Is It Worse Doctor?

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Is it worse doctor?

- Common question
  - Usually as the patient enters the room 😊
- What does the patient think ‘worse’ means?
- What do we think worse means?
- Has ‘it’ really changed?
  - e.g. visual acuity
Agenda

- Visual acuity measurement
- What are we measuring?
- Why and how do we measure it?
- Chart types
- Live measuring
- Has it changed doctor?
- Causes of variation
- Can we do better?
What are we measuring?

- Ability of visual **system** to see fine detail
  - High contrast – plain black on white

Limit

Minimum size that can be detected = 1 minute of arc
How low can you go?

- Theoretical limit due to
  - Optical properties of the eye
    - 45 minutes of arc
  - Separation of cones at the fovea
    - Also 45 minutes of arc

www.alpao.com
Measuring acuity

- Part of the DESP screening protocol
- Used in M1 maculopathy definition
  - 6/12 or worse with retinopathy within 1DD
    - Probably not very good
- Letter charts commonly used
Are letters any good?

- Familiar task
- 26 letters so hard to guess, but...
- Some letters easier to read than others
- **Approx** equal legibility
  - BS4274 – DEFHNPRUVZ
  - Sloan – SDKHNOCVRZ

Herman Snellen
1834-1908
www.zazzle.co.uk
Well done Herman, but...

Snellen chart has serious flaws

- Crowding phenomenon
  - Number of letters on line
    - From one to eight
  - Spacing between letters
  - Spacing between lines
- Irregular jump in size
  - 6/60 to 6/36 = 40% change
  - 6/12 to 6/9 = 25% change
- Recording system
LogMAR charts

- LogMAR = \( \log_{10} \) Minimum Angle of Resolution
  - Minimum gap that can be detected = 1 min of arc
    - \( \log_{10} 1 = 0 \) so 6/6 on logMAR chart scores 0.00

- Standard scoring not intuitive
  - Score -0.02 per letter
  - E.g. three letters on 0.2 line gives score of 0.24
  - Better than 6/6 gives minus score so 6/5 = -0.10
Advantages of logMAR chart

- Same task at every size
  - 5 letters per line (crowding)
  - Equal mix of letter difficulty on each line
  - Each line 33% smaller than one above
  - Spacing between lines equal to letter size below
- Vision below 1.00 (6/60)?
  - Halve the test distance and add 0.30 to the score
Why don’t we use LogMAR more?

Disadvantages (not major)

- Big chart 60cm square
- Slower as more letters to read
- Scoring clunky
  - But you get used to it...
- More M1 false positives
  - Maybe because of poor technique
Why do measurements vary?

- There is no such thing as an absolutely accurate measurement
- Repeat test 10 times one after the other
  - Same subject, operator and equipment
- Will we get the same result each time?
  - Very unlikely, yet the subject hasn’t changed!
- Called test-retest variability (TRV)
Distribution curves

- Physiological measurements tend to show normal distribution (or similar)
So how tall am I?

95% certain that my true height is between 1.795cm and 1.865cm
Test-retest variability

- Higher TRV = lower ability to detect change
- If the test itself varies, how do you know whether change is genuine or just chance?
- ‘Change’ must at least exceed the TRV
Has my vision changed doctor?

- To be reasonably certain (95% confident) the ‘change ‘ is genuine (significant)
  - LogMAR +/-0.07 to 0.20 = 3.5 to 10 letters
    - +/-0.15 = 7 or 8 letters for children
  - Snellen +/-5 to 16 letters
    - Worse for patients with pathology

- And that’s under ideal test conditions...

- But don’t ignore a trend
Can we do better?

- Causes of variation
  - Glasses (varifocals)
  - Test distance
  - Illumination
- Repeat test, even dilated
- The Terminator
The Terminator

At what point do you allow the patient to stop attempting to read letters?

- **logMAR**
  - Not until they get at least half the letters on a line wrong

- **Snellen**
  - No established method
  - Complete line and any number on next line?
  - From 6/18 down
    - Continue if up to 2 errors on a line?

VA = 0.86 LogMAR

![LogMAR Chart]

![Snellen Chart]
Take home messages

- Don’t read too much into small apparent changes in acuity
  - But don’t ignore a trend!
- Consider switching to LogMAR charts
  - Ideally electronic
- Agree on and implement a termination point