

Available online at www.sciencedirect.com

Journal of Prosthodontic Research

journal homepage: www.elsevier.com/locate/jpor

Original article

Analysis of gaze points for mouth images using an eye tracking system

Mayu Yamamoto DDS^{*}, Katsunori Torii DDS, PhD, Masaki Sato DDS, PhD,
Junko Tanaka DDS, PhD, Masahiro Tanaka DDS, PhD

Department of Fixed Prosthodontics and Occlusion, Osaka Dental University, Osaka, Japan

ARTICLE INFO

Article history:

Received 21 June 2016

Received in revised form

30 November 2016

Accepted 9 December 2016

Available online xxx

Keywords:

Eye tracking

Gaze point

Esthetic dentistry

Mouth

Esthetic restoration

ABSTRACT

Purpose: We aimed to clarify whether people stare at non-esthetic restorations by analyzing the gaze point of laypersons looking at mouth images with intraoral non-esthetic restoration. **Methods:** The gaze points of 47 laypersons who do not visit dentists were measured using an eye tracker. The stimuli were 18 photographs of mouths with or without a non-esthetic tooth restoration, each randomly shown for 5s. The analysis sites included a tooth with non-esthetic restoration and the same tooth on the opposite side of the mouth. We measured the proportion of participants who first fixated on each analysis site, and total fixation time for each site.

Results: In images without non-esthetic restorations, a similar proportion of participants first fixated on each analysis site. However, more participants first fixated on non-esthetic restorations when the images contained them. Total fixation time for each site did not differ significantly between the left and right sides in the images without non-esthetic restoration ($P > 0.05$). Participants fixated on the non-esthetic restoration significantly more in the images containing them ($P < 0.01$).

Conclusions: Within the limitations of this study, the present findings suggest that in photographs of the mouth with non-esthetic restoration on either side, the non-esthetic restoration is first gazed before the opposite side. In addition, the non-esthetic restoration is gazed longer than the opposite side, and there was no major difference in the fixation time regarding the state of non-esthetic restoration.

© 2016 Japan Prosthodontic Society. Published by Elsevier Ltd. All rights reserved.

1. Introduction

Patients and laypersons have a strong desire to possess esthetically pleasing teeth [1-3], which has put strong emphasis on esthetic dentistry. New esthetic materials and

treatments are developed on a daily basis and applied in clinical settings [4,5]. Research on the awareness of tooth esthetics has long been conducted mainly using subjective evaluation by questionnaire [6-12]. However, when people look at the mouth of others during face-to-face interactions, it is unclear as to what extent they fixate on areas considered

^{*} Corresponding author at: Department of Fixed Prosthodontics and Occlusion, Osaka Dental University, 5-17, Otemae 1-chome, Chuo-ku, Osaka 540-0008, Japan. Fax: +81 6 6910 1046.

E-mail addresses: yamamo-m@cc.osaka-dent.ac.jp, mochiko.j23@gmail.com (M. Yamamoto).

<http://dx.doi.org/10.1016/j.jpor.2016.12.005>

1883-1958/© 2016 Japan Prosthodontic Society. Published by Elsevier Ltd. All rights reserved.

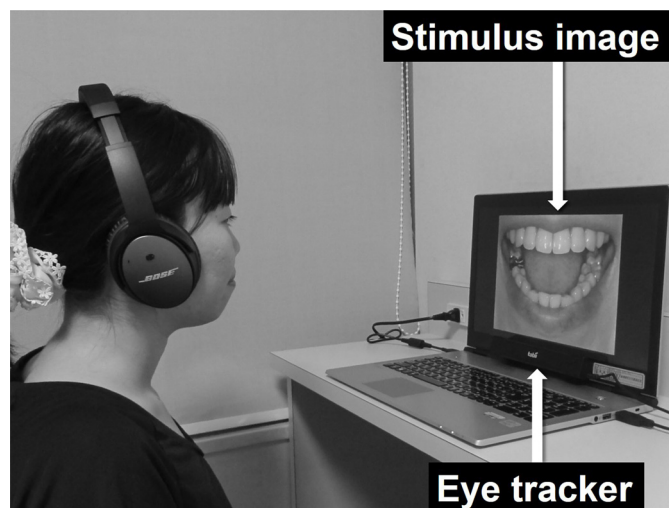


Fig. 1 – Measurement environment.

unesthetic by dentists, such as metal or discolored teeth. Restoration by means of metal crowns and other techniques is still common in the Japanese population [13]. If it is true that people stare at non-esthetic restorations, then the need for improvements in esthetic dentistry would be validated, which could lead to further developments in the field.

Line-of-sight analysis using eye-tracking is a technique used in various fields [14-18]. Eye tracking involves following the movement of a person's line of sight, which can provide information about the places people look, how long they look at these places, and the order in which they look at them. Eye tracking can also measure unconscious movements of the line of sight [19], which can provide information on people's behavior that cannot be obtained from questionnaires and interviews. In general, people move their line of sight to a subject of interest and obtain detailed visual information on this subject using foveal vision. This involves forming an image in the fovea centralis, where visual acuity is consistent with the position of the gaze point; thus, a person's visual cognitive behavior can be understood by measuring the movement of the gaze point [20]. Objective evaluation by quantifying unconscious gazing behavior is therefore needed to clarify to what extent people gaze at non-esthetic restorations in the mouth.

We previously performed a gaze point analysis in dental patients using photographs of mouths with intraoral non-esthetic restorations. Our results revealed that dental patients gaze at non-esthetic restorations and that, unlike laypersons who do not visit dentists, they were found to have a stronger interest in teeth. The aim of the present study was to clarify whether laypersons who do not visit dentists at the time of enrollment in the study gaze at non-esthetic restorations. The null hypothesis were: 'There would be no difference between the first gaze point fixation on mouth images without exposed non-esthetic restorations, and that on mouth images with exposed non-esthetic restorations on the right and left sides.', 'there would be no difference in the total fixation time at the gaze point between the tooth with non-esthetic restoration and the same tooth on the opposite side' and 'there would be

no difference in the total fixation time at the gaze point regardless of the state of non-esthetic restoration'.

2. Materials and methods

2.1. Participants

Our research protocol was reviewed and approved by Osaka Dental University and Tezukayama Gakuin University Institutional Review Board. We posted advertisements in classroom buildings on the campus of The Tezukayama Gakuin University, faculty of Human Society to recruit Forty-seven Japanese laypersons (7 men, 40 women, mean age \pm SD: 23.4 \pm 5.4years). The sample size was calculated on the basis of a pilot study [21]. A significance level of 0.05, effect size of 0.42, and statistical power of 0.8 were set. A necessary sample size of 47 participants was included.

Our inclusion criteria were that all participants were Japanese, have unimpaired vision with or without corrective lenses and be willing to attend the eye tracking session of about 15min. We excluded dental students and laypersons who visit dentists at the time of enrollment in the study from participating because they might be predisposed to look preferentially at the non-esthetic restorations.

2.2. Eye tracking system

Eye tracking was performed using an eye tracker (Tobii X2-30, Tobii Technology Japan, Ltd., Tokyo, Japan) and analysis software (Tobii Studio Version 3.2, Tobii Technology Japan, Ltd.). The eye tracker was mounted at the bottom of a display that showed the stimulus images. Each participant were asked to sit in an upright position, with a distance of approximately 60cm between the eye tracker and eyeball (Fig. 1). After calibration, participants were instructed to relax and freely look at images displayed on the screen. To eliminate ambient noise during measurements, participants wore noise-canceling headphones (Bose Quietcomfort 25, Bose Corporation,

Download English Version:

<https://daneshyari.com/en/article/8706766>

Download Persian Version:

<https://daneshyari.com/article/8706766>

[Daneshyari.com](https://daneshyari.com)