



Laser-Based Skin Compliance Measurement Apparatus.

The index finger contacted a 0.5-inch-diameter smooth circular surface attached to the end of a rotating rod at a distance $L = 11\text{ cm}$ from the pivot point (P). A first-surface mirror (Edmund Optics, Barrington, NJ) attached to the rod at P reflected a laser beam onto a wall at distance $W = 413\text{ cm}$. A mass, $M = 50\text{ gm}$, was placed in a receptacle overlying the finger-contact surface. Indentation of the skin caused rotation of the rod by angle θ . Since the angle of incidence between the light beam and mirror equaled the angle of reflection, rotation of the mirror by θ caused the laser beam to project at angle twice θ from the horizontal. We derived the displacement (d) of the skin, from the height of the laser dot (h) on the wall, given the constants L and W :

$$d = L \sin\left[0.5 \text{ArcTan}\left(\frac{h}{W}\right)\right]$$

The sensitivity of the system was such that the slight increase in fingertip blood volume caused by the heartbeat often produced a noticeable decrease in the height, h , of the laser beam dot. In such cases, we took the measurements in the diastolic phase (maximum laser dot height of the cardiac cycle, corresponding to lowest fingertip blood volume).

(Adapted from Peters R, Hackeman E, Goldreich D (2009) Diminutive digits discern delicate details: fingertip size and the sex difference in tactile spatial acuity. Journal of Neuroscience 29: 15756 –15761 – Supplemental Fig. 1).