

ABSTRACT

The aim of this study was to determine how surrounding gum and lip color affected the perceived color of teeth. Computer generated images of a mouth, showing teeth, gums, lips, and a light skin tone were grouped into sets of five or seven images. A different tooth shade was chosen for each set. The chosen shades were white, grayish white, and yellow, to represent a range of human tooth color. Each image within a set had the same tooth color, but the surrounding lip or gum color was manipulated using Adobe Photoshop software. Various hues of magenta, yellow, blue, or red were added to the original, control image. An additional image was darkened by reducing the L* value of the control image. The images in each set were ordered vertically, and spaced a distance of at least 12 inches apart on a flat surface for viewing. Lighting conditions were controlled for Northern Daylight. Fifty-six randomly selected subjects were asked to select one image from each set that appeared to have the whitest teeth. They were also asked to select which image looked the healthiest and which image appeared to be the most attractive overall in each set. The same picture could be selected for all three answers. For perceived tooth whitening, 40% of the subjects selected an image with a magenta hue added to the gums. The control image was next, receiving only 22% of the responses. When asked what they perceived as healthy and attractive, a magenta hue was chosen 28% of the time, with 40% of subjects selecting the control image. What enhanced the perception of whiteness, did not always enhance the perception of health and attractiveness. **In conclusion, the subjects' perception of health, attractiveness, and whiteness is greatly influenced by the color of the adjacent lips and gums.**

MATERIALS AND METHODS

Seven images all having the same tooth color and the same lip color, but varying in the hue of the gums were generated and called a set. Each set differed from the other sets by changing the shade of tooth color as follows: Set B tooth color corresponded to white tooth shades; Set D tooth color corresponded to yellow tooth shades; and Set F tooth color corresponded to dull white, or gray white, tooth shades.

The images were numbered and ordered as shown in Table 1. Panelists were randomly chosen from employees and were mostly female, ranging in age from 21 to 65. The images were generated using Adobe Photoshop to control and alter the hue, and the printed image color confirmed with a Minolta Colorimeter.

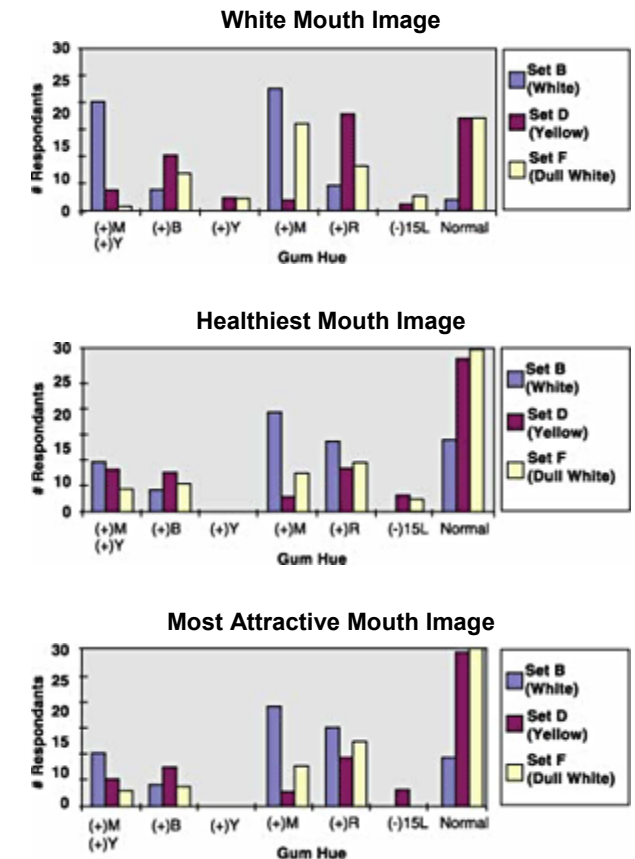
Table 1.

Hue of Gums	Set B	Set D	Set F
+25M(Magenta) and +20Y(Yellow)	9	21	33
+B (Blue)	10	22	34
+Y (Yellow)	11	23	35
+M (Magenta)	12	24	36
+R (Red)	13	25	37
-15L (Lightness)	14	26	38
Normal (Baseline image)	15	27	39

Images were displayed in a viewing room where lighting conditions were controlled for Northern daylight, which consisted of 50 watts incandescent, 8 watts ultraviolet, and 35 watts fluorescent lighting. A light meter was used to measure the light emitted in the room during the experiment (Model DLM2, #L155489). Readings ranged from 103.1 foot candles to 105.7 foot candles over the 5 hour experimental time period. The images in each set were ordered in a vertical line and spaced a distance of at least 12 inches apart from any other images. The images were viewed on a flat, gray surface so as to reduce any color contrast from the background. The panelists were asked to view each set of pictures, and then answer three simple questions for each set. They were asked 1.) to select the image that appeared to have the whitest teeth in each set, 2.) to select which mouth looked the healthiest, and 3.) to select which mouth appeared to be the most attractive overall in each set. The same picture could be selected for all three answers.

RESULTS

Looking at perceived whiteness, a magenta or magenta/yellow hue to gums made white teeth look their whitest. Removing the yellow was favorable for dull white teeth, and perceived whiteness for yellow teeth was best with no magenta or yellow in the gums, but the addition of red instead (Graph 1). For healthiest and most attractive mouth in Sets B, D, and F, the responses were very similar to each other and both were shifted toward baseline hue preference from the magenta and red in perceived whiteness (Graphs 2, and 3). A clear dislike in gum hues were yellow and darker.



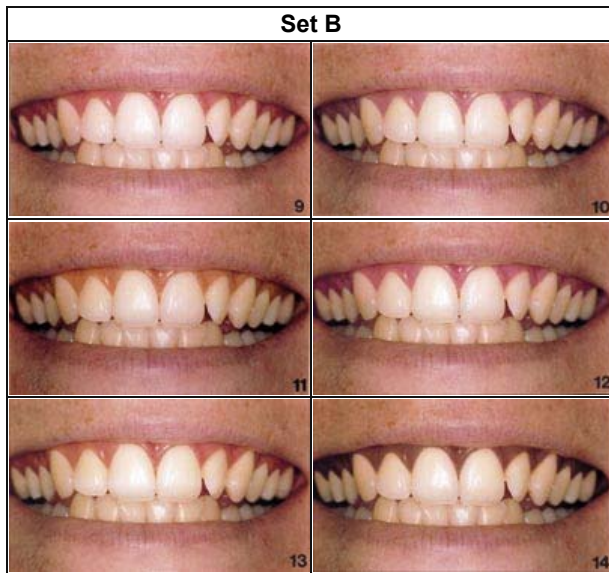
The Influence of Lip/Gum Color on Subject Perception of Tooth Color

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CONCLUSION

Gum and lip color influence the perceived color of teeth. Definite preferences emerged in lip and gum color, and even more definite were the dislikes in those categories. A magenta hue appeared to enhance the perceived whiteness of tooth color, while yellow and darker hues did not. Also, what the consumer perceived as white was not always what they perceived as healthy and attractive.