

Ergonomics Study of a Helmet-Mounted Augmented Reality System for Coal Power Plant Workers

Objective

To determine how two common types of head-mounted AR devices, the **RealWear HMT-1** and Microsoft HoloLens, affected indicators of eye strain and forces of the neck and shoulder muscles of industrial field workers.

Overview

The **RealWear HMT-1** and Microsoft HoloLens were identified as two common types of head-mounted AR devices available to industrial field workers.

Each were tested on how they affected indicators of eye strain and forces of the neck and shoulder muscles for electric utility power plant operators while they performed five routine inspection tasks using coal burning equipment. The inspection tasks were conducted under three conditions: HoloLens, HMT-1, absence of AR (normal).

The duration of the inspection tasks ranged from an average of 10 to 28 seconds. Twelve experienced power plant operators participated in the study. Surface electromyography (sEMG) of the right and left sternocleidomastoid, splenius, semispinalis capitis, and upper trapezius muscles were measured, and a small camera recorded blink rate of the right eye.

Results

- There was no significant difference in electromyography (EMG) muscle activity between AR and no AR conditions.
- The HoloLens may decrease blink rate compared to the HMT and no AR conditions. The HoloLens averages 1.5 to 5 fewer blinks per minute, although it was not statistically significant. Decreased blink rate is a factor for eye strain and dry eye syndrome.
- There was no significant difference in perceived safety between the HMT and HoloLens and no AR.
- The HMT was rated as 'easier to use' and 'more comfortable' than the HoloLens.