Comparison Visual Acuity among different smart phones using PEEK Acuity Application.

Ophthalmol Pak. - Official Journal of College of Ophthalmology & Allied Vision Sciences

Aimen Munir[1], Tahir Shaukat[2], Amina Hashmi[3]
Noor International University[1,3]
University of Lahore[2]

ABSTRACT

Purpose: To assess whether smartphone resolution differences influence visual acuity results when using the Peek Acuity application compared to the Snellen chart.

Methodology: On 398 eyes belonging to 199 patients older than 20 years old, a cross-sectional study was conducted through non-probability convenient sampling. Ethical approval was obtained from the Institutional Review Board, and oral informed consent was taken from all participants prior to data collection. Patients with significant ocular diseases and a VA of less than 6/60 were not included in the study. For simplifying statistical analysis, VA measured via mobile phones (Vivo, Infinix, Redmi, Google pixel) and snellen chart were converted to a log MAR scale. The VA measured using various smartphones and the snellen chart were compared using one-way ANOVA with Bonferroni.

Result: A one-way ANOVA demonstrated no statistically significant difference in visual acuity measurements between the Snellen chart and the PEEK Acuity application used on four different smartphones ($F(4, 3976) = 2.153$, $p = 0.072$). Bonferroni post-hoc analysis confirmed no significant pairwise differences (all $p > 0.05$). These findings indicate that the PEEK Acuity app produced visual acuity results comparable to the Snellen chart, and smartphone device variation did not influence measurement accuracy.

Conclusion: Visual acuity measured using the Peek Acuity app on smartphones of different resolutions was comparable to the Snellen chart, supporting its reliable use for tele-ophthalmology regardless of device type.

Keywords: Telemedicine, smartphone, Visual Acuity

How to cite this article: Munir A, Shaukat T, Hashmi A. A Study on the Comparison of Visual Acuity Recorded by Different Smartphones Using PEEK Acuity. Ophthalmol Pak.2025;15(3):74-79.
DOI: https://doi.org/10.62276/OphthalmolPak.15.03.207

Correspondence: Aimen Munir,
Demonstrator, Noor International University.
Email: aimen1830@gmail.com

Received: 19-10-2025
Accepted: 26-11-2025

INTRODUCTION

The visual system's ability to resolve spatial details is known as visual acuity.[1] Measuring visual acuity (VA) is the fundamental process in any eye care practice. It assesses the general performance of the visual system.[2] VA plays a crucial role in the diagnosis and prognosis of any eye condition.[3] Visual acuity (VA) is a conventional indicator of central visual performance, especially the capability of the eye to discern fine details.[4] In clinical environments, standardized charts are frequently utilized to swiftly evaluate VA.[5] The Snellen chart is the most widely used tool for assessing visual acuity in both ophthalmology and general practice.[6] The implementation of mobile phone technology in health care delivery is growing quickly.[7] Telemedicine tools has been enabling healthcare delivery to patients during since the COVID-19 pandemic and are expected to remain in use for the foreseeable future.[8]

Numerous online tools for testing visual acuity exist.[9] Nevertheless, these acuity tools have not been adequately validated against standard clinical tests.[10] Therefore, it is crucial to validate these tools, especially applications that are accessible for devices like tablets or smartphones and can be downloaded for free.[11] The Google Play Store features over 100 vision test applications, yet very few, if any, have undergone thorough validation.[12]

An app has been introduced named Peek Acuity.[13] To enable anyone to assess their visual acuity using simply an Android smartphone, eye professionals created the Peek Acuity app for smartphones.[14] Peek started off as a project at the London School of Hygiene & Tropical Medicine's (LSHTM) International Centre for Eye Health (ICEH), a research and education organization. Peek has maintained a close working relationship with ICEH[15] and other organizations on research, education, and information dissemination ever after splitting from LSHTM in 2015. The app has been proven by some researches to be quite effective during the global pandemic.[16]

In this study we have recorded visual acuity with various smartphones of different brands such as Redmi, Vivo, Infinix, and Google pixel, to compare the results with vision recorded through Snellen. The rationale of this study is that different smartphones have different levels of resolution. For instance, we cannot consider the resolution of a highly resolution phone with high quality display and a low-resolution phone with a low-quality display as same. The aim of our research is to take VA through Peek acuity application with different smartphones, and compare it with snellen (the standard procedure) to analyze whether the peek acuity app will give same results on different smartphones with varying resolution or the resolution will prove to be a limitation to this app.

METHODOLOGY

This cross-sectional analytical study was conducted at the National Eye Center, Lahore, after obtaining ethical approval from the Institutional Review Board. A convenient sample of 199 participants (398 eyes) aged above 20 years was recruited. The sample size was calculated using formula $n = \frac{Z^2pq}{d^2}$ with Z = 1.96, p = 0.5, q = 0.5, and d = 0.07, resulting in a minimum required sample of 196 participants. The sampling method was nonprobability convenient sampling.

Participants with clear ocular media and best-corrected visual acuity better than 6/60 were included, while those with significant ocular disease, history of ocular trauma or surgery, or uncorrectable low vision were excluded. Written informed consent was obtained prior to enrolment.

Visual acuity was measured monocularly with best-corrected distance vision using both the Peek Acuity app and a standard Snellen chart. Four smartphones (Vivo Y71, Infinix Hot 10 Play, Redmi Note 8 Pro, and Google Pixel 6) were used for digital testing. All assessments were performed in controlled lighting conditions with standardized testing distances; smartphones were set to maximum brightness.

Results were recorded in logMAR units for uniformity. Data was analyzed in SPSS version 26. One-way ANOVA with Bonferroni post-hoc testing was used to compare visual acuity measurements between the smartphones and the Snellen chart. A p-value < 0.05 was considered statistically significant.

SPECIFICATIONS OF DIFFERENT SMARTPHONES (Google pixel 6, Infinix Hot 10 play, Vivo y71, Redmi note 8 pro)

Specifications		Google pixel 6	Infinix Hot 10 play	Vivo y71	Redmi note 8 pro
Launched		Released 2021, October 28	2021, January 21	2018, April	2019, September 24
Display	Type	AMOLED,90Hz	IPS LCD,440 nit	IPS LCD	IPS LCD, HDR,500 nits
	Size	6.4 INCHES	6.82 inches	6.0 INCHES	6.53 inches
	Resolution	1080x2400 pixels, 20.9 ratio	720x1640 pixels (~263 ppi density)	720x1440 pixels,18:9 ratio	1080x2340 pixels, 19.5:9 ratio
Policy	OS	Upgradeable to Android 13 from version 12	Android 10, XOS 7	Android 8.1, fun touch 4	Upgradeable to Android 11.5, MIUI 12.5, and Android 9.5 (Pie)
	Chipset	Google tensor (5nm)	MT6762 Helio G25 (12NM) from Mediatek	Qualcomm MSM8917 Snapdragon 425(28nm)	Mediatek Helio G90T (12nm)
	GPU	Mali-G78 MP20	PowerVR	Adreno 308	Mali-G76 MC4

RESULT

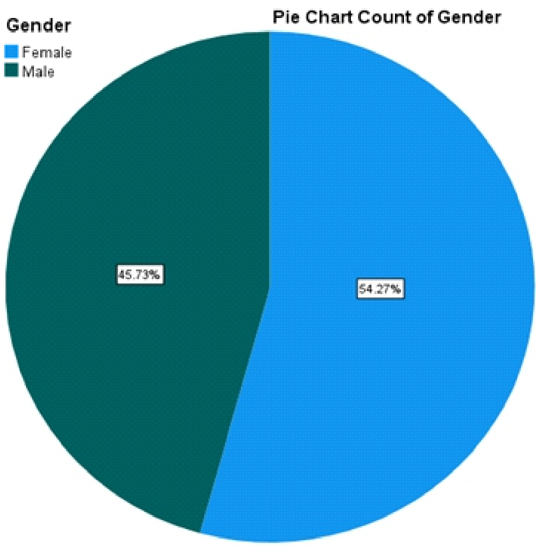

Fig 1.0 Frequency Of Male And Female

This study included 199 (Male 45.73%, Female 54.27%). The ratio of visual acuities is shown in Fig1.1. There was a higher ratio of emmetropic patients. This study compares Visual acuity taken digitally with different devices (infinix, Vivo, Google pixel, Redmi) with Snellen standard chart visual acuity.

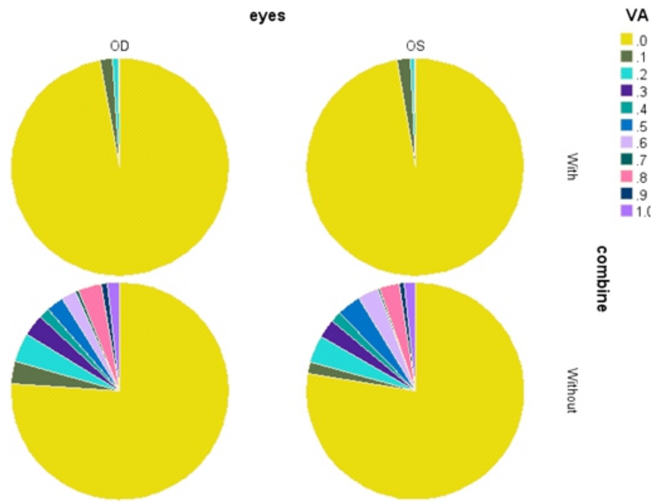

Fig 1.1 Frequency of Visual Acuities

TABLE 1.0: ANOVA					
VA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.280	4	.070	2.153	.072
Within Groups	129.316	3976	.033		
Total	129.596	3980			

The table shows the end results of right and left eyes of 199 patients. It shows no significance within the groups and between the groups.

Table 1.1: COMPARISON OF VISUAL ACUITY AMONG DIFFERENT SMARTPHONES (BONEFERRONI TABLE)

MULTIPLE COMPARISONS						
DEPENDENT VARIABLE: VA						
BONFERRONI						
(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Snellen	Infinix	.0181	.0090	.450	-.007	.044
	Vivo	.0250	.0090	.056	.000	.050
	Redmi	.0182	.0090	.435	-.007	.044
	Google Pixel	.0181	.0090	.450	-.007	.044

MULTIPLE COMPARISONS

Dependent Variable: VA

Bonferroni

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Snellen	Infinix	.0181	.0090	.450	-.007	.044
	Vivo	.0250	.0090	.056	.000	.050
	Redmi	.0182	.0090	.435	-.007	.044
	Google Pixel	.0181	.0090	.450	-.007	.044
Infinix	Snellen	-.0181	.0090	.450	-.044	.007
	Vivo	.0069	.0090	1.000	-.018	.032
	Redmi	.0001	.0090	1.000	-.025	.026
	Google Pixel	.0000	.0090	1.000	-.025	.025
Vivo	Snellen	-.0250	.0090	.056	-.050	.000
	Infinix	-.0069	.0090	1.000	-.032	.018
	Redmi	-.0068	.0090	1.000	-.032	.019
	Google Pixel	-.0069	.0090	1.000	-.032	.018
Redmi	Snellen	-.0182	.0090	.435	-.044	.007
	Infinix	-.0001	.0090	1.000	-.026	.025
	Vivo	.0068	.0090	1.000	-.019	.032
	Google Pixel	-.0001	.0090	1.000	-.026	.025
Google Pixel	Snellen	-.0181	.0090	.450	-.044	.007
	Infinix	.0000	.0090	1.000	-.025	.025
	Vivo	.0069	.0090	1.000	-.018	.032
	Redmi	.0001	.0090	1.000	-.025	.026

In the above, Bonferroni table of both right and left eyes clearly shows the comparison of each group with the other, as mentioned above all the smartphones show equivalent results to Snellen. Results showed non-significant (P value 1.00) with all devices. Table 1.0 and Table 1.1. Significance level was considered 0.05.

DISCUSSION

Our study found no statistically significant differences in visual acuity (VA) measurements between the standard Snellen chart and the PEEK Acuity app across four smartphones of varying resolutions (Vivo Y71, Infinix Hot 10 Play, Redmi Note 8 Pro, Google Pixel 6). This suggests that under standardized test conditions (controlled lighting, fixed distance, maximum screen brightness), device specification differences—including display technology and resolution—had minimal impact on VA measurement outcomes.

This finding aligns well with existing evidence. A systematic review by Samanta et al. reported that among remote VA apps, PEEK Acuity exhibited the highest correlation with in-clinic ETDRS measurements (mean difference ~0.055 logMAR) and very good test-retest reliability (±0.029 logMAR) in home-based settings.'—— Their work supports the notion that smartphone-based VA testing can yield clinically meaningful results independent of device variation, provided consistent protocols are followed.

Further, Massie et al. examined the role of optometry in telehealth and concluded that tele-optometry modalities are viable adjuncts to in-person care but noted evidence gaps around clinical equivalence and device variability. Our data contributes to closing that gap by demonstrating device-independence within normal acuity ranges.

Earlier research by Zhao et al. involving children found an intraclass correlation coefficient (ICC) of 0.88 between PEEK Acuity and traditional VA assessment in ages 3–17, indicating good agreement in pediatric screening contexts. Our adult-based sample complements this by indicating similar accuracy in mature populations across different smartphone models.

Moreover, the validation of the PEEK near-vision test in community screeners showed agreement limits of −0.11 to +0.07 logMAR and achieved high sensitivity (~91 %) and specificity (~99 %). Although focused on near vision and a different device set, this supports the robustness of the PEEK platform across vision testing conditions.

Taken together, the literature suggests that when testing conditions are standardized, smartphone-based acuity tools perform comparably to gold-standard charts—and our findings reinforce this in the specific context of device resolution differences. From a practical standpoint, this is important: many tele-ophthalmology and community screening programs cannot mandate specific smartphone models, so device-agnostic reliability is a key advantage.

Our study adds value by systematically comparing multiple smartphone models with distinct display technologies (LCD vs AMOLED), resolutions and hardware, and still showing no meaningful difference in outcome. This strengthens the argument for deploying PEEK Acuity in diverse real-world settings even where users may have older or lower-specification smartphones.

Limitations include our sample of adult participants with relatively good ocular health and best-corrected vision; results may differ in populations with poor vision or ocular pathology (e.g., dense cataract, media opacities). Also, testing was done under controlled conditions in a clinical environment; home-based or unsupervised use may introduce additional variability. Future research should assess device-independent performance in more heterogeneous populations, varied lighting environments, and unsupervised settings.

In summary, our findings support the deployment of PEEK Acuity as a reliable, practical alternative for visual acuity screening, independent of smartphone resolution, in tele-ophthalmology and optometry programs.

CONCLUSION: When compared to the standard Snellen chart, the visual acuity measured by smart phones (Redmi Not 8 Pro, Google Pixel 6, Vivo Y71, Infinix Hot 10 Play) utilizing the peek acuity application can be utilized as an efficient and trustworthy replacement to assess VA in tele-ophthalmology.

Conflict Of Interest: None to declare

Ethical Approval: The study was approved by the Institutional Review Board / Ethical Review Board vide ref No. NEC/ERB/23815/2024 dated 01.02.2024 National Eye Center, Lahore.

Authors' Contributions:

Aimen Munir: Concept, Design, Literature search, Data acquisition, Data analysis, Statistical analysis.

Tahir Shaukat: Manuscript preparation, Manuscript editing.

Amina Hashmi: Manuscript review.

REFERENCES:

1. Bennett AG. Ophthalmic test types. A review of previous work and discussions on some controversial questions. Br J Physiol Opt. 1965;22:238-271.
2. Campbell FW, Green DG. Optical and retinal factors affecting visual resolution. J Physiol. 1965;181:576-593.
3. Bhaskaran A, Babu M, Abhilash B, Sudhakar NA, Dixitha V. Comparison of smartphone application-based visual acuity with traditional visual acuity chart for use in tele-ophthalmology. Taiwan J Ophthalmol. 2022;12:155-163.
4. Kniestedt, C. & Stamper, R. Visual acuity and its measurement. Ophthalmol. Clin. N. Am. 2003;16:155–170.
5. Anstice, N. S. & Thompson, B. The measurement of visual acuity in children: an evidence-based update. Clin Exp Optom. 2014;97:3–11.
6. Bastawrous A, Rono HK, Livingstone IA, Weiss HA, Jordan S, Kuper H, et al. Development and validation of a smartphone-based visual acuity test (Peek Acuity) for clinical practice and community-based fieldwork. JAMA Ophthalmol. 2015;133:930-937.
7. Tofigh S, Shortridge E, Elkeeb A, Godley BF. Effectiveness of a smartphone application for testing near visual acuity. Eye (Lond). 2015;29:1464-1468.
8. Satgunam P, Thakur M, Sachdeva V, Reddy S, Rani PK. Validation of visual acuity applications for teleophthalmology during COVID-19. Indian J Ophthalmol. 2021;69:385-390.
9. Wu RC, Morra D, Quan S, Lai S, Zanjani S, Abrams H, et al. The use of smartphones for clinical communication on internal medicine wards. J Hosp Med. 2010;5:553-559.
10. McGraw P, Winn B, Whitaker D. Reliability of the Snellen chart. BMJ. 1995;310:1481-1482.
11. Lovie-Kitchin JE. Validity and reliability of visual acuity measurements. Ophthalmic Physiol

Opt. 1988;8:363-370.

12. Brady CJ, Eghrari AO, Labrique AB. Smartphone-based visual acuity measurement for screening and clinical assessment. JAMA. 2015;314:2682-2683.

13. Katibeh M, Sabherwal S, Pandian D, et al. Development and validation of a digital (Peek) near visual acuity test for clinical practice, community-based survey, and research. Transl Vis Sci Technol. 2022;11:18.

14. de Venecia B, Bradfield Y, Trane RM, Bareiro A, Scalamogna M. Validation of Peek Acuity application in pediatric screening programs in Paraguay. Int J Ophthalmol. 2018;11:1384-1389.

15. Perera C, Chakrabarti R, Islam FMA, Crowston J. The Eye Phone Study: reliability and accuracy of assessing Snellen visual acuity using smartphone technology. Eye (Lond). 2015;29:888-894.

16. Davara ND, Singh J, Shukla R, et al. Feasibility study for measuring patients' visual acuity at home by their caregivers. Indian J Ophthalmol. 2022;70:2125-2130.

17. Samanta A, Mauntana S, Barsi Z, Yarlagadda B, Nelson PC. Is your vision blurry? A systematic review of home-based visual acuity for telemedicine. J Telemed Telecare. 2023;29:81-90.

18. Massie J, Block SS, Morjaria P. The role of optometry in the delivery of eye care via telehealth: a systematic literature review. Telemed E-Health. 2022;28:1753-1763.

19. Zhao L, Stinnett SS, Prakalapakorn SG. Visual acuity assessment and vision screening using a novel smartphone application. J Pediatr. 2019;213:203-210.

20. Sabherwal S, Javed M, Watts E, Katibeh M, Pintus A, Latorre-Arteaga S, et al. Near visual acuity measurements by community screeners using digital (Peek) testing versus conventional charts in India. Transl Vis Sci Technol. 2025;14:24