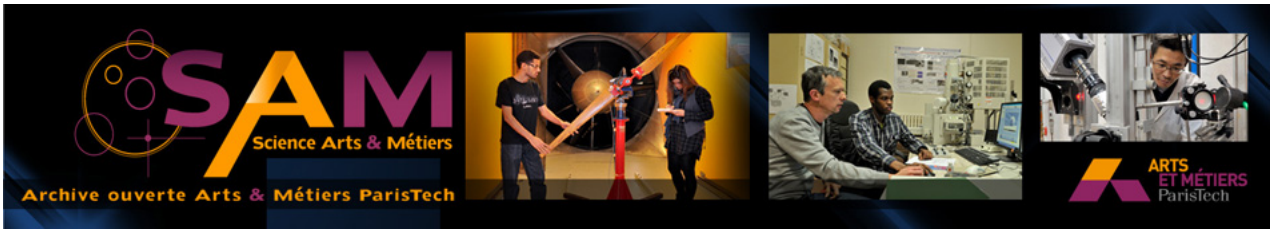

# Transient Response of the Head Kinematics - Influence of a Disturbed Visual Flow

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Vision influences the controlled kinematics of human body. Previous studies have shown the influence of vision on head stabilization or whole posture. However, latencies between the stimuli and the head motion have never been quantified. The aim of this study is to quantify the influence of a perturbed vision on the head kinematics.

Seven healthy volunteers without uncorrected vision (26.7±6.9 years old, 1 female, 2 right-handed/right-dominant eye, 5 right-handed/left-dominant eye) were studied. Visual stimuli were performed through an immersive personal 3D viewer (HMZ-T1, Sony), securely tied on the head. Motion analysis of the head and the torso were performed using the optoelectronic Vicon system (100Hz). Three markers were glued on the personal viewer, close to the nasion, left and right tragus, in order to create the head frame. Three markers were glued to create the torso frame (both acromia and C7).

Two different 3D animated scenes were created on Blender and displayed at 24Hz. The first animation was a landscape with a ball rolling on the ground, and then the ball stopped before being virtually launched via a catapult toward the screen. Two velocities were programmed: 4.67 and 10.58 $m.s^{-1}$. The second animation was a beach with sea and sky, where horizon tilted anticlockwise at 2 different constant rates: 0.24 $deg.s^{-1}$ and 0.48 $deg.s^{-1}$ with maximal amplitude of 8° and 16° respectively. The motion of the head relative to the torso was calculated for both scenes on seated and upright position, at the 2 different velocities, 2 times each, for a total of 16 random tests on each volunteer.

For the launched ball animated scene, the reaction time seated was, as expected, shorter for the fast launches. For the beach animated scene, the head profiles followed most of the time the kinematic profile of the tilted animation, linearly or by steps, and not necessary until the end. Volunteers who were right-handed and right dominant eye tilted their head clockwise, at the inverse of the stimuli.

Both experiments confirmed that visual stimulus could influence the kinematics of the head-neck system. In the ball animation, velocity of the stimulus does not seem to affect the amplitude of movement. In the beach animation, the head motions were variable, but performed at the same mean speed than the stimuli. Furthermore, the limited number of volunteer cannot conclude on the direction of rotation of the head, depending of the dominant hand and eye.