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The Balsam Alabdulkader-Leat (BAL) Chart!

Continuous-text reading acuity charts in Arabic for normal and low vision

The BAL acuity Chart (Alabdulkader & Leat, 2017) is the first standardized continuous text near visual acuity chart in Arabic for normal and low vision. It was designed based on the accepted design criteria for reading acuity charts. It has a wide range of potential applications, including in clinical assessment and research studies of reading. Clinical applications include measurement of near visual acuity for adult patients and children of grade 3 upwards, determination of near reading additions for presbyopes, prediction of performance with magnification devices, estimation of magnification, and measurement of performance with low vision devices. The chart may also be used in research settings when reading performance needs to be assessed as an outcome measure of studies of treatment, therapies or rehabilitation. . There are three versions of the chart containing different test sentences, which can be used interchangeably for repeated measures, e.g. to measure change over time or to measure reading performance for the right, left and binocular viewing.

The size of the print of the BAL chart was calibrated against English logMAR reading charts, i.e. the logMAR print sizes of the sentences was determined empirically.

Using the BAL Chart

Conditions for testing

The chart should be evenly lit so that no shadows or glare will interfere with reading. The luminance of the white background on the charts should be approximately 100 cd/m^2. This is usually achievable using ordinary room lighting or desk lamps.

The print sizes and markings on the chart are designed for testing at the standard reading distance of 40 cm (16 inches). However, the range of print sizes can be extended to larger values for low vision by testing at a shorter viewing distance.

For clinical measurement of near acuity in normally-sighted patients, the patient can be asked to read the smallest line of print that they are able. For assessment in patients with low vision, the patient is asked to read the sentences aloud from the top, as quickly and accurately as possible. The clinician notes the fluency/speed of reading for the largest print sizes (maximum reading speed), the print size at which the patient's reading noticeably slows (the previous level is the clinically measured Critical Print Size - CPS), and the smallest print size that the patient can read the majority of the words (reading visual acuity). The reading speed for large print (maximum reading speed) is a good indication of the potential reading speed with magnifying devices, and the CPS and reading acuity can both be used to estimate the magnification required.

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The visual acuity can be recorded as logMAR or as point print. If testing is undertaken at a different distance than 40 cms, reading acuity and CPS can be either be recorded as point print at the distance used or the logMAR equivalent can be calculated according to the following equation:

$$\text{Equivalent logMAR} = \text{labelled logMAR value} + \log^{10}\left(\frac{40}{\text{viewing distance in cm}}\right)$$

For research assessments, it is recommended that the experimenter cover the chart and expose each print size at a time. The experimenter should use a stop watch to record how long it takes for the participant to read each print size (pair of sentences) and any errors that the participant makes. The number of errors for each sentence should be noted as the number of characters. Ideally, the participant should be recorded with an audio or video recorder, so that the time taken to each print level and the errors can be calculated afterwards. In this case, the participant can be asked to read down the chart from the top, as the time and errors can be recorded later. For research purposes, the Maximum Reading speed, CPS and Reading Acuity are accurately calculated as described below.

Reading performance measures

Each version of the BAL chart contains 15 print size levels in a sequence of decreasing print size. The testing results can be plotted to show a person's reading speed or accuracy as a function of print size. Three reading performance measures: maximum reading speed, reading acuity and the critical print size (CPS) can be calculated as follows:

Maximum reading speed

The BAL chart sentences have the same number of characters and the same spatial layout throughout the charts. Reading speed can be calculated in standard length words per minute (SLWPM). The standard word length in Arabic is estimated to be five characters. Each level of the BAL chart has 20.4 standard words. Maximum reading speed in SLWPM can be calculated by the equation below

$$\text{Reading speed (SLWPM)} = 60 * \frac{(20.4 - (\frac{\text{\# of errors in characters}}{5}))}{\text{time in seconds}}$$

Reading acuity

Reading acuity (or reading threshold) takes into account the number of errors that are made at each print size level. This is similar to the "by-letter" method that is used for measuring distance visual acuity with a logMAR chart. The step size is divided by the number of words on each print size level so that

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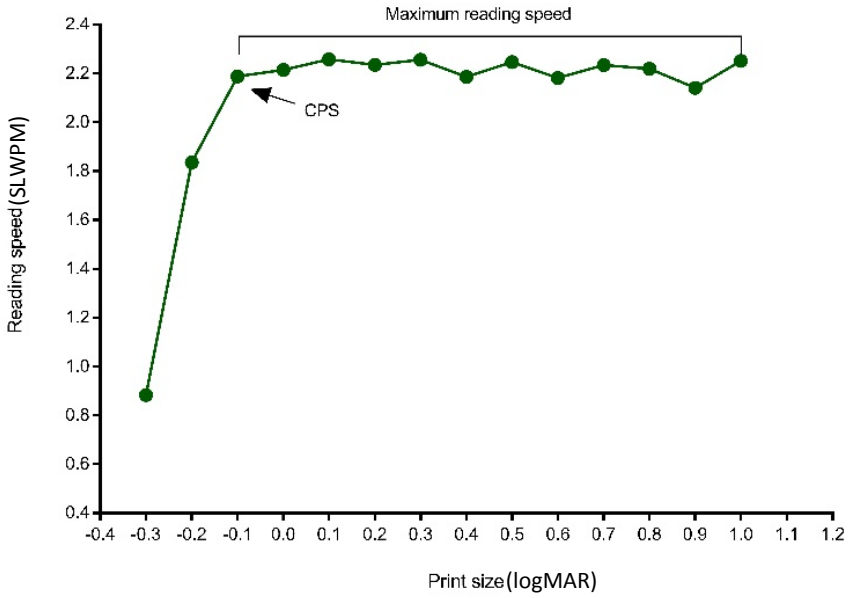
each word in the sentence has a weight. This means that as the number of errors increases, the final reading acuity decreases. Reading acuity using the BAL chart can be calculated as follows

$$\text{Smallest size attempted} + \left[\left(\frac{\text{numbers of errors in characters}}{5}\right) * 0.005\right)]$$

The critical print size

The critical print size is the smallest print size within the reading speed plateau (see figure). For patients with normal vision, it is relatively easy to determine the CPS from the reading speed curve by eye. For low vision patients, it can be more difficult to estimate. It can be defined as the smallest print that results in a reading speed within 0.1 log reading speed (80%) of the average reading speed of the plateau or that was higher or equal to the lowest reading speed in the plateau (for example, if there was another point within the reading speed plateau that was lower than 0.1 below the average, see Alabdulkader & Leat, 2017).



References

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