Eye movements associated with recognition of affect in humans: implications for the detection of concealed firearm carrying

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**INTRODUCTION**

In prior work the effect of gun carrying on the mood (i.e., affective state) of the surveillance targets was assessed. In order to examine this effect, mock CCTV footage was generated of persons who acted as surveillance targets whilst concealing either a firearm or an innocuous object matched to the firearm (for a complete description of this aspect of the experiment see [1]). It was found that gun carrying was associated with increased dysphoria (i.e., an affective state characterized by hostility, anxiety or depression) which was in accordance with results from previous research [2]. In a consequent study [3] the participants (i.e., observers) watched this footage and estimated the emotional state of surveillance targets without knowledge about the presence of a firearm (i.e., Affect Detection Task, ADT). Likert-scale questionnaires were used to provide the data about which cues convey information needed to identify the affective state in a firearm and non-firearm carriers.

In order to infer which parts of the body a person carrying a concealed firearm are relevant for performing this task without relying on the observers’ consciously reported strategies only, it was done in the previous study [2], here the observers performed the ADT task whilst their eye movements were recorded. The eye-tracking technique is known to be able to clarify whether involuntary eye-movements are related to attention to emotionally arousing information presented in images [4,5]. Applying this particular method in the current study is therefore believed to provide information about whether the perception of a particular affective state of carriers of concealed firearms is associated with a certain eye-movement pattern.

**METHOD**

Participants 12 postgraduates and members of staff from LU (5 females). Mean age: 27.75 (SD = 2.6). No previous experience in surveillance.

**Materials**
- Tobi X50 stand-alone eye-tracker with ClearView 2.6.0 software.
- For the set up of the experiment see Figure 1.
- Mock CCTV footage. In total 22 video clips (2 sec. long) with 11 different surveillance targets in two conditions (concealed gun present; concealed innocuous object present).

**Procedure**
- Affect Detection Task: observers watched the CCTV footage. In total 22 video clips (2 sec. long) with 11 different surveillance targets in two conditions (concealed gun present; concealed innocuous object present). In a consequent study [3] the participants (i.e., observers) watched this footage and estimated the emotional state of surveillance targets without knowledge about the presence of a firearm (i.e., Affect Detection Task, ADT). Likert-scale questionnaires were used to provide the data about which cues convey information needed to identify the affective state in a firearm and non-firearm carriers.

**RESULTS**

**Performance on Affect Detection Task**

When the N Gods Ranks Test was performed, the observed dysphoria in the Gun condition was higher than the observed dysphoria in the Innocuous Object condition (see Figure 3), which was congruent with the self-ratings of surveillance targets. However, this effect did not reach statistical significance.

**Eye movement data**

Friedman test was performed. Significant differences in mean fixation duration across three AOIs (Face, Upper body (‘Body’), Lower body (‘Legs’) see Figure 4). Mean fixation duration across all participants on the ‘Body’ was significantly longer than on the ‘Legs’ in both Gun and Innocuous Object conditions (see Figures 4 and 5 for comparison).

**No significant differences in the observers’ eye fixations duration on all AOIs between Gun and Innocuous Object conditions (see Figure 4).**

**Relationship between performance on the ADT and the visual cues used by observers in this task**

Spelman’s correlation test was performed.

When the firearm was present:
- significant negative correlation between the perceived depression, hostility, dysphoria and the duration of fixation on the legs of the carriers (rs = .730, n = 12, p = .007; rs = .628, n = 12, p ≤ .039 and rs = .615, n = 12, p ≤ .033, respectively).
- significant negative correlation between mean fixation duration on ‘Body’ and observers’ performance on ADT on Positive Affect scale (rs = -.441, n = 12, p = .023). More correct recognition of positive affect in surveillance targets with a concealed firearm was related to the longer looking time of observers at the body of the targets.

When the firearm was present:
- significant negative correlation between mean fixation duration on ‘Legs’, and observers’ performance on ADT (i.e., difference between surveillance targets and observers' scores on MAACL-R) on Hostility scale (rs = -.649, n = 12, p = .023). More correct recognition of hostility in surveillance targets when they were carrying a concealed firearm was associated with longer looking time of observers at the legs of the targets.

When an innocuous object was present: no significant correlations were found.

**REFERENCES**


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