Losing weight without dieting:
Viewpoint-dependent weight assessment on the basis of faces

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Introduction

Beside variables like facial symmetry (e.g. Grammer and Thornhill 1994; Jones et al 2001; Rhodes et al 2001; Fink et al 2006), averageness (e.g. Carbon et al; 2010) and skin color (Jones et al 2004 & Fink et al 2006) the perceived human weight proves to be a reliable predictor for health and fitness (Coetzee, Perrett & Stephen, 2009). They showed that perceived facial adiposity is used as a cue to health. Unanimously people make fairly accurate weight judgments using facial cues alone, for instance BMI explains 43% of the variance in facial weight judgments.

To the authors' knowledge, there is no study considering the impact of viewing angle on weight perception. Specifically, are we able to influence weight judgments in 2D pictures by changing the viewing angle and if so, are we still able to judge the weight accurately of people of another morphological group (race) due to lack of knowledge about their body prototypes?

To approach the first question, we let participants judge the weight of persons on basis of human faces in three viewing conditions in two experiments. The third experiment investigates the impact of human race on perceived weight.

Method

Experiment 1: weight assessment on the basis of faces (within subjects)

Participants. 31 (18 female) subjects from Germany (Mainz) participated in the experiment. Mean age was 36.8 years (*SD* = 17.2, range 18 to 69 years).

Material. The material consisted of three sets each with 48 3D models of human faces (24 female & 24 male, *M* = 23.5, *SD* = 16.0, range 3 to 56 years) in three viewing conditions (slanted downwards by +30°, face frontal, or slanted upwards by -30°). Conditions were balanced across the sets in a fixed order. Gender of the stimuli was arranged blockwise. Each picture was standardized to a width-to-height-ratio of 1024 × 768 pixels.

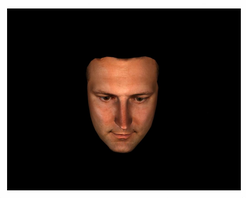
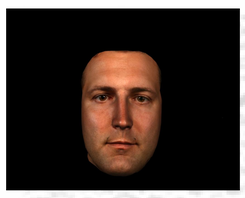
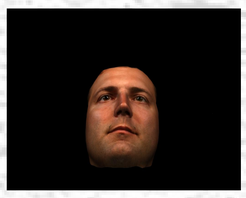


Figure 1a) Example stimulus +30°



1b) Example stimulus "frontal"



1c) Example stimulus -30°

Procedure. Participants were randomly allocated to one set. The task was to judge the weight of persons on the basis of 48 human faces. Each trial started with a fixation cross, followed by a blank screen and the target until a verbal response was made. Stimuli were presented on a Dell e151FPp 15" TFT-monitor (60 Hz). Eyes-monitor-distance was 50 cm. Weight judgments were made in kg.

Results

A repeated measures ANOVA for weight estimation resulted in a significant main effect for *viewing angle,* $F(2,58) = 278.4$, $p < .001$, $\eta_p^2 = .906$ (see figure 2, blue line and figure 3). We found an effect for the *gender of stimulus,* $F(1,29) = 590.7$, $p < .001$, $\eta_p^2 = .953$.

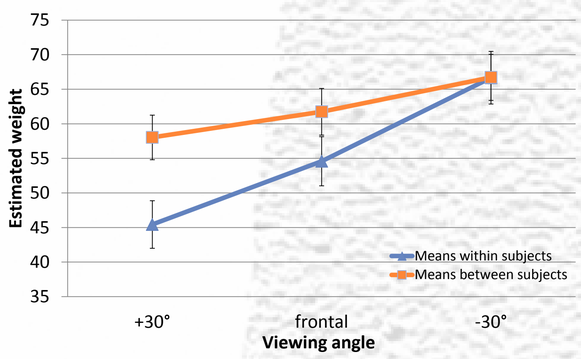


Figure 2. Results of experiment 1 and 2: Main effect of viewing angle

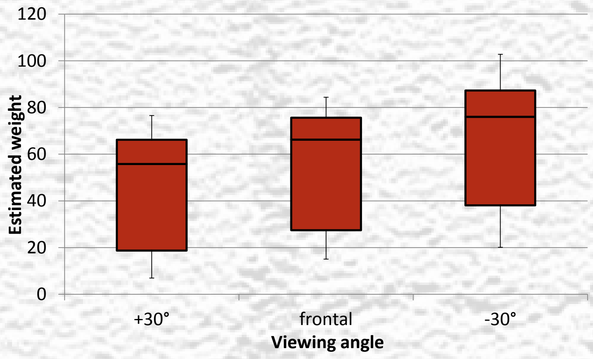


Figure 3 (experiment 1). Distribution of weight judgments (stimulus based analysis), $F(2,94) = 300.3$, $p < .001$, $\eta_p^2 = .865$.

We also examined the relationship between "+30°" and "-30°" viewing angle together and "frontal" with a regression analysis (see figure 4). Viewing angles significantly and positively predicted 96,9 % of the variance in weight judgments, $F(2,47) = 696.0$, $p < .001$, $R^2 = .969$.

Interestingly, there was a significant and strong relationship between +30° and the "frontal" condition, $t(47) = 6.9$, $\beta = .772$, $p < .001$, while the relationship between "frontal" and "-30°" was not significant, $t(47) = 2.0$, $\beta = .217$, $p = .058$, *n.s*.

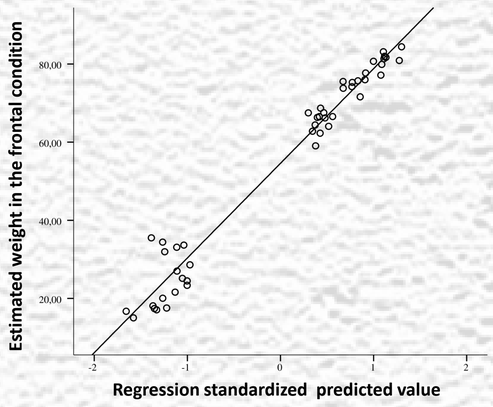


Figure 4. Interrelation between the "+30°" + "-30°" and the "frontal" condition

Method

Experiment 2: weight assessment on the basis of faces (between subjects)

Participants. 30 (15 female) subjects from Germany (Mainz) participated in the experiment. Mean age was 35.0 years (*SD* = 15.5, range 19 to 68 years).

Material. The material consisted of three sets each with 48 3D models of human faces (24 female & 24 male, *M* = 26.8, *SD* = 18.0, range 3 to 64 years) with the same three viewing angles as in experiment 1. Each set consisted of only one viewing angle. Gender of the stimuli was arranged blockwise. Each picture was standardized to a width-to-height-ratio of 1024 × 768 pixels.

Procedure. The weight estimation task was the same as in experiment 1.

Results

ANOVA for weight estimation resulted in a significant main effect for *viewing angle,* $F(2,27) = 9.1$, $p = .001$, $\eta_p^2 = .403$) (see figure 2, orange line and figure 5).

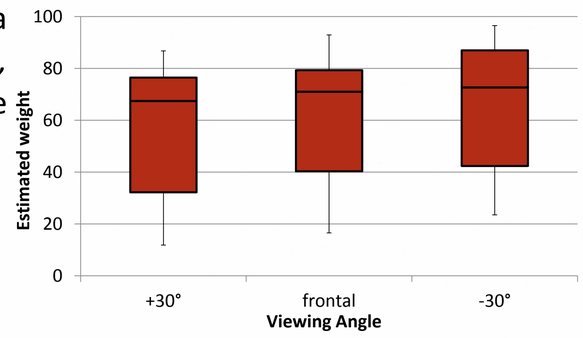


Figure 5 (experiment 2). Distribution of weight judgments (stimulus based analysis), $F(2,94) = 97.5$, $p < .001$, $\eta_p^2 = .675$.

Method

Experiment 3: Intercultural differences relating to weight perception

Participants. The Japanese sample consisted of 146 (100 female) psychology students from Ritsumeikan University (Kyoto). Mean age was 19.1 years (*SD* = 2.0, range 18 to 36 years). The German sample consisted of 125 (106 female) psychology students from the Johannes Gutenberg-University (Mainz). Mean Age was 22.1 years (*SD* = 3.9, range 18 to 42 years).

Material. The material consisted of a printed questionnaire with 12 (6 Japanese & 6 German) frontal pictures of human faces (equal ratio for gender). Mean age was 24 years (*SD* = 3.9). The stimuli were printed in 4 different random orders.

Procedure. Participants were randomly allocated to one of the orders. The task was to judge the weight of persons on the basis of 12 human faces. Weight judgments were made in kg.

Results

An independent samples t-test for weight estimation resulted in a significant effect for the *ethnicity of the observers*, $t(269) = 23.6$, $p < .001$. We also found an effect for the observer's average *relative estimation error* (AREE), $t(269) = 23.8$, $p < .001$. AREE for the *ethnicity of stimulus* was also significant, $t(270) = 35.3$, $p < .001$ (see figure 5).

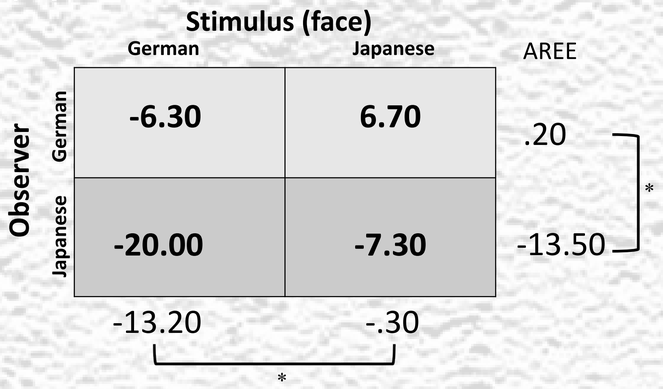


Figure 5. Distribution of the average relative estimation error in %. Negative numbers indicate underestimation.

Discussion

Experiment 1 and 2 demonstrated that weight judgments are susceptible to the manipulation of viewing angle. Faces seen from -30° yielded the highest judgments of weight and +30° viewing angles produced the lowest.

Beside the significant relationship between +30° and "frontal", the relationship between -30° and "frontal" was not significant, what indicates the use of *different cognitive processes.*

In the third experiment we found an interesting cultural effect. Whereas German observers judged all faces equally well, Japanese observers had trouble with European faces but not with Asian faces.

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