Moorfields Eye Hospital NHS
NHS Foundation Trust

Consumer electronic devices as low vision aids

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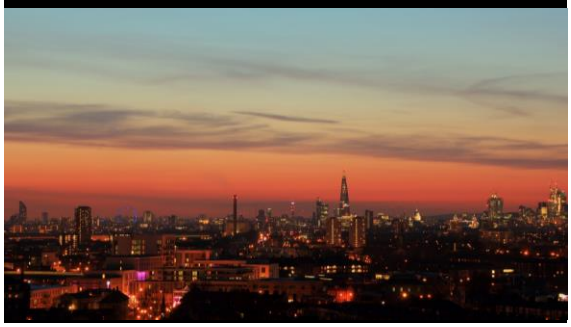
- Work performed with Antonio Filipe Macedo, University of Minho, Portugal

Universidade do Minho 1974-2014

- And by me in London



More than half of all British adults have a smartphone

170,000,000 iPads have been sold since 2010

1,500,000 books are available to download on Kindle

Anecdotally, many people with visual impairment use these devices

The theory: Visual requirements for electronic device use

eReaders

- Sony Reader, Amazon Kindle 2
  - Maximum text size 0.7 logMAR
    - OK if VA 6/12 or better
  - Screen contrast 62%
    - OK if CS 1.10 log or better
    - Approx 97% older population
- Crossland, Macedo, Rubin, *Brit J Ophthalmol* 2010

Smartphones and tablets

- Near 100% contrast
  - Fluent reading (10:1) if CS >10% (1.0 log unit)

The practice: Actual use of electronic devices

Research question

How do people with visual impairment use smartphones, tablet computers and eReaders?

- What devices do they use?
- What do they do with them?
- What accessibility features do they use?

Method

- Online survey (surveygizmo.com)
- One in English, one in Portuguese
- Publicised through colleagues, online discussion groups, Twitter

Survey asked…

- Age
- Level of vision (no vision/low vision)
- Diagnosis
- Whether they used smartphones, tablet computers, eReaders
- What device they own
- What they do with it
- What accessibility options are helpful

Results: Participants

132 complete responses to survey
Global spread of responses
52 from the UK
40 from Portugal
15 from USA

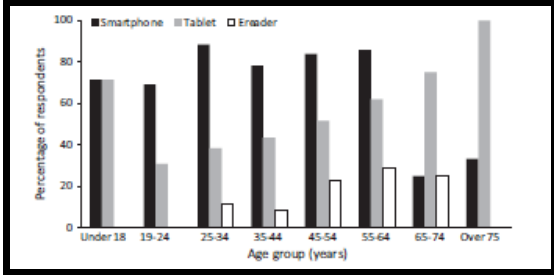
34/132 (26%) described self as 'no vision'

Modal age: 45-54 years

Results: Diagnosis

Nystagmus	15
Glaucoma	14
RP	10
AMD	9
Optic atrophy	7
Other macular	6
Genetic condition	6
Albinism	4

Age and device use

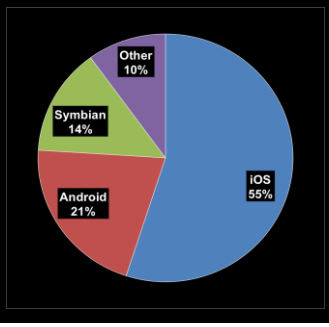


Smartphones

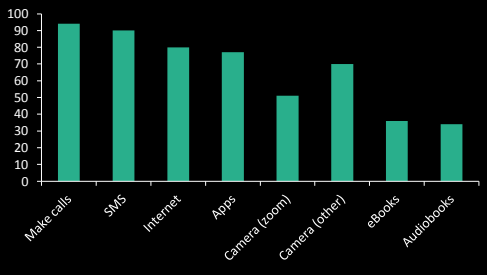
Smartphone use

- 107/132 (81%) used a smartphone

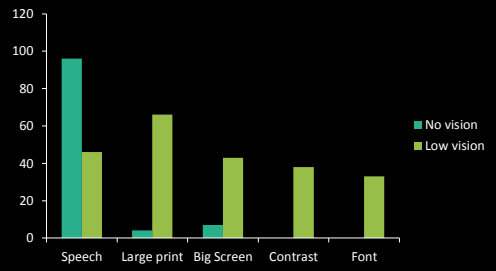
Smartphone: operating system



Results: Smartphone use



Results: Accessibility options



No vision vs. Low vision

- 28/34 with no vision use smartphone (82%)
- 79/98 with low vision use smartphone (80%)
- People with no vision more likely to use text-to-speech
- Nearly half of those with low vision used text-to-speech as well

Why don't you use a smartphone?

- Cost (7 people)
- Don't think would be able to use (7)
- Not interested (6)
- Never thought of it (4)

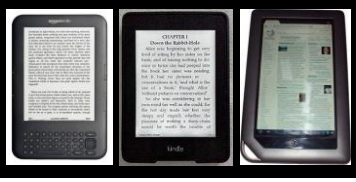
Electronic readers

Results: eReaders

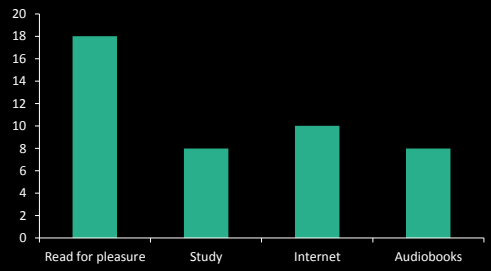
22/132 (17%) used an eReader

eReader: screen type

13/22 (60%) electronic paper, no backlight
2/22 illuminated backlit display
4/22 LCD display
3/22 don't know



eReader: activities performed



eReader: accessibility

- Enlargement (13 people)
- Font choice (10 people)
- Speech (8)

eReader: no vision vs low vision

- 20% of people with low vision used eReader
- 6% of those with no vision

Why don't you use an eReader?

- Not interested (32 people)
- Don't think could use it (14)
- Too expensive (13)

Tablet computers

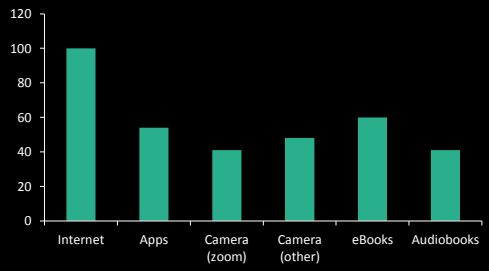
Results: Tablet use

63/132 (48%) of respondents use a tablet computer
- 50% of those with low vision, 41% of those with no vision

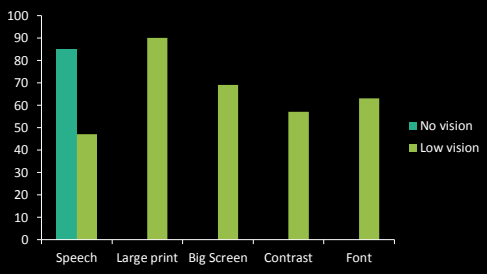
Why not?: can't afford (25), not interested (10)

45/63 (71%) use an iPad
- Kindle Fire, Android,Microsoft Surface also used

Results: Tablet use



Results: Accessibility options



iPad supports Braille devices

Apps...

Results: Apps

Most common: Facebook, BBC iPlayer, Dropbox, Twitter...

Specific VI apps:
- Digiteyes, Amsler grid, Dragon dictation, Vision Sim, MD evReader, TapTapSee, Goodreader

TapTapSee

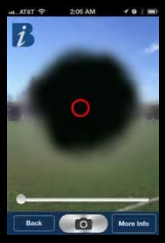
- Photo recognition app
- iPhone only
- Free then $8/100 pictures

VizWiz

- Crowdsourced video recognition
- iPhone only
- Free

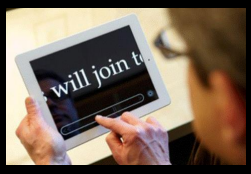
VisionSim

- Vision impairment simulator
- iPhone/Android
- Free



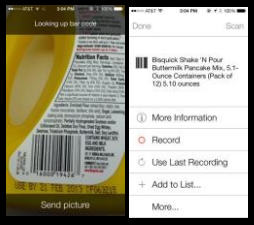
MD evReader

- Scrolled text display on iPad/TV
- Free
- Various colour/contrast options
- Developed by Royal Holloway, University of London



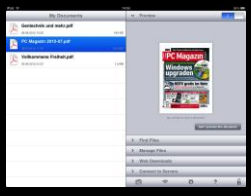
Digiteyes

- Barcode identifier
- iPhone
- $10



GoodReader

- Powerful PDF reader/annotator
- Works with speech
- iPhone/iPad



Dragon dictation

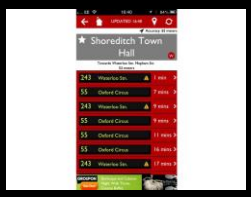
- Speech to text software
- ?less needed with Siri etc
- iPhone/Android
- Free

Ariadne GPS

- Talking GPS with local information
- $6
- iPhone

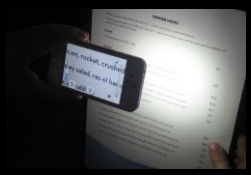
Buses due

- Various free travel apps
- iPhone/Android/ Windows



Vision Assist/SuperVision Plus

- Portable magnifier app
- Image stabilisation
- Magnification
- Contrast reversal
- Distance and near



- Quality questionable

Information

How did you find out about using electronic devices for low vision?

Was told by a friend	29%
Found out online	23%
Was told by a rehab worker/TVI	4%
Was told by a local organisation	3%
Was told by an optometrist	1.5%
Was told by an ophthalmologist	0

Discussion

Does this mean the end of portable electronic magnifiers?

NO!

…or at least NOT YET

Image quality

Image shake

Ease of use

Does this mean the end of optical magnifiers?

NO!

Convenience

Cost

When the battery runs out…

Does this mean the end of low vision clinics?

NO!

Appropriate refractive correction

Advice

Optical magnifiers

Training (including in consumer device use?)

Limitations

Self-selected group of expert users
- Recruited online; able to access online survey; interested in answering survey

Self-reported vision status
- Instructions for "reduced vision even with glasses or contact lenses"
- Diagnoses (free text) were consistent with visual impairment

Discussion

iPad the most popular tablet
- as accessibility better, or just as first mainstream device?

Electronic books least used (in this population of "online" people)

Cross-sectional prevalence study would be very interesting

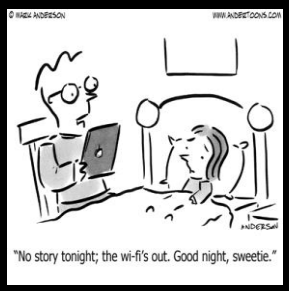
Conclusions

Tablet computers can be used by people with visual impairment

Speech is used by nearly half of those with low vision, and nearly all of those with no vision

40% use their tablet's camera and screen as a magnifier

Thank you for your attention



Thank you for your attention

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