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Speed Dependency of Apparent Motion Processing in Humans

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ABSTRACT

Studying the basic evoked responses to apparent motion with varying speed is a potentially important tool for achieving better understanding of the time course of the visual processing in the human brain. Evoked changes in the magnetic field of the visual cortex were recorded in six subjects while they viewed bar stimulus displacements at six different speeds. The latencies and the strength of three peak components (M1: 150+-50ms, M2: 250+-50ms, M3: 350+-50ms) of the mean evoked responses for each stimulus speed were obtained and compared using two different methods – a conventional root mean square measure and a new cross-wavelet measure. We found that the cross-wavelet preprocessing produced stronger and sharper peaks and was more sensitive, so that the variability between subjects was slightly higher than for the root mean square measure. Both estimation methods showed significant nonlinear increase in the magnitudes of all three peaks for higher stimulus velocities. The magnitude increase was stronger for earlier components and could be well described by a logarithmic rule for peaks M1 and M2. The peak latencies did not vary substantially across speeds for peaks M1 and M3, but M2 latencies exhibited a significant U-shaped trend with increasing stimulus velocity. These results might indicate that all three evoked components reflect motion-related activity, which is not limited to a single stage of the visual processing in the human brain.