

Effects of time pressure on searching for terrorist threats in X-ray air passenger luggage images

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Abstract

In order to understand the development of skill in the domain of airport security an experiment was performed to examine how naïve observers searched a range of X-ray images of air passenger luggage for potential terrorist threat items. For each image their eye movements were recorded remotely and participants had to rate their confidence in whether or not a potential threat item was present. Half of all observers had a restricted search time of 10 seconds and the others had an unlimited search time. Observer performance in identifying targets correctly was measured as the areas under their receiver operating characteristic (ROC) curves. Results showed that observers with an unlimited viewing time exhibited significantly better detection performance than those under the time pressure condition. The eye movement data revealed that naïve observers could fixate on a potential target early in their visual search of each image. Observers were particularly inclined to fixate on targets earlier and process visual information faster (i.e. with a shorter visual dwell time on the area of interest in the X-ray luggage image) in the time pressured condition. One possible interpretation between performance and the eye movement data is a speed-accuracy relationship. The naïve observers lacked knowledge of possible threats which degraded their performance. Implications for training of security screeners are discussed.

Introduction

Aviation security greatly depends on the performance of security screeners in detecting items which pose potential threat to air travel when they visually examine X-ray images of passenger luggage. The work environment of screeners is time-pressurised and difficult as passenger flow must be maintained whilst the X-ray images are difficult as these have low signal-to-noise ratio with widely varying backgrounds. Generally the search time for experienced security screeners is between six to ten seconds per luggage item (Gale et al., 2000). In such a short period the screener must not only select the appropriately potential target area of the luggage item (which contains a possible threat item) but also correctly recognize the target object - even when it is in a camouflaged situation or in a cluttered background.

In D. de Waard, G.R.J. Hockey, P. Nickel, and K.A. Brookhuis (Eds.) (2007), *Human Factors Issues in Complex System Performance* (pp. 435 - 442). Maastricht, the Netherlands: Shaker Publishing.