Introduction
Patients with Age-related Macular Degeneration (AMD) have an impairment of the central retina which leads to the presence of a scotoma in their visual field. Because of the absence of central vision, patients mostly complain about reading difficulty. Causes of these low performances remain unclear but wet AMD is commonly assumed to be more deleterious than dry AMD. We propose here to investigate the relation between reading speed and type of AMD while controlling for other factors. We used a set of French sentences following the MNRead principles (Legge 1989) to determine monocular Maximum Reading Speed (MRS). Anatomic impairment and Preferred Retinal Location used to fixate (PRL) were assessed with a MP1 micropertimeter. Finally, a linear mixed-effects model was fitted to estimate implication of each factor on MRS when adjusting for other relevant factors.

Methods
We analyzed a dataset initially collected to assess the effect of interline spacing on reading speed in AMD patients (Calabrèse 2010).

The participants
- 96 eyes (64 dry + 32 wet) from 61 patients with AMD (aged 55-94 years)
- Only eyes with an absolute macula scotoma
- Patients followed at the low vision clinic of La Timone Hospital, France

The procedure
- Static perimetry
- Microperimetry (MP-1 micropertimeter, Nidek)
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The reading test
- Decreasing sizes of characters (step = 0.1 logMAR)
- Three interline spacings: 0.75x, 1x, 2x the standard interline spacing
- Monocular reading speed measured for each sentence

- Maximum Reading Speed (MRS) determined for each eye and interline spacing.

Results: Efficient predictors of Maximum Reading Speed
Our first result is a higher MRS for the Wet group compared to the Dry group. To assess whether this Wet-Dry difference in MRS could be induced by covariates, we performed a mixed-effects analysis including the following factors:

- Scotoma size (in deg2)
- Scotoma shape
- Island of vision within the scotoma
- PRL-spacing along the scotoma
- Phakic vs. pseudophakic
- Lens opacity
- Better eye vs. worse eye within a patient

Because of the absence of central vision, patients mostly complain about reading

We log transformed MRS and centered continuous factors on their respective means.

Maximum Reading Speed (MRS) determined for each eye and interline spacing

Wet AMD vs. Dry AMD

**Figure 1. Mean scotoma size for wet and dry AMD**

**Figure 2. Scatterplot of MRS as a function of scotoma size for wet and dry AMD**

**Figure 3. Mean scotoma size for phakic and pseudophakic groups**

**Table 1: Results for the fixed effects given by our final model. This model only includes the significant effects. Reference levels of discrete factors are wet and pseudophakic.**

Conclusions
A dataset collected in AMD patients was used to identify efficient predictors of Maximum Reading Speed.

- The first important result is a large difference in MRS between wet and dry AMD: patients with wet AMD read significantly faster than patients with dry AMD even when adjusting for other relevant factors. This seems in contradiction with the common view that wet AMD is more deleterious (Rubin 2009). Our interpretation of this result is in line with the suggestion of Sunness (1996): different time courses of wet and dry AMD could lead to different adaptation strategies; sudden onset of wet AMD would lead to more favorable strategies.

- Second, we found a significant effect of scotoma size on reading speed in previous studies (Rubin 2009, Ergun 2003). Our large range of scotoma sizes allows us to show a shallower effect than in previous studies.

- Third, a significant effect of the distance between the PRL used to fixate and the fovea emerged. This result suggests that PRL would be involved during reading.

- Finally, we report a new predictor of MRS: patients with Intra-Ocular Lenses (IOL) read significantly more slowly than phakic patients. This result is surprising, considering the fact that cataract surgery improves reading speed in AMD-free patients with central vision (Akutsu 1992). This suggests the involvement of the peripheral properties of intra-ocular implants (Mutlu 2009).