

Aspects on Function in Age-Related Macular Degeneration

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Avhandlingen är baserad på följande arbeten:

- I. Christina Winther, Lars Frisén: A compact rarebit test for macular diseases. *Br J Ophthalmol* 2010; 94: 324-327.
- II. Christina Winther, Lars Frisén: New rarebit vision test captures macular deficits hidden to acuity tests. *Acta Ophthalmol* 2015; 93: 481-485.
- III. Christina Winther, Lars Frisén: Self-Testing of Vision in Age-Related Macula Degeneration: A Longitudinal Pilot Study Using a Smartphone-Based Rarebit Test. *J Ophthalmol* 2015 June 1. doi: 10.1155/2015/285463.
- IV. Christina Winther, Lars Frisén: Assessment of spot reading capacity in patients with age-related macular degeneration using printed charts and a new smartphone-based reading test. Manuscript.



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Aspects on Function in Age-Related Macular Degeneration

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Abstract

Age-related macular degeneration (AMD) is one of the leading causes of severe visual loss among persons ≥ 60 years. AMD can be categorized in one of three stages: early, intermediate, or late. In early AMD visual symptoms are inconspicuous whereas, in the late stage, severe loss of vision is common. Late AMD has dry and wet forms. Wet AMD is a chronic disease with episodes of exacerbation, with varying intervals between relapses. The sooner a new episode of disease activity is discovered and treated the better for the visual outcome while delayed treatment often leads to irreversible loss of visual function. Providing timely diagnosis and treatment poses a difficult challenge for ophthalmology clinics today. Measurement of visual resolution by using conventional distance acuity charts is inadequate for the detection of early functional changes in AMD and also for monitoring the progression in the disease. A key problem is associated with the optotype test targets and their information overload. Optotypes are many times larger than the retinal functional units, the receptive fields, and viewing time is usually unrestricted. There is a need for new sensitive tests of vision to uncover low degrees of visual impairment in AMD and for allowing self-testing of vision in patients treated for wet AMD. There is also a need for simplified and standardized reading tests to gain insight into an important task of daily life, reading performance. The aims of this thesis was to evaluate new vision tests designed for the detection and grading of lesions in the macula and to study if these tests are suitable for self-testing of vision. Further, a new abbreviated and standardized reading test was studied.

Methods: In prospective studies on AMD patients and normal subjects new tests of vision were evaluated. The tests in paper I-III are based on Rarebit testing which is able to detect gaps in the receptive fields, using bright microdots on a dark background. The tests were gradually refined from mini data projectors and personal computers to a unique application for smartphone, including the possibility of self-testing of vision and transmission of results. The reading test evaluated in paper IV was also in the form of a smartphone application.

Results: The new tests of vision evaluated in paper I-III capture macular deficits hidden to conventional acuity tests. The new reading test evaluated in paper IV measures basic reading abilities at least as good as conventional and more time-consuming

Conclusions: By using new more sensitive tests which appear to have good potential for effective self-testing of vision in AMD, some currently performed hospital-based controls may be replaced with self-tests at home. This may contribute to a more effective use of healthcare resources. The new reading test demonstrates a new approach towards meaningful and time-efficient assessment of reading ability.

Key words: age-related macular degeneration, macula, macular oedema, rarebit, reading test, reading speed, self-test, smartphone application, vision test, visual acuity.