Bayesian Adaptive Assessment Of Reading Performance: The Quick Reading Method

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Reading is a fundamental skill and the reading performance is a key endpoint for quantifying normal or abnormal development and aging. The deficit or pathology in ophthalmic, cognitive or oculomotor functions can lead to a deficit in reading performance (Legge et al 1985). Despite its importance for clinical and developmental assessment, existing reading tests are time consuming and difficult to administer.

quick Reading

\[-\log_{10}(\text{speed}) = \log_{10}(\text{duration}) = f(\alpha, \kappa, \tau)\]

\[= \alpha + (1 - \alpha) \cdot \exp\left(-\left(\frac{\log_{10}(\text{letter size}) - \kappa + \log_{10}(\text{frameRate}/60)}{\tau}\right)\right)\]

Figure 1. A typical reading speed vs. letter size function.

Figure 2. Left, the qRD method distributes trials around threshold; Right, the qRD method selects the stimulus to maximize the information gain.

Experiment

Figure 4. Reading curves measured by two methods.

Figure 5. Precision and bias curves from human experiment.

Simulation

Figure 3. The precision and bias of estimated reading curve and parameters as functions of trial number.

Summary

The quick Reading method can be used to precisely and efficiently assess reading performance, with great promise in clinical applications.

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