

Purpose

As visual acuity tests are poor predictors of the real-world function, performance-based tests, e.g., reading speed measurements, can be used to better quantify near visual function.^{1,2} Because sentence complexity influences reading performance, the original German-language Radner Reading Chart^{3,4} emphasizes the principle of highly standardized sentences, i.e. highly comparable in number and length of words, as well as in difficulty and construction. The Radner reading chart consists of "sentence optotypes", which are optimized reading test items, standardized by construction and statistical selection. Sentence optotypes consist of short sentences that are highly comparable in terms of number of words (14 words), word length, position of words, lexical difficulty and syntactical complexity. Language specific characteristics were taken into account as were the number of letters and syllables per word, line, and sentence.

The aim of this study was to create an Italian version of the Radner Reading Chart according to Radner's strict principles.

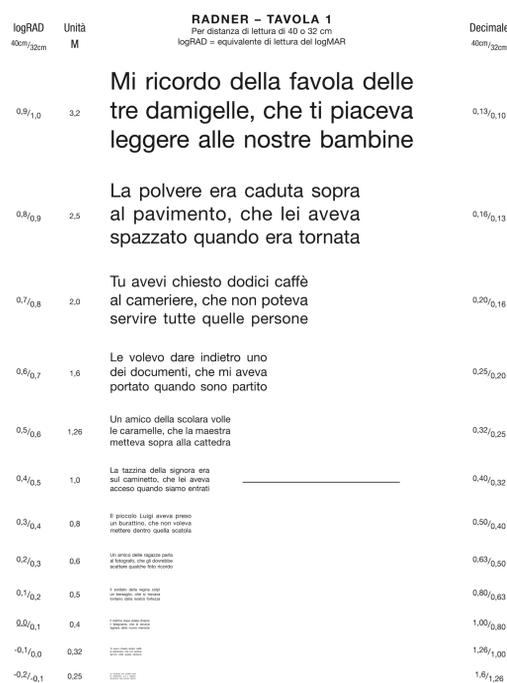


Figure 1 - The Italian Radner Reading Chart 1 (of 3) showing the concept of sentence optotypes. Print sizes are logarithmically scaled. Original size: 210 x 297 mm (A4).

Materials & Methods

41 sentences were constructed in Italian language, following the procedure defined by Radner, to obtain "sentence optotypes" with comparable structure and the same lexical and grammatical difficulty. Sentences were statistically selected and performed in 211 normal, non-presbyopic, native Italian-speaking volunteers. The most equally matched sentence in terms of reading speed and number of reading errors were selected to develop 28 short Italian sentences for the construction of the first Italian version of the Radner Reading Charts. To assess the validity of the reading speed results obtained with the 28 selected short sentences, we statistically compared the reading

speed and reading errors with the average of two long 4th-grade paragraph (97 and 90 words) under the same conditions.

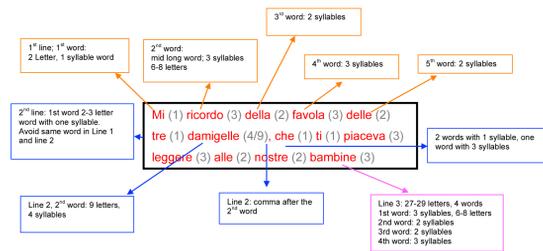


Figure 2 - Italian Sentence-Optotypes. Sentence structure: 5-5-4 words; number of characters per line: 27-29 including spaces.

Results

The overall mean reading speed of the tested probands was 189 +/- 26 w/min. The 28 sentences more similar as reading time were selected, achieving a coefficient of variation (the relative SD) of 2.2%. The reliability analyses yielded an overall Cronbach's alpha coefficient of 0.98. The correlation between the short sentences and the long paragraph was high ($r=0.85$, $p<0.0001$).

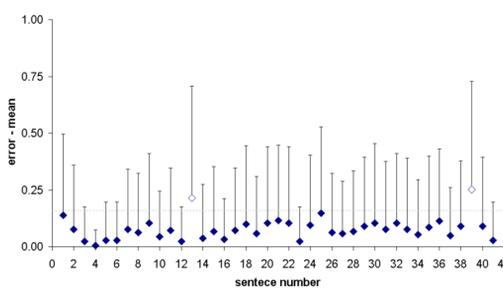


Figure 3 - Mean number of errors (+SD) for each sentence. Blank diamonds represent excluded sentences.

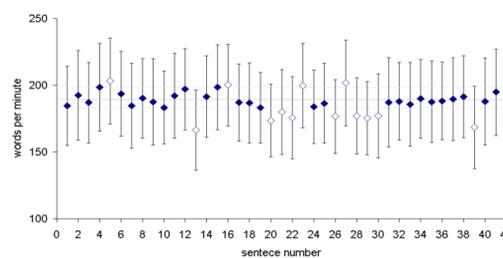


Figure 4 - Mean reading speed per sentence (+/- SD). The blank diamonds represent sentences outside the interval of range for inclusion on the charts.

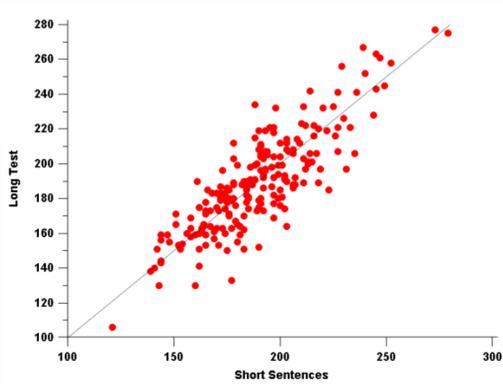


Figure 5 - Scatter plot of long text vs short sentences. Pearson correlation: $r = 0.85$, $p < 0.0001$

Discussion

The importance of standardization was recognized internationally.^{5,6} The Radner reading chart is a highly standardized multilingual reading test system that was recently developed for clinical practice and research. During the past few years it has become an international project; together with several universities we have developed an international and interdisciplinary cooperation with psychologists, linguists, statisticians, optometrists and ophthalmologists. The result of the collaboration is a standardized, valid and reliable reading test system, available in numerous languages, which we hope will act as an internationally comparable reading chart standard. We now have a German, English, Dutch, Swedish, Spanish, Hungarian and this Italian version available. French, Turkish and Portuguese versions are under development.

The 28 short single Italian sentence optotypes were highly comparable in syntactical structure; number, position, and length of words; lexical difficulty; and reading length. The Italian Radner Reading Chart is precise (high consistency) and practical (short sentences) and therefore useful for research and clinical practice to simultaneously measure near reading acuity and reading speed.

The advantage of such sentence optotypes is that they minimize variations between test items and keep the geometric proportions constant. Changes in reading performance with smaller print sizes are therefore related to the print size and not to text characteristics. Together with a logarithmic scaling of the print sizes, it enables accurate and comparable measurements of reading acuity and/or reading speed at different acuity levels, independently of viewing distance.

For clinical and research purposes the simultaneous determination of reading acuity and reading speed in the same examination using standardised test items is a refinement in the diagnosis of reading performance. Comparable reading charts composed of defined test items in different languages would improve diagnosis and facilitate international communication about the reading performance of patients.

References

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