

Comparing the Peek Acuity and Vula Vision mobile apps for visual acuity test accuracy, fail rate and test duration

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INTRODUCTION

Peek Acuity is a smartphone-based vision check app developed by eye experts to allow anyone to check visual acuity using only an Android smartphone. Peek Acuity helps screen and identify people who need further examination and has been proven to be as accurate as conventional vision tests in peer-reviewed research. Another visual acuity screening app developed by Vula Mobile was launched in 2014 and since then this award-winning system, which uses apps to connect health workers with specialists, has been used to test the vision of over 30,000 people across South Africa. Table 1 provides a comparison between the Peek Acuity and Vula Vision acuity tests.

Table 1. Comparison between Peek Acuity and Vula Vision mobile apps

	Vula Vision	Peek Acuity
Test Method	Tumbling 'E' test	Tumbling 'E' test
Test Procedure and Instructions	Test one eye at a time. Patient is 2m from the facilitator. Cover opposite eye loosely with one hand.	Test one eye at a time. Patient is 2m from the facilitator. Cover opposite eye loosely with one hand.
Test Execution	'E' presented at various sizes and pointing in randomised directions of up, down, left or right.	'E' presented at various sizes and pointing in randomised directions of up, down, left or right.
Test Responses	Patient responds by pointing with their free hand the direction the 'E' is pointing. If the 'E' is not visible the patient responds by saying the 'E' is not visible.	Patient responds by pointing with their free hand the direction the 'E' is pointing. If the 'E' is not visible the patient responds by saying the 'E' is not visible.
Test Duration	Less than 2 minutes for both eyes.	Less than 2 minutes for both eyes.
Capturing of test results interface for facilitator	Swipe on the tablet screen in the direction the patient is pointing OR Use the YES/NO buttons on the screen. Select YES if the patient indicated the direction correctly or NO if the patient indicated the direction incorrectly or is unable to see the 'E'.	Swipe on the tablet screen in the direction the patient is pointing. Shake the device if the patient can't see the 'E'.
App Operating Systems	Android and iOS	Android
Test Results	LogMar and Snellen scores	LogMar and Snellen scores
Refer Criteria	Adjustable. Set up by the facilitator via the app settings.	Adjustable. Set up by the facilitator via the app settings.
Protocols	Clinical threshold seeking. Test distance of 2m.	Clinical threshold seeking. Adjustable test distance of 2m or 3m.

OBJECTIVES

To compare the Vula Vision visual acuity app to the Peek Acuity app in terms of:

- LogMar acuity score;
- Fail rate correspondence using identical cut-off logMar scores; and
- Test duration.

METHOD

A sample of 134 subjects was recruited, of which 5 subjects were younger than 18 years. Age ranged from 7 - 76 years with an average age of 37 years.

A within-subject design was used to determine the visual acuity with the two test methods (Peek Acuity and Vula Vision) with a counterbalanced design.

Equipment

Data collection was conducted in various office, optometry clinics and old-age home settings. All rooms were fitted with a chair with a backrest for the test subjects to be seated for the duration of testing. A measuring tape was used to measure a 2 meter distance from the test subject's eyes. Marking tape was placed on the floor of each room to indicate the position of the chair's front legs as well as the position of the test facilitator's feet. Good lighting was ensured at all times by making use of natural, as well as ceiling lights in the testing rooms.

RESULTS

There was no statistically significant difference between the Logmar scores for left ($p>0.05$; paired samples T-test) or right eyes ($p>0.05$; paired samples T-test) using Peek Acuity and Vula Vision acuity measurements (Table 2). The average difference between the LogMar scores obtained between the Vula Vision and Peek Acuity within-subject tests was -0.01 for left and right ears with standard deviations of 0.12 and 0.50, respectively.

Based on a referral criteria of at least one eye presenting with a LogMar score of >0.2 there was no significant difference in test outcomes between Peek Acuity and Vula Vision ($p<0.001$; Chi-Square) with a 92% overall correspondence.

There was a significant difference in test duration between Peek Acuity and Vula Vision ($p<0.01$; Paired samples T-test) with Vula Vision being 18 seconds (36-second standard deviation) faster on average (Table 3). This translates to a 23% improvement in test time using Vula Vision compared to the Peek Acuity test.

Procedures

The test facilitator marked a line on the floor and aligned the front legs of the chair with the line. A demo test subject was positioned on the chair and held a measuring tape between the eyes. A distance of 2 meters was measured from the demo test subject's eyes. A line at the 2 meter mark was indicated on the floor. This is where the test facilitator's feet are to be positioned when conducting the tests.

The test subject was seated comfortably on the chair with their back against the backrest. The test facilitator was positioned at the 2 meter mark with feet in line with the marked line on the floor facing the test subject. The test facilitator held the testing device at eye level against his/her chest with the screen facing towards the test subject to have full visibility of the screen of the testing device.

The facilitator alternated the test order to counterbalance the data collection using the same device. The facilitator faced the test subject and presented the test on a screen. Test subjects had to cover one eye while testing the other eye. Test subjects indicated the direction of the 'E'. If participants were unable to confidently identify the direction of the 'E', the facilitator had to shake the phone (Peek Acuity) or select 'No' (Vula Vision) on the test screen.

Default test paradigm employed by the Peek Acuity and Vula Vision acuity screening apps were used.

Table 2. Acuity comparison between Vula Vision and Peek Acuity test results (n=134)

	Vula Vision	Peek Acuity
n	134	134
Ave LogMar - Left (SD)	0.13 (0.8)	0.14 (0.8)
Range LogMar - Left	-0.3 to 5.0	-0.1 to 5.0
Ave LogMar - Right (SD)	0.15 (0.9)	0.17 (0.9)
Range LogMar - Right	-0.3 to 5.0	-0.1 to 5.0

Table 3. Time comparison between Vula Vision and Peek Acuity tests (n=134)

	Vula Vision	Peek Acuity
n	134	134
Average test duration (SD)	59.4 sec (22.1)	76.8 sec (43.5)

CONCLUSIONS

There was no statistically significant difference between the LogMar scores obtained using the Peek Acuity or Vula Vision acuity tests. Based on a fail criterion (>0.2 Logmar) the pass and fail outcomes were significantly associated between Peek Acuity and Vula Vision tests with an 92% overall correspondence. Vula Vision test was 23% faster on average compared to Peek Acuity test.