

## **Determining falling patterns by estimation of horizontal distance and height**

Yasuyoshi Yanagida, Masato Maeda, Hideyuki Nushida, Migiwa Asano, Yasuhiro Ueno

Int J Legal medicine 2009: 414;371-76

### **Abstract**

Whether by accident or foul play virtually thousands of fall-related fatalities occur each year. While a number of past studies addressed the relationship between fall, injury, and death, only a small fraction sought to establish an objective index geared specifically towards determining the cause of a particular fall. The primary objective in the present study was to determine the range of attainable horizontal distances in various forms of active and passive falling patterns. The secondary objective involved the capturing of physical motions at the point of impact via 3D motion analyses in order to identify the defining physical characteristics of a particular form of fall. The introduction of live test subjects to these series of experiments added the advent of fear and other psychological factors to the study which are crucial in simulating real-life cases. To corroborate this point, five subjects (three male and two female) expressed their wishes to withdraw from the study, attributing their decision to feeling an inherent danger and fear of the physical aspects of the present study. The ten subjects were made to fall from a height of 3.65 m under 13 conditions of various natures. Footage of the subjects falling was captured on two high-speed video cameras which markedly improved the calculation of 3D coordinates along the subjects' flight path. After extensive calculations, we were successful in determining the maximum attainable horizontal distances in passive falling patterns. Additionally, we found that force applied to the abdominal area results in shorter horizontal distances in comparison to falls where force is directly applied to the posterior side of the body.