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Identification of acutely sick people and facial cues of sickness

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Take-home message:

Facial cues associated with the skin, mouth, and eyes can aid in detection of acutely sick, and potentially contagious, people

Background

Detection and avoidance of sick individuals have been proposed as essential components in a behavioral immune defense, limiting the risk for contamination. However, almost no knowledge exists on whether humans are able to detect sickness in individuals and, if so, by what cues. Our aim was to determine whether it is possible to identify experimentally-induced sick people from facial pictures, and to specify cues that contribute to this identification.

Methods

Obtaining photos) 16 people were photographed on two separate occasions in a double-blind, placebo-controlled, cross-over design, once after injection with LPS (2.0 ng/kg of body weight), and once after placebo (0.9% NaCl). The photos were taken 2 hours after injection in both conditions.

Study 1) The photographs were rated by 62 naïve observers (31 women, 31 men, mean age 25.5 years, *SD* = 8.8). They judged the 32 photos on whether the person in the photo was sick or healthy in a forced-choice procedure with each photo being shown along with the question "Is this person sick or healthy?"

Study 2) A second group with 60 naïve observers (38 women, 22 men, mean age 27.3 years, *SD* = 6.2) rated the photos with respect to health (scale from 1-7 "*very good*"), tiredness (scale from 1-7 "*very tired*") and 8 facial cues.

Results

Study 1) The untrained people identified sick individuals above chance level by looking at facial photos taken two hours after injection with LPS (vs placebo), the sensitivity and specificity was 64% and 59%, respectively.

Study 2) The LPS injection, as compared to placebo, made people look more sick (*b* = .48) and more tired (*b* = .45, p's<.001). LPS injected people were also perceived to have paler skin (*b* = .54), a more swollen face (*b* = .18), paler lips (*b* = 1.55), more droopy corners of the mouth (*b* = .42), more hanging eyelids (*b* = .45), and redder eyes (*b* = .33, p's <.001). After LPS injection, the faces also had less glossy (*b* = -.22) and less patchy skin (*b* = -.41, p's<.001). As illustrated in Figure 2 and Figure 3, several facial cues, representing changes of the skin, the eyes, and the mouth, were affected by acute sickness.

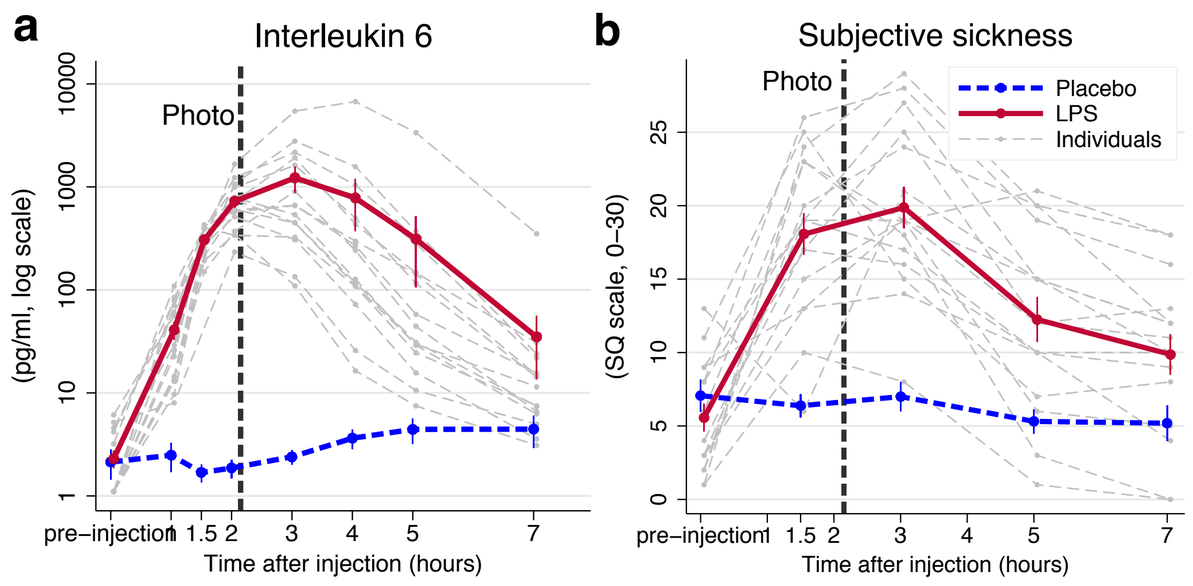

Figure 1
Illustrations of the timing of when the photos were taken (2h and 10 min post injection) and circulating the mean levels of interleukin (IL) 6 and development of sickness (subjective sickness rated on the Sickness questionnaire (SQ), after injections with placebo and lipopolysaccharide (LPS). All 16 subjects participated in both conditions, and the dotted grey lines show their raw data in the LPS condition.

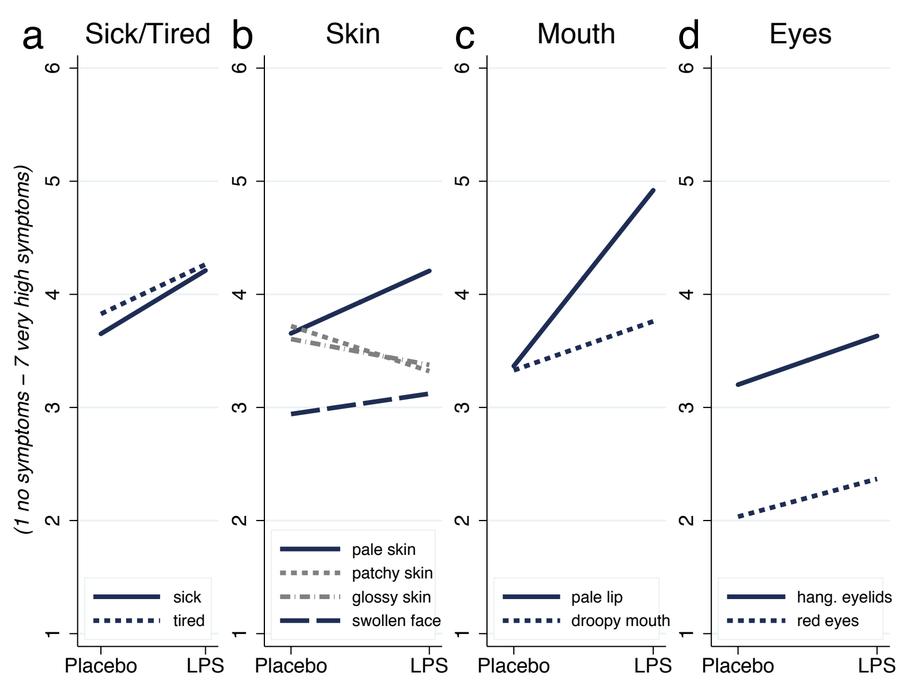

Figure 2
Effects of lipopolysaccharide (LPS) -induced acute sickness on: a) appeared sickness and tiredness, and b) cues relating to the skin, c) the mouth and d) the eyes, as compared to placebo. The regression lines are estimated after removal of variation between the observers using empirical Bayes' estimates. Thus, the regression lines represent the average change in the average observer. The scales for cues range from 1 "no symptoms" to 7 "very high symptoms". The analyses consist of 2860-2876 ratings each (60 observers rated the 32 photos, some photos were rated twice by each observer).

Figure 3
Averaged images of 16 individuals (8 women) photographed twice in a cross-over design, during experimentally-induced acute sickness (A) and placebo (B). The photos were taken 2 hours after injection with lipopolysaccharide (LPS) or placebo (Saline). Images made by MSc Audrey Hepburn, St:Andrews University, using Psychomorph.

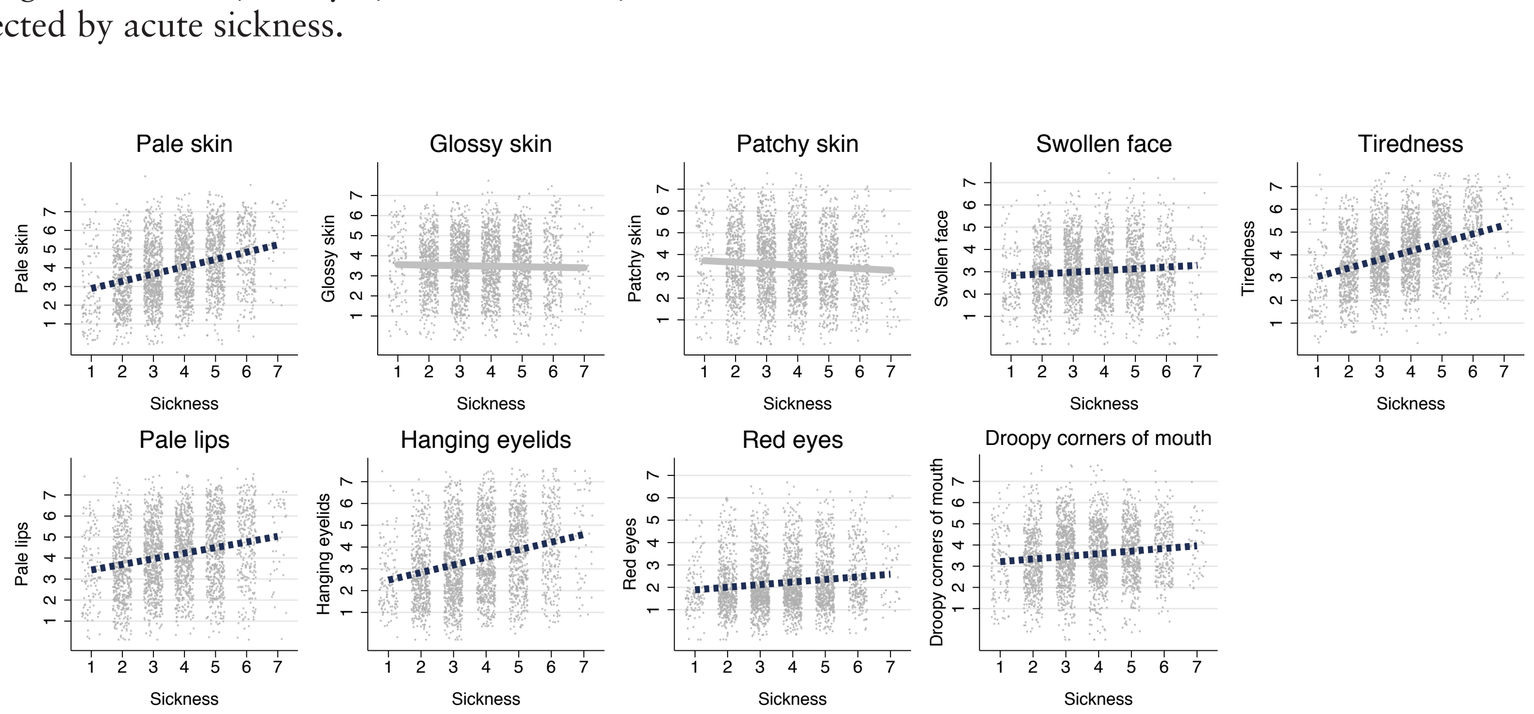

Figure 4
Relationships between appeared sickness and facial characteristics. All significant regressions illustrated by dashed lines in black, and non-significant regression lines by solid light grey lines. The regression lines and the data points (individual data points in grey being jittered to better illustrate the distributions) are estimated after removal of variation between the observers using empirical Bayes' estimates. Thus, all observers have been adjusted (in level) to represent an average observer. The plots consist of 2856-2873 ratings each (60 observers rated the 32 photos, some photos were rated twice by each observer) on 7-graded Likert scales (1 = no symptoms, 7 = very high symptoms).

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