

Object stability estimation – Effects of aspect ratio and body position

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The stability of an object can be defined as the degree of resistance to position change or the capacity of an object to return to its original position after having been displaced. In addition to visual, people also use non-visual information – for example vestibular information in assessing the stability of an object [1,2].

The aim of this research was to examine whether non-visual (vestibular) information have different contribution to estimation of object stability depending on object's proportions.

15 students participated in the study. Images of objects, more specifically conical frustrums – cones with a top sliced off, tilted close to a table edge, were used as stimuli. Estimations of object stability were made in three different body orientations – when sitting upright, or lying left and right side down. Stimuli had different: 1) aspect ratio (base diameter: height - 1:1, 1:1.5, 1:2, 1:2.5); 2) tilt direction (left or right); 3) degree of tilt (5°, 10°, 15° more or less than a critical angle - a state in which the object is equally likely to fall over or to return to its upright position, for a certain object). Participants' task was to judge whether the object would fall down from the surface, or not. Participant could make 2 types of errors: 1) critical angle overestimation; 2) critical angle underestimation.

Results have shown that aspect ratio and body position have statistically significant effect on object stability estimation accuracy. In upright position, participants generally made less errors in estimating object stability than in other two body positions (lying left and right side down). In all body positions (two tilted and upright) critical angle underestimation was registered for objects with 1:1 aspect ratio. In two tilted body positions participants mostly made equal number of mistakes of both types for objects with 1:1.5, 1:2, 1:2.5 aspect ratio and in upright position participant more frequently overestimated critical angle of objects with 1:2.5 aspect ratio.

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