Gaze distribution of an observer while imagining wearing clothing portrayed in an advertisement and predicting the impression on others

Fuyuko IWASAKI, Michiko INOUE, and
Masashi NISHIYAMA[0000-0002-5964-3209]

Graduate School of Engineering, Tottori University
101 Minami 4-chome, Koyama-cho, Tottori, 680-8550, Japan
nishiyama@tottori-u.ac.jp

Abstract. Observers using image-sharing social networking services often imagine wearing the clothing portrayed in advertising images and predict the impression on others. It is likely that an observer's gaze is drawn to specific body parts of the person shown wearing the clothes, and as such, the specific body parts that are focused on by the observer could provide cues regarding impression prediction. Although previous analytical studies have investigated the role of gaze distribution in evaluating the subject attractiveness, no studies have examined the gaze of observers while they imagined wearing clothes and predicted the impression on others. In this paper, we measured the gaze distribution while observers imagined wearing a portrayed subject's clothing and predicted the impression on others. We further investigated the degree to which an observer's gaze was focused on each subject's body part according to the characteristics of the gaze distribution. The experimental results showed that, in the case of an image taken from head to toe, the observer's gaze tended to be focused most on the subject's chest, followed by the head. In the case of images taken with the head occluded, the observer's gaze tended to focus most on the subject's chest, followed by the stomach.

Keywords: Gaze distribution · Impression prediction · Imagining wearing clothing · Advertising images.

1 Introduction

In recent years, image-sharing social networking services (SNSs) have become a common platform for advertising and purchasing clothing [13, 12]. As a result, SNS feeds often show many images of people wearing fashionably coordinated clothing. Here, we refer to the people in the images as subjects. The subjects in SNS images are often photographed from head to toe, or their heads are hidden. Here, a 'whole-body image' refers to an image in which a subject is visible from head to toe, while a 'head-occluded image' shows a subject with their head hidden.

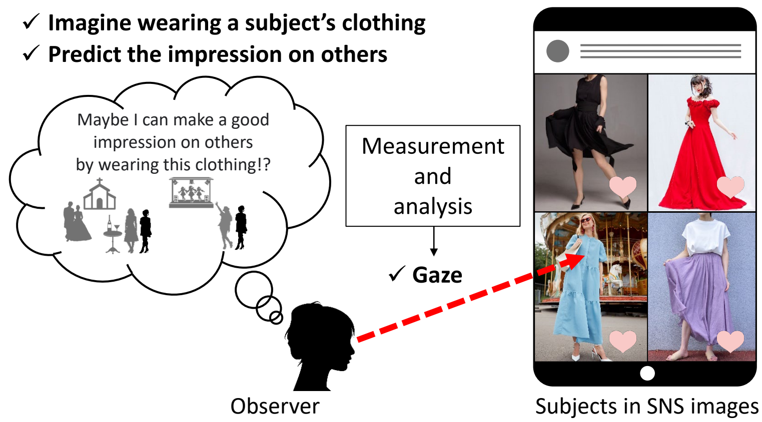

Fig. 1. We investigated gaze distribution by measuring and analyzing the female observer's gaze. The observer looks at the subject in the image, imagines wearing the subject's clothing, and predicts whether she would make a good impression on others.

People using image-sharing SNSs subjectively predict whether they would make a good impression on others in a certain outfit by imagining themselves wearing the portrayed subject's clothing [3, 5, 9]. This is the case for both whole-body and head-occluded images. In the following, we refer to people who use image-sharing SNSs as observers. When observers who are using SNSs make a prediction about the impression on others that a certain outfit would produce, they look directly at the subject's body, as shown in Fig. 1. While imagining wearing the subject's clothing, it is likely that the observer's gaze is drawn to the subject's body parts, which could provide cues about the impression on others. If we could identify the body parts that are the focus of the observer's gaze, we might be able to determine which body parts provide helpful information when making decisions about purchasing clothing. This information could be applied to the field of clothing marketing.

In this study, we investigated the gaze of female observers who were asked to imagine wearing a subject's clothing and to predict the impression on others. Although the analysis conditions differed from those in our present research, several previous studies investigated the subject body parts that were most frequently gazed at by observers who were asked to predict the degree to which others would find the subject attractive. For example, Gervais et al. [6] analyzed gaze characteristics for subjects with different body shapes in a whole-body image. Furthermore, Cornelissen et al. [4] examined gaze characteristics for naked subjects in a head-occluded image. However, these studies [6, 4] did not consider the gaze of observers asked to imagine wearing a subject's clothing and to predict the impression on others.

In this paper, we attempted to determine which body parts in a whole-body image or a head-occluded image were the focus of a female observer who was asked to imagine wearing the portrayed subject's clothing and to predict the impression on others. First, we measured the gaze distribution while observers imagined wearing a portrayed subject's clothing and predicted the impression on others. Second, we investigated the degree to which an observer's gaze was focused on each subject's body part. We confirmed the following results in subjective assessments involving 24 female observers. The female observer's gaze tended to be focused most on the subject's chest, followed by the head, in the case of an image taken from head to toe. In contrast, the female observer's gaze tended to focus most on the subject's chest, followed by the stomach, in the case of images taken with the head occluded.

2 Hypothesis

In our subjective assessments, to investigate the degree to which the observer's gaze was focused on each subject's body part, we asked the female observer to imagine wearing the portrayed subject's clothing and to predict the impression on others. No existing analytical studies have conducted subjective assessments for this purpose, as described in Section 1. In our subjective assessments, we generated the following hypotheses based on the previous studies [6, 4].

H1 : When a female observer imagines wearing a subject's clothing in a *whole-body* image and predicts the impression on others, the observer's gaze will be most focused on the subject's *head*.

H2 : When a female observer imagines wearing a subject's clothing in a *head-occluded* image and predicts the impression on others, the observer's gaze will be most focused on the subject's *stomach*.

We explain the detail of the previous study [6] that we referred to when generating hypothesis H1. This previous study analyzed the observer's gaze when predicting the appearance attractiveness of the subject's body shape in a whole-body image. They used whole-body images of women wearing the same white tank top and blue jeans and conducted subjective assessments with male and female observers in this previous study. They reported that the observer's gaze was more focused on the chest and waist than the face when the observers were asked an appearance-focused question (compared to a personality-focused question). However, through the experimental results in [6], they also reported that the dwell time on the face is longer than that on the chest and waist. From these results, we generated hypothesis H1, that the gaze is drawn to the head.

Next, we explain the detail of the previous study [4] that we referred to when generating hypothesis H2. This previous study analyzed the observer's gaze when predicting the physical attractiveness of a naked subject in a head-occluded image. They used head-occluded images of naked women with mosaicing faces and conducted subjective assessments with male and female observers in this previous study. They reported that the observer's gaze was more focused on the upper abdomen and chest than the pelvic and hip when the observers were asked an attractiveness question. Furthermore, the experimental results in [4] demonstrated that female observers did not focus their gaze on the chest as much as male observers. From these results, we generated hypothesis H2, that the gaze focuses on the stomach.

3 Gaze measurement from observers

3.1 Stimulus image

Figure 2 shows a part of the stimulus images used in our experiment. In the following, we denote a set of whole-body images as $\mathcal{S}_w$ and a set of head-occluded images as $\mathcal{S}_h$. The number of subjects in each stimulus image was set to 1. The total number of stimulus images per observer was 104, with 52 whole-body images and 52 head-occluded images. All subjects in stimulus images were female. To generate a head-occluded image, an area above the tip line of a chin was cropped from a whole-body image. We used only the subject's standing posture, where her clothes and face were visible. No restrictions were placed on the position and orientation of the limbs of subjects to ensure that the postures of subjects were aligned. We selected the subject's facial expressions that did not give a negative impression but gave a positive or neutral impression. The size of whole body images was resized to 900 pixels in height and 382$\pm$82 pixels in width while maintaining the aspect ratio. The size of head-occluded images was 757$\pm$9 pixels in height and 382$\pm$82 pixels in width. These stimulus images were downloaded from the photo material site[1].

Next, we describe how to select stimulus images for our experiments. We assumed a formal setting, such as a wedding or a concert, and a casual setting, such as an outdoor festival or a theme park, as scenes in which observers predict impressions on others. To consider these scenes, we prepared the same number of stimulus images for both formal and casual clothing. We also prepared the same number of stimulus images with backgrounds taken outdoors and indoors.

3.2 Observers

We recruited 24 observers (21.5$\pm$1.3 years old, university students, Japanese ethnicity). All observers were female. In the following, the female observer is denoted as o, and a set of the observers is denoted as $\mathcal{O}$.

We asked a female observer $o \in \mathcal{O}$ the following question when she viewed the subject in the stimulus image.

Q : When you imagine yourself wearing the subject's clothes, do you feel that the people around you will have a good impression of you?

Each observer responded on a 4-point scale (4: yes, 3: likely yes, 2: likely no, 1: no). Before performing our subjective assessments, we asked an observer to imagine a situation in which they would use image-sharing SNSs to purchase clothing that would make a good impression on others. We thoroughly explained the disadvantages of gaze measurement to the participants and obtained their consent on a form.

[1] https://www.photo-ac.com/

Fig. 2. A part of the stimulus images of $\mathcal{S}_w, \mathcal{S}_h$ used in our experiment.

3.3 Setting

Figure 3 shows our experimental setting. A 24-inch display (AOC G2460PF, 1920 $\times$ 1080 pixel resolution) was used to show the stimulus images. A gazepoint GP3 HD, a stationary eye-tracker, was used to measure the gaze of female observers. This eye-tracker was placed in front of the display. An observer was seated with her face facing the display screen. The distance from her face to the display screen was kept at 65 cm. The height of the observer's eyes varied among individuals, ranging from 110 cm to 120 cm from the floor. Observers were instructed to keep their faces as still as possible when measuring gaze. The sampling rate of the eye-tracker was set to 150 Hz. We performed resampling using linear interpolation at 50 Hz to ensure that the time intervals were equally aligned because the

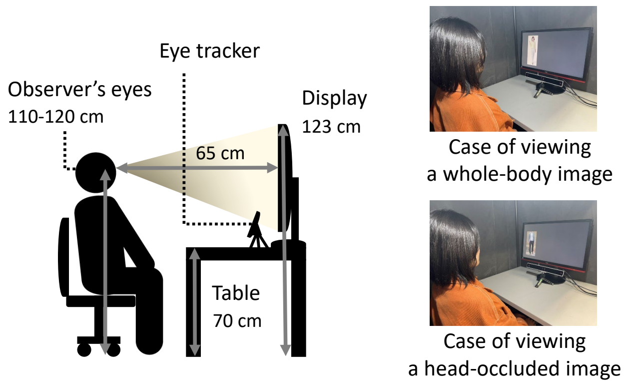

Fig. 3. Setting for gaze measurement.

time interval of the measured gaze was not constant due to the eye-tracker's specifications.

3.4 Procedure

We describe the procedure for measuring the female observer's gaze.

P_1 : One observer o was randomly selected from a set of observers $\mathcal{O}$.
P_2 : The question content and measurement procedure were explained to an observer o.
P_3 : The start image was shown on the display for two seconds.
P_4 : One stimulus image was randomly selected from a set of whole-body images $\mathcal{S}_w$ or a set of head-occluded images $\mathcal{S}_h$ and then shown on the display for three seconds without overlap. The observer's gaze was measured during this period.
P_5 : The end image was shown on the display for two seconds. An observer answered the question Q described in Section 3.2.
P_6 : The procedure from P_3 to P_5 was repeated until all stimulus images in $\mathcal{S}_w$ and $\mathcal{S}_h$ were selected.
P_7 : The procedure from P_1 to P_6 was repeated until all observers in $\mathcal{O}$ were selected.

Examples of images shown on the display in procedures from P_3 to P_5 are shown in Fig. 4(a) for a whole-body image and Fig. 4(b) for a head-occluded image. When showing a stimulus image on the display, we need to be aware of center bias [1], which fixes the observer's gaze at the center of the display at the initial time. We asked an observer to look at the center of a randomly placed white cross in the start image of procedure P_3 to avoid center bias. In procedure P_4, a stimulus image was randomly placed to avoid overlapping the position of a white cross in the start image with the position of a subject in an image.

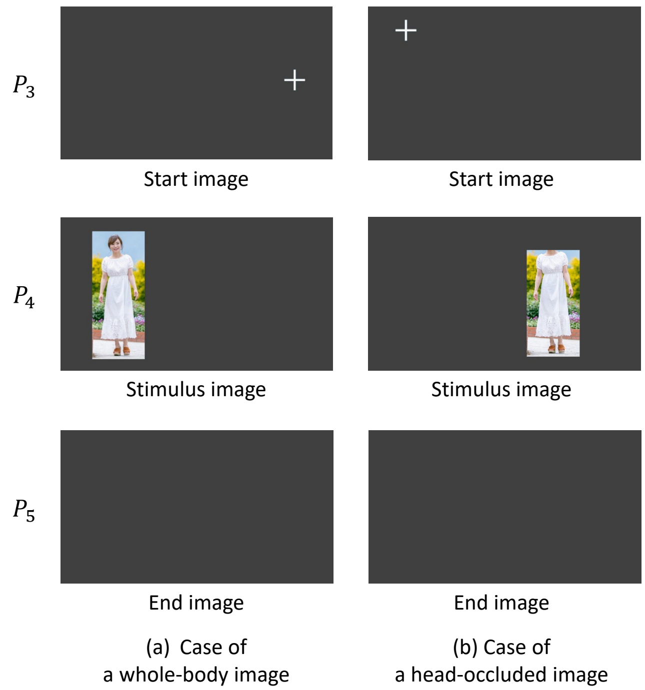

Fig. 4. Examples of the images shown on the display when measuring gaze.

4 Gaze analysis

4.1 overview

When analyzing the observer's gaze, we need to notice that the pixels representing the body parts differ among the stimulus images. The subject's body parts are not aligned in the stimulus images, as described in Section 3.1. For example, a subject placed body parts with both hands downward, one hand on the waist, both feet shoulder-width apart, or both knees crossed. When using a heatmap representation on stimulus images for gaze analysis, such as [11, 10, 7], it is not easy to compare the measured gaze pixels among stimulus images directly.

For gaze analysis, we used the body-part attention probability analysis [8], which indicates how likely it was that the observer's gaze was focused on each subject body part. This probability was calculated based on the distance between a pixel representing each subject body part and a pixel where the observer's gaze was measured. We describe the body parts used in gaze analysis in Section 4.2, and the method for calculating the body-part attention probability in Section 4.3.

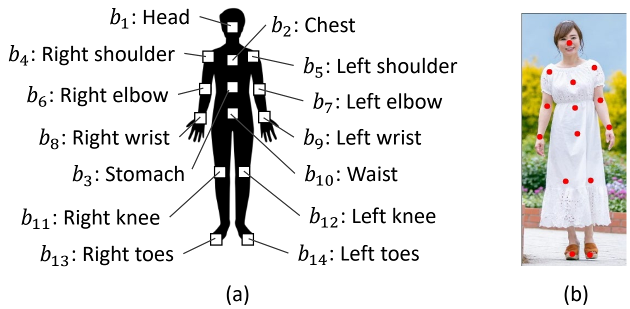

Fig. 5. Body parts for gaze analysis.

4.2 Body parts for gaze analysis

Figure 5 shows the body parts used in gaze analysis. The body parts are defined as head b_1, chest b_2, stomach b_3, right shoulder b_4, left shoulder b_5, right elbow b_6, left elbow b_7, right wrist b_8, left wrist b_9, waist b_{10}, right knee b_{11}, left knee b_{12}, right toes b_{13}, and left toes b_{14}. When selecting the body parts for gaze analysis, we did not use those close to other body parts, such as fingers. Instead, we used the body parts that were distant from each other among the body parts. In the case of a whole-body image, we denote a body part b_w, and a set $\mathcal{B}_w = \{b_1, b_2, \cdots, b_{14}\}$ consisting of 14 body parts. In the case of a head-occluded image, we denote a body part b_h, and a set $\mathcal{B}_h = \{b_2, \cdots, b_{14}\}$ consisting of 13 body parts excluding the head b_1.

When perfoming gaze analysis, we detected the head position (b_1) and the 12 body part positions $(b_4, \cdots, b_{14})$ using OpenPose [2]. The head b_1 is indicated by the nose position of OpenPose. Note that this detector do not define body parts for chest b_2 and stomach b_3. Let b_2 be the 1:4 endpoint of the line segment connecting the midpoint of the line segment connecting the right shoulder b_4 and the left shoulder b_5 to the waist b_{10}. Let b_3 be the midpoint of the line segment connecting the chest b_2 and the waist b_{10}. In the following, we denote a pixel $\boldsymbol{i}_{b_w}$ representing a body part b_w detected in a whole-body image, and a pixel $\boldsymbol{i}_{b_h}$ representing a body part b_h detected in a head-occluded image.

4.3 Body-part attention probability

In the case of a whole-body image, we calculate the body-part attention probability using [8] for body part b_w of Section 4.2. In the following, one whole-body image is denoted as $\mathcal{I}_w$ that is an element of a set of whole-body images $\mathcal{S}_w$. Suppose a pixel $\boldsymbol{i}_w$ is an element of $\mathcal{I}_w$. When a female observer $o \in \mathcal{O}$ views a whole-body image $\mathcal{I}_w$, the body-part attention probability $p(b_w|o, \mathcal{I}_w)$ represents that her gaze is focused on a body part b_w in the image. This probability is calculated as follows:

$$p(b_w|o,\mathcal{I}_w) = \sum_{\boldsymbol{i}_w \in \mathcal{I}_w} \mathcal{N}(\boldsymbol{i}_w|\boldsymbol{i}_{b_w},\Sigma)p(\boldsymbol{i}_w|o,\mathcal{I}_w). \tag{1}$$

Note that this equation satisfies as follows:

$$\sum_{b_w \in \mathcal{B}_w} p(b_w|o,\mathcal{I}_w) = 1. \tag{2}$$

The first term $\mathcal{N}(\boldsymbol{i}_w|\boldsymbol{i}_{b_w},\Sigma)$ of Equation (1) is a bivariate normal distribution, where a mean is $\boldsymbol{i}_{b_w}$ and a covariance matrix is $\Sigma = \mathrm{diag}(\sigma^2,\sigma^2)$. The closer the distance from a pixel $\boldsymbol{i}_w$ to a pixel $\boldsymbol{i}_{b_w}$ of a body part b_w, the higher the value of $\mathcal{N}(\boldsymbol{i}_w|\boldsymbol{i}_{b_w},\Sigma)$ is recorded. The second term $p(\boldsymbol{i}_w|o,\mathcal{I}_w)$ of Equation (1) refers to the probability that the gaze of an observer o is focused at a pixel $\boldsymbol{i}_w$ that consists of a whole body image $\mathcal{I}_w$. The probability $p(\boldsymbol{i}_w|o,\mathcal{I}_w)$ is calculated as follows:

$$p(\boldsymbol{i}_w|o,\mathcal{I}_w) = \frac{1}{n(\mathcal{T})}\sum_{t\in\mathcal{T}}\mathcal{N}(\boldsymbol{i}_w|\boldsymbol{i}_g(t),\Sigma), \tag{3}$$

where $\boldsymbol{i}_g(t)$ is a pixel representing the gaze measured from an observer o at time t, $\mathcal{T}$ is a set of times when the gaze was measured, and $n(\ )$ is a function that returns the number of elements in a set.

Next, in the case of a head-occluded image, we calculate the body-part attention probability using [8] for body part b_h of Section 4.2. In the following, one head-occluded image is denoted as $\mathcal{I}_h$ that is an element of a set of head-occluded images $\mathcal{S}_w$. Suppose a pixel $\boldsymbol{i}_h$ is an element of $\mathcal{I}_h$. The body-part attention probability for a head-occluded image is calculated as follows:

$$p(b_h|o,\mathcal{I}_h) = \sum_{\boldsymbol{i}_h \in \mathcal{I}_h} \mathcal{N}(\boldsymbol{i}_h|\boldsymbol{i}_{b_h},\Sigma)p(\boldsymbol{i}_h|o,\mathcal{I}_h), \tag{4}$$

where the first and second terms of this equation are calculated in the same way as for a whole-body image.

5 Experiments

5.1 Subjective assessments on hypothesis H1 and hypothesis H2

Protocol We explain the case of a whole-body image for the experiment on hypothesis H1 described in Section 2. Using a set of observers $\mathcal{O}$ and a set of whole-body images $\mathcal{S}_w$, we marginalized the body-part attention probability $p(b_w|o,\mathcal{I}_w)$ defined in Equation (1), and calculated the marginalized probability $p(b_w)$ for whole-body images as follows:

$$p(b_w) = \frac{1}{n(\mathcal{O})n(\mathcal{S}_w)}\sum_{o\in\mathcal{O}}\sum_{\mathcal{I}_w\in\mathcal{S}_w} p(b_w|o,\mathcal{I}_w), \tag{5}$$

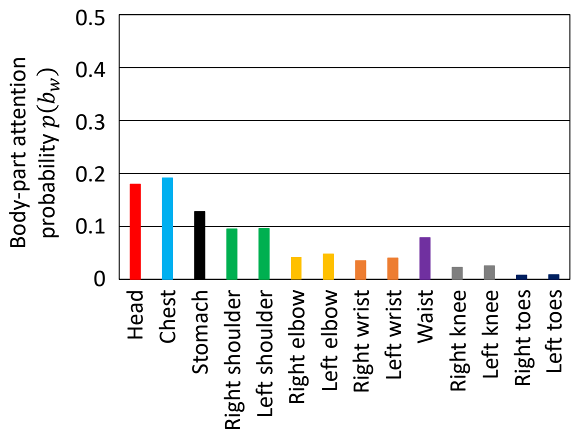

Fig. 6. Body-part attention probability $p(b_w)$ for a set of whole-body images $\mathcal{S}_w$.

where we set $n(\mathcal{O}) = 24$, $n(\mathcal{S}_w) = 52$.

Next, we explain the case of a head-occluded image for the experiment on hypothesis H2. Using a set of head-occluded images $\mathcal{S}_h$, we marginalized the body-part attention probability $p(b_h|o, \mathcal{I}_h)$ defined in Equation (4), and calculated the marginalized probability $p(b_h)$ for head-occluded images as follows:

$$p(b_h) = \frac{1}{n(\mathcal{O})n(\mathcal{S}_h)} \sum_{o \in \mathcal{O}} \sum_{\mathcal{I}_h \in \mathcal{S}_h} p(b_h|o, \mathcal{I}_h), \tag{6}$$

where we set $n(\mathcal{O}) = 24$, $n(\mathcal{S}_h) = 52$.

Results for hypothesis H1 Figure 6 shows a bar graph representation of the body-part attention probability $p(b_w)$ of Equation (5) for the case of a whole-body image. The horizontal axis shows the body part indicated in Fig. 5, and the vertical axis indicates the value of $p(b_w)$. The higher the probability of a certain body part, the more the gaze tended to be focused on that body part. The experimental results showed that the chest was the body part with the highest $p(b_w)$, and the head was the body part with the next highest $p(b_w)$. The difference between these probabilities was 0.01, indicating that the gaze probability was similar between the head and the chest. Hypothesis H1 stated that the female observer's gaze would be most focused on the subject's head, but this did not hold. Instead, in the case of full-body images, the female observer's gaze tended to focus most on the chest, followed by the head.

Results for hypothesis H2 Figure 7 shows a bar graph representation of the body-part attention probability $p(b_h)$ of Equation (6) for the case of a head-occluded image. The experimental results showed that the chest was the body

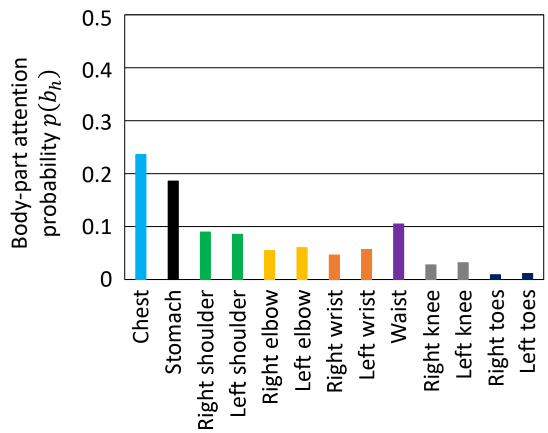

Fig. 7. Body-part attention probability $p(b_h)$ for a set of head-occluded images $\mathcal{S}_h$.

part with the highest $p(b_h)$, and the stomach was the body part with the next highest $p(b_h)$. The difference between these probabilities was 0.05, indicating a slightly different trend between the chest and stomach. Hypothesis H2 stated that the female observer's gaze would be most focused on the subject's stomach, but this did not hold. Instead, in the case of head-occluded images, the female observer's gaze tended to be focused most on the chest, followed by the stomach.

5.2 Visualization of gaze distribution for each stimulus image

Protocol We visualized how the gaze was focused on body parts for each stimulus image. In the case of a whole-body image, we used the second term $p(\boldsymbol{i}_w|o, \mathcal{I}_w)$ of Equation (1). This term refers to the probability that the gaze of a female observer o is focused on a pixel $\boldsymbol{i}_w$ consisting of a whole-body image $\mathcal{I}_w$, as described in Section 4.3. Using a set of observers $\mathcal{O}$, we marginalized $p(\boldsymbol{i}_w|o, \mathcal{I}_w)$, and calculated the marginalized probability $p(\boldsymbol{i}_w|\mathcal{I}_w)$ for each whole-body image as follows:

$$p(\boldsymbol{i}_w|\mathcal{I}_w) = \frac{1}{n(\mathcal{O})} \sum_{o \in \mathcal{O}} p(\boldsymbol{i}_w|o, \mathcal{I}_w). \tag{7}$$

In the case of a head-occluded image, we used the second term $p(\boldsymbol{i}_h|o, \mathcal{I}_h)$ of Equation (4). Using a set of observers $\mathcal{O}$, we marginalized $p(\boldsymbol{i}_h|o, \mathcal{I}_h)$, and calculated the marginalized probability $p(\boldsymbol{i}_h|\mathcal{I}_h)$ for each head-occluded image as follows:

$$p(\boldsymbol{i}_h|\mathcal{I}_h) = \frac{1}{n(\mathcal{O})} \sum_{o \in \mathcal{O}} p(\boldsymbol{i}_h|o, \mathcal{I}_h). \tag{8}$$

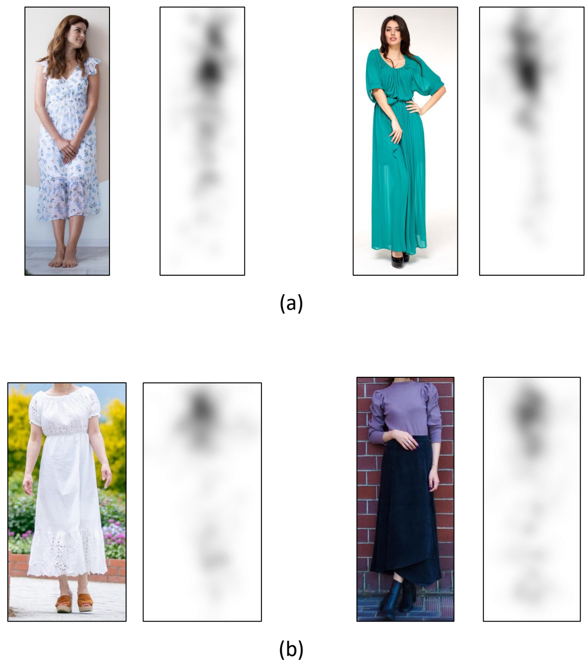

Fig. 8. Visualization of gaze distribution for each stimulus image. In (a), $p(\boldsymbol{i}_w|\mathcal{I}_w)$ is for a whole-body image. In (b), $p(\boldsymbol{i}_h|\mathcal{I}_h)$ is for a head-occluded image.

Results Figure 8(a) shows the visualization of $p(\boldsymbol{i}_w|\mathcal{I}_w)$ of Equation (7) for each whole-body image. In this figure, the black area indicates that the observer's gaze is focused. In contrast, a white area indicates that the observer's gaze is not focused. In the subject on the left in Fig. 8(a), the observer's gaze was focused mainly on the chest, followed by the head. For the subject on the right, the observer's gaze was focused mainly on the chest, followed by the head. We believe that $p(\boldsymbol{i}_w|\mathcal{I}_w)$ for each whole-body image indicates that the female observer's gaze tends to focus on the chest, followed by the head.

Next, Fig. 8(b) shows the visualization of $p(\boldsymbol{i}_h|\mathcal{I}_h)$ of Equation (8) for each head-occluded image. In the subject on the left in Fig. 8(b), the observer's gaze was focused on the chest, followed by the stomach. For the subject on the right, the observer's gaze was focused mainly on the chest, followed by the stomach. We believe that $p(\boldsymbol{i}_h|\mathcal{I}_h)$ for each head-occluded image indicates that the female observer's gaze tends to focus on the chest, followed by the stomach.

6 Conclusions

In this paper, we investigated which body parts in a whole-body image or a head-occluded image were the focus of a female observer who was asked to imagine wearing a subject's clothing and to predict the impression on others. We confirmed that the female observer's gaze tended to be focused most on the subject's chest, followed by the head, in the case of whole-body images. We also confirmed that the female observer's gaze tended to focus most on the subject's chest, followed by the stomach, in the case of head-occluded images.

In future work, we will investigate the observer's gaze distribution by increasing the number of observers and measuring gaze diversity concerning the gender, age, and ethnicity of observers. We will also expand our analysis to various subjects' postures in stimulus images, such as sitting and side-facing standing postures.

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References

1. Bindemann, M.: Scene and screen center bias early eye movements in scene viewing. Vision research **50**(23), 2577–2587 (2010)
2. Cao, Z., Hidalgo, G., Simon, T., Wei, S., Sheikh, Y.: Openpose: Realtime multi-person 2d pose estimation using part affinity fields. IEEE Transactions on Pattern Analysis and Machine Intelligence **43**(1), 172–186 (2021)
3. Conner, B.H., Peters, K., Nagasawa, R.H.: Person and costume: Effects on the formation of first impressions. Home Economics Research Journal **4**(1), 32–41 (1975)
4. Cornelissen, P.L., Hancock, P.J., George, H.R., Tovée, M.J.: Patterns of eye movements when male and female observers judge female attractiveness, body fat and waist-to-hip ratio. Evolution and Human Behavior **30**(6), 417–428 (2009)
5. Davis, F.: Fashion, culture, and identity. University of Chicago Press (1994)
6. Gervais, S.J., Holland, A.M., Dodd, M.D.: My eyes are up here: The nature of the objectifying gaze toward women. Sex Roles **69**, 557–570 (2013)
7. Irvine, K.R., McCarty, K., Pollet, T.V., Cornelissen, K.K., Tovée, M.J., Cornelissen, P.L.: The visual cues that drive the self-assessment of body size: Dissociation between fixation patterns and the key areas of the body for accurate judgement. Body Image **29**, 31–46 (2019)
8. Kinoshita, K., Inoue, M., Nishiyama, M., Iwai, Y.: Body-part attention probability for measuring gaze during impression word evaluation. In: Proceedings of 23rd International Conference on Human-Computer Interaction. pp. 105–112 (2021)
9. Naumann, L.P., Vazire, S., Rentfrow, P.J., Gosling, S.D.: Personality judgments based on physical appearance. Personality and social psychology bulletin **35**(12), 1661–1671 (2009)
10. Nummenmaa, L., Jari, H., Santtila, P., Hyönä, J.: Gender and visibility of sexual cues influence eye movements while viewing faces and bodies. Archives of Sexual Behavior **41**(6), 1439–1451 (2012)
11. Piers, C., Peter, H., Kiviniemi, V., Hannah, G., Martin, T.: Patterns of eye movements when male and female observers judge female attractiveness, body fat and waist-to-hip ratio. Evolution and Human Behavior **30**(6), 417–428 (2009)

12. Pujadas-Hostench, J., Palau-Saumell, R., Forgas-Coll, S., Matute, J.: Integrating theories to predict clothing purchase on sns. Industrial management & data systems **119**(5), 1015–1030 (2019)
13. Pujadas-Hostench, J., Palau-Saumell, R., Forgas-Coll, S., Sánchez-García, J.: Clothing brand purchase intention through sns. Online Information Review **43**(5), 867–892 (2019)