Stimuli were radial gratings with 5 black spokes on a white background that rotated around their centers, projected onto a small rear projection screen using a video projector. Subjects fixated the middle of the screen and adjusted the speed of the “match grating” to be the same as that of the “sample grating”.

First Experiment:
In this experiment the mean luminance of the sample grating was always 3700 cd/m² and its temporal rate varied between 2 to 14 Hz (0.4 to 2.8 revolutions/sec). The mean luminance of the match grating was either the same as the sample grating or 1.1 cd/m². (using three 1.2 neutral density filters) Results show that there is a significant increase in the perceived speed of the rotating grating under low luminance. This effect depends on speed of the grating and is more around 10 Hz.

Second Experiment:
In this experiment the mean luminance and the speed of the sample grating was kept constant (10 Hz & 3700 cd/m²) and the luminance of the match grating was varied between 3700 to 1.1 cd/m² (using 1.2 neutral density filters) Results show that the perceived speed of a rotating grating increases as its luminance decreases. Also it shows that there must be at least a 250 fold drop in the luminance for this effect to take place.

Discussion
The low light speed up effect is sensitive to both luminance and temporal rate. It has been previously shown that low contrast stimuli appear to move more slowly than high contrast stimuli if they move at 8 Hz or below. Above 8 Hz they appear to move faster (Thompson 1982). This effect has been attributed to the temporal properties of magnocellular and parvocellular pathways (Perrone 2005, Thompson et al 2006). The effect of low luminance on the speed perception observed here differs strongly from the effect of low contrast in that 1) the speed shows an increase rather than decrease; 2)the increase is same across a wide range of temporal rates, peaking at 10 Hz, showing no reversal.

Fig. 1 Rotating Stimuli
Fig. 2a) Matched speed versus sample speed for two experimental conditions for three subjects.
Fig. 2b) Relative speed versus sample speed for two conditions (high and low luminance matches)
Fig. 3 Relative speed (sample/match) for different levels of match luminance

Conclusion
Perceived Speed of a rotating radial grating is increased as the mean luminance of the grating decreases.