charts. Mean difference of clinical Snellen's chart of 100 patients was 1.62 while mean difference of Rest Snellen's vision chart was 1.65.

CONCLUSION: The study demonstrates that this Rest Snellen's vision chart is valid and quite accurate and can be used for screening purposes for community outreach programs if letter size is 44mm and is tested at distance of 3 meters keeping brightness of smart phone maximum.

KEYWORDS: Smart-phone, Visual acuity, Rest vision chart, Snellen's visual acuity.

INTRODUCTION:

The most common measurement of proper visual function is visual acuity because it can be checked quite easily. Visual acuity is defined as the size of the object that is resolved by an eye. It can be measured by identifying the angle subtended at the eye by the smallest recognizable optotype. In practice, measurement of visual acuity is performed using specialized eye charts.[1]

Many charts are in use to assess visual acuity in clinical practice. The most favorite Charts are Snellen's visual acuity chart and Log MAR based ETDRS charts. Snellen's chart is easy, mainly accepted and common assessment process for measuring VA. However, it has diverse disadvantages like the number of letters increase from top to bottom.

These problems were overcome with introduction of the ETDRS charts, which have equal number of letters in each line, similar and uniform legibility of each line and offer an ease of conversion of VA to a logarithmic scale. The ETDRS charts are now considered as the most accurate and standard method of VA recording, when precise data on VA measurement is required.[2]

Visual Acuity assessment is the most important part of screening programs. It is not easy every time to carry these Charts for screening purposes. In this time of digital world it is easy to install these charts in Computers, Tabs and Smart-phones. But how much these charts are valid is a point of discussion. Computerized Log MAR charts are digital portable and valid visual Acuity testing system. Studies have shown these digital charts are as effective as conventional Visual acuity charts.[3]

The measure to resolve some doubts would be development of computer programs to measure visual acuity. Control of the stimulus presented reduces memorizing the sequence of optotypes, perform instantaneous change contrast, change the font size, switch presentations between linear and angular, insert interaction bars, thus reducing the variability of the measurements obtained with the tables and projectors usually used.[4]

Now-a-days smart phones have changed the living standards of the people of this world. Smart phones are being widely used by everyone in this community. These mobile phones have advantages beyond texts and calls. These mobile phones have larger display screens, personal management tools, high resolution cameras, and recording devices.[5]

Moreover these phones can also be used for research purposes. These smart phones can offer computer applications in comparison to other mobile phones.[6] These phones an easily be used and its psychological acceptance is also good. The recent advances in smart phones have made it possible to use these mobile phones in healthcare programs. These mobile phones are being used in medical field as a personal and professional tool.[7]

Smart phone installed healthcare applications are being broadly used in many developed as well as underdeveloped countries by physicians and surgeons. These healthcare applications are available with various titles. Mobipocket Reader is available for free and includes a library of all eBooks stored in local media.[8]

Smart phone based healthcare applications can also be used by medical as well as nursing students for study and research purposes. Many drug guides and medical eBooks are available for educational needs.[9]

Our main focus is to assess the validity of visual acuity charts installed in smart-phones keeping in mind that these charts are easily portable and will be important tools for screening vision in community outreach programs. It is the reason that the portability of these applications attracts the healthcare professionals to use them in their clinical practice.[10]

It is in discussions and in many parts of the world efforts are being made to design such charts. Smart-phone based visual acuities test agreed well with those of Snellen's and ETDRS charts.[11]

Various studies have been done to find out the accuracy and usage of smart phone based healthcare applications for community outreach programs. Visual acuity charts in clinical practice have some limitations like illumination of these charts in good light and low dissimilarity situations. In good light conditions monocular visual acuity is better on ETDRS charts as compared to dark light conditions.[12]

PATIENTS AND METHODS:

In this study a total of 100 patients were checked. Visual acuity of these patients was assessed first on Snellen's chart then on smart phone based Snellen's vision chart installed in smart phone. This study was applied on different students of College of Ophthalmology and Allied Vision Sciences and patients at Mayo hospital Eye ward. Results of these two charts were compared.

The data was recorded on the Performa, fed on the computer using the SPSS 13.0 software. The results were analyzed and tabulated using the same software.

RESULTS:

Results shows on Snellen's chart 58% of total patients gave visual acuity 6/6-6/9, 22% gave visual acuity 6/12-6/18 while 20% of total gave visual acuity 6/24-6/60. While in same number of patients on smart phone 55% of patients gave visual acuity 6/6-6/9, 25% of patients gave visual acuity 6/12-6/18 and 20% of patients gave visual acuity 6/24-6/60. So, here results can be compared. It shows that accuracy is more in patients with poorer visual acuity. The reason may be letter size and distance difference of both charts.

	Frequency	Percent
6/6-6/9	58	58
6/12-6/18	22	22
6/24-6/60	20	20
Total	**100**	**100**

	Frequency	Percent
6/6-6/9	55	55
6/12-6/18	25	25
6/24-6/60	20	20
Total	**100**	**100**

Results show mean difference and standard deviation of Snellen's visual acuity chart and smart phone visual acuity chart. There is no significant difference between these two charts which shows the accuracy between the results of these two charts.

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
VA Snellen's	100	1.62	0.80126	0.08013
Smartphone VA	100	1.65	0.79614	0.07961

CONCLUSION:

A total of 100 patients was checked for this study. Visual acuity of these patients was assessed first on Snellen's chart at a distance of 6 meters and then visual acuity was taken on smart phone installed application of visual acuity at a distance of 3 meters. This smart phone chart named Rest vision testing chart was downloaded from play store and was installed in Smart phone Samsung galaxy grand prime (SM-G530H). According to requirements and instructions given by owner for usage of this chart were followed. Screen size of this smart phone was 5.0 inches display with resolution power of 540 * 960 pixels.

- Letter size for this screen size was set 44 mm for distance of 3 meters.
- Brightness of smart phone was kept maximum.
- Contrast ratio was 756 (nominal): 1.935 (sun light).

After these settings visual acuity of 100 patients was taken at a distance of 3 meters. Final results were compared. Results showed the mean difference of 1.6200 on **Snellen's** chart and 1.6500 on smart phone vision testing chart. It shows that there is no significant difference between these two charts. In remote areas where **Snellen's** charts are not available or if it is not possible to take this chart **along with** you on screening camps you can use this Rest vision testing chart for more accurate results.

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