

# Shoulder pain from using your iPad? Don't use it on your lap

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The sudden popularity of tablet computers such as the Apple iPad has not allowed for the development of guidelines to optimize users' comfort and well-being. In a new study published in *Work: A Journal of Prevention, Assessment, and Rehabilitation*, researchers from Harvard School of Public Health, Microsoft Corporation, and Brigham and Women's Hospital report that head and neck posture during tablet computer use can be improved by placing the tablet higher to avoid low gaze angles, and through the use of a case that provides optimal viewing angles.

"Compared to typical desktop computing scenarios, the use of media tablet computers is associated with high head and neck flexion postures, and there may be more of a concern for the development of neck and shoulder discomfort," said lead investigator Jack T. Dennerlein, PhD, of the Department of Environmental Health, Harvard School of Public Health, and Brigham and Women's Hospital.

Fifteen experienced tablet users completed a set of simulated tasks with two media tablets, an Apple iPad2 and a Motorola [Xoom](#). Each tablet had a proprietary case that could be adjusted to prop up or tilt the [tablet computer](#). The Apple Smart Cover allows for tilt angles of 15° and 73°, and the Motorola Portfolio Case allows for tilt angles of 45° and 63°. Four user configurations were tested: Lap-Hand, where the tablet was placed on the lap; Lap-Case, with the tablet placed on the lap in its case set at the lower angle setting; Table-Case, with the tablet placed on a table with its case at the lower angle; and Table-Movie, with the tablet placed on a table with its case at the higher angle.

During the experiment, users completed simple computer tasks such as Internet browsing and reading, game playing, email reading and responding, and movie watching. Head and neck postures and gaze angle and distance were measured using an infrared three-dimensional

motion analysis system.

Head and neck flexion varied significantly across the four configurations and across the two tablets tested. The iPad2 was associated with more flexed postures when it was placed in its case. This appeared to be driven by differences in case design, which drastically altered the tablet tilt angle and the corresponding viewing angle. For both tablets, the gaze angle changed in a similar fashion to the head flexion across all configurations, with non-perpendicular viewing angles causing increased head and neck flexion. Head and neck flexion angles were greater, in general, than reported for desktop or notebook computing.

Only when the tablets were used in the Table-Movie configuration, where the devices were set at their steepest case angle setting and at the greatest horizontal and vertical position, did [posture](#) approach neutral. This suggests that tablet users should place the tablet higher, on a table rather than a lap, to avoid low gaze angles, and use a case that provides steeper viewing angles. However, steeper angles may be detrimental for continuous input with the hands. "Further studies examining the effects of tablet and configuration on arm and wrist postures are needed to clarify and complete the postural evaluation," noted Dr. Dennerlein.

"Our results will be useful for updating ergonomic computing standards and guidelines for tablet computers. These are urgently needed as companies and health care providers weigh options to implement wide-scale adoption of tablet computers for business operations," Dr. Dennerlein concluded.

**More information:** The study, "Touch-Screen Tablet User Configurations and Case-Supported Tilt Affect Head and Neck Flexion Angles," by Justin G. Young, Matthieu Trudeau, Dan Odell, Kim Marinelli, Jack T. Dennerlein has been made freely

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