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Assessing the Noticeability of Hyperpigmented Facial Spots Using Eye-Tracker Technology

J. Kaczvinsky, PhD, N. Harrington, PhD, E. Jewell-Motz, PhD, W. Kennedy, MA, M. Marmor, BA, J. Li MS, MA, A. Menke, BS and E. Reinhardt, BEng

P&G Beauty, Cincinnati, Ohio USA

INTRODUCTION

Hyperpigmented facial lesions such as lentigines are closely associated with both chronological and photo-induced aging of the skin. As such, improving the appearance of these lesions is an important clinical target for anti-aging skin care products. Since consumer research has identified hyperpigmentation as a key sign of aging, we wanted to better understand how individuals assess facial spots.

OBJECTIVE

In this study we used eye tracking technology to assess whether:

- Naïve subjects notice (i.e., fix their gaze) on hyperpigmented facial spots.
- Whether their attention was drawn due to the presence of the spot.
- If facial spot noticeability changes when observers are asked to evaluate a face and estimate the subject's age.

EYE TRACKING

Eye tracking technology[1] was developed to measure the direction, sequence and duration of an observer's gaze over time, reflecting near infrared light off observer's corneas to follow their eye movements as they respond to a visual stimulus – in this case, facial images.

METHODS

Subject Photography. Facial images of 6 subjects with hyperpigmented facial spots were captured using the REAL 3.0 imaging system[2] under cross-polarized illumination. Subjects were imaged without facial make-up against a black background after acclimating to room conditions for about 10 minutes.

Spots were removed from the images and background skin tone matched by computer enhancement (Photoshop).

Eye Tracker. Subject images were presented via a Tobii X50 (rev1) eye tracker unit connected to a Shuttle SCPI PC with two HP1740 monitors. Data was captured by Tobii Clearview Software and analyzed using Microsoft Excel and SPSS statistical software.

Study Design. Each of 27 female judges (aged 35-45 years) were shown the 12 images (6 with spots and the same 6 without) in identical random order in two different formats:

Non-Directed Study. Judges viewed each image for 5 seconds without specific instructions. The number of ≥100 msec gaze fixations by each judge on each image were recorded. Relative number of judges fixating at least once on the region of the face (ROI) containing the spot in each of the matched "spot" vs. "no spot" images were compared.

Directed Study. Same as non-directed study, except judges were told they were going to be asked to estimate the age of the woman in the image.

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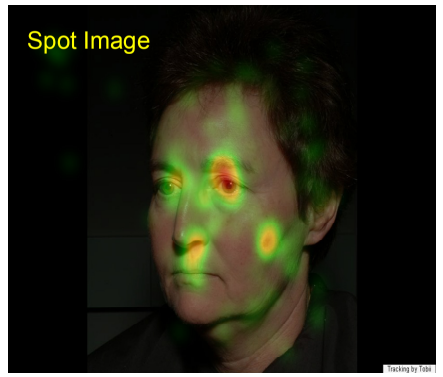
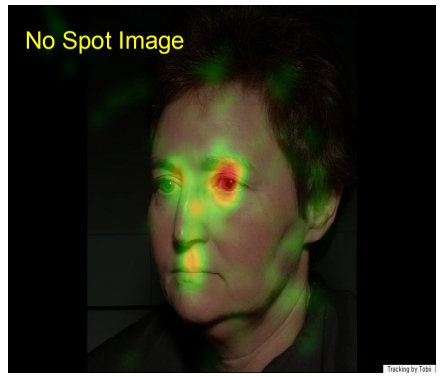
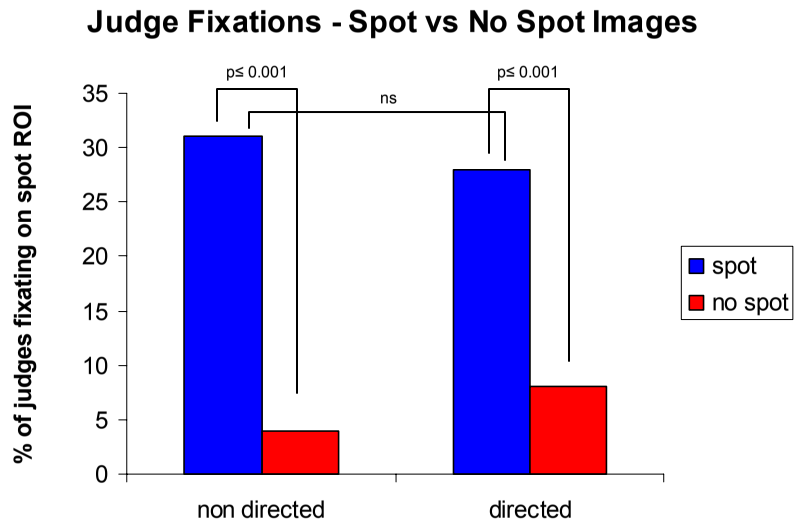
RESULTS

- "Heat map" shows where judges fixed their gaze when viewing images (composite of all judges' observations).
- Subject had a prominent lentigo on her left cheek, removed by computer image enhancement in the "no spot" image.

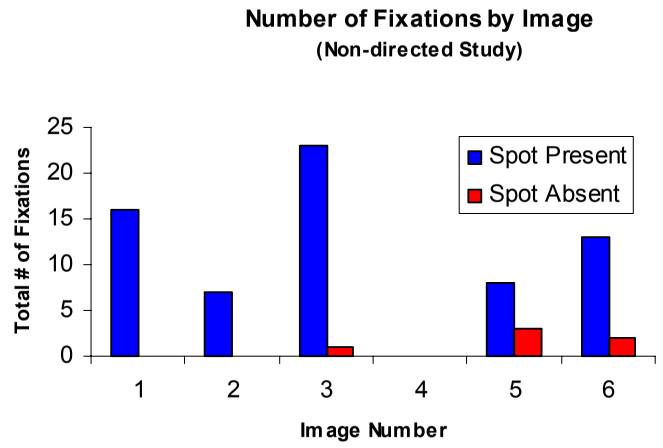




- A significantly higher percentage of judges fixated on ROIs containing facial spots in images where they were present than in identical images where they were removed.
- The overall percentage of judges fixating on the spot ROIs was not substantially different when observing casually than during directed evaluation.
- However, the judges fixating on the spot ROIs in each case were not the same.



- The noticeability of facial spots varied from image pair to image pair.
- Differences in noticeability appeared related to the size, number, intensity and location of the lentigo(s) on the face.
- All judges had the vast majority of their gaze fixations in the "T-zone" formed by the eyes, nose and mouth, to the base of the lips (see images above, for example).



CONCLUSIONS

- Viewing images differing only by the presence of a facial spot, substantially more observers fixed their gaze in the region of the face containing the spot when it was present.
- Not all the judges fixated on spots even when present, suggesting that the importance of hyperpigmentation may vary for each observer and affect noticeability.
- Judges fixating on spot AOIs in the two study formats were not the same, so spot noticeability differences between casual and focused observation are not clear.
- Increased fixation on spots distracted attention from the T-zone, which may be more critical to the perception of physical characteristics.
- Hyperpigmented facial spots do attract attention and could therefore be an important factor in the estimation of someone's perceived age and attractiveness.

ACKNOWLEDGEMENT

The authors thank J. Sacha and S. Carleton for their help with this research.

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2. Miyamoto K et al, *Skin Res. Technol.*, **8**, 227-35 (2002).

This work was funded by P&G Beauty.