Collision avoidance behavior of the frog and the underlying neuronal correlates.

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We have examined collision avoidance behavior of the frog, *Rana catesbeiana*, and the underlying neuronal correlates using computer graphics to model a looming stimulus.

In behavioral experiment, a black square (35x35cm) approaching at a velocity of either 2 or 4m/s through a path of 6m was presented in the dorsal visual field of the animal. The threshold of the stimulus size triggering avoidance behavior and the remaining time before the predictive collision were calculated from successive video fields. The results showed that the means of time-to-collision but not threshold size for each velocity were significantly different. This suggests that the frog displays avoidance behavior when the visual angle of a looming object reaches a constant value (about 20°).

Single unit recordings in the optic tectum showed that 11 neurons exhibited extremely tight tuning for collision bound trajectories with mean half-width at half height value of less than 1° .Two types of theoretical analysis revealed that peak firing rate always occurred after the object had reached a constant angular size of 24° and 21° , respectively. These results strongly suggest that the collision-sensitive neurons of the frog comprise a threshold detector, which triggers collision avoidance behavior.