

Letters to the editor*

Esthetic effect of orthodontic appliances

I read with interest Berto and colleagues' recent article on the esthetic effects of orthodontic appliances (Berto PM, Lima CS, Lenza MA, Faber J. Esthetic effect of orthodontic appliances on a smiling face with and without a missing maxillary first premolar. *Am J Orthod Dentofacial Orthop* 2009;135[Suppl 1]:S55-60). This article reports experimental findings that suggest that orthodontic appliances do not negatively impact esthetic judgments. Although the authors are to be applauded for several aspects of their study, not the least for the photorealistic manipulation of their stimuli, there are a number of potential methodologic flaws and limitations to which I want to draw attention.

The authors used only 1 image as the base for their stimuli. This is a problem for several reasons. First, the person depicted is unlikely to represent the population of dental appliance users at large. It is possible that orthodontic appliances affect judgments of esthetic appearance differently as a function of user attractiveness, sex, or other aspects of the face that vary by person. Second, repeated exposure to the same stimulus is known to increase positive affective responses to that stimulus;¹ raters are likely to find the face more attractive the more they see it, clouding any possible effects of the appliance. The fact that the sitter's gaze is directed away from the camera is also an issue because gaze direction interacts with facial expression on judgments of attractiveness, with smiling faces judged more attractive when the gaze is direct and neutral faces more attractive when the gaze is indirect.² I agree that an oblique view is perhaps best for viewing the appliance, but, during social interactions, a frontal view is more common. Assessing the impact of the appliance from the front will more closely reflect how appearance will be judged during social interactions; this is presumably more important to potential users than how they are perceived by others in their environment with whom they are not interacting.

As for the experimental design, I am concerned that, by presenting every rater with every stimulus (no orthodontic appliance, fixed esthetic brackets, fixed metal brackets with ties of various colors, and all of these with and without a missing maxillary first premolar), the authors might have inadvertently induced demand characteristics in their sample. The raters, discerning the aims of the study, are likely to have responded in a socially desirable manner, avoiding the cognitive discomfort associated with judging others harshly on uncontrollable aspects of their appearance by providing equivalent ratings for all stimuli. The raters might be more willing to judge stimuli with an extraction space as less esthetically pleasing because, as the authors point out,

laypersons probably perceive poor dental hygiene to be the cause of a missing tooth (an aspect of appearance that is seen to be under personal control). A convention in psychological studies of attractiveness is to present stimuli from multiple conditions to all raters only when the manipulation is subtle or unrelated to widely held conceptions of social worth. It is common, for example, in studies of the effect of facial asymmetry on attractiveness to have participants express a preference for an original (asymmetric) image or a version of that same image that has been symmetrically remapped with computer graphics software, precisely because the differences in appearance are not striking.^{3,4} When differences are striking or likely to be related to perceived social worth—eg, when the manipulation involves facial scarring—a between-participants design is preferable.⁵ When assessing the influence of dental appliances on appearance, I believe that it is worthwhile to sacrifice a certain amount of statistical power by using a between-participants design to alleviate the effects of demand characteristics.

Finally, the authors did not state whether the order in which the stimuli were pasted into the presentation album was randomized for each rater. If the images were presented to every rater in the same sequence, the results might be confounded by order effects. If, for example, a stimulus with an extraction space is consistently presented before another without an extraction space, the latter stimulus might receive disproportionately higher ratings simply because it contrasts positively with the stimulus preceding it. It would have been preferable to continuously randomize presentation order, but, at the very least, a second album should have been assembled with the stimuli in reverse order, a technique commonly used in studies with a similar method.⁶

Although I believe the article is a useful first step, I hope that the authors will find these comments useful if they decide to follow up their findings with a more comprehensive study. Until such a study is carried out, any conclusions the authors reached regarding the effects of orthodontic appliances on esthetic appearance must be considered tentative.

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Am J Orthod Dentofacial Orthop 2009;136:305-6
0889-5406/\$36.00

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doi:10.1016/j.ajodo.2009.07.004

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Author's response

It was a pleasure to receive the letter from Dr Robert Burriss. We thank him for his comments about our study (Berto PM, Lima CS, Lenza MA, Faber J. Esthetic effect of orthodontic appliances on a smiling face with and without a missing maxillary first premolar. *Am J Orthod Dentofacial Orthop* 2009;135[Suppl 1]:S55-60) and for his interest in it. His letter raises a few questions, and this is an invaluable opportunity to clarify some points about our study methods.

Dr Burriss made an interesting observation about the use of 1 image to produce all the changes discussed in the study and expressed his belief that it would have been worthwhile to sacrifice a certain amount of statistical power by using a between-participants design. We respect his opinion on the sacrifice of statistical power but do not agree with it, because the use of several images and a between-participants design, although correct, would be negative for several reasons.

First, and the least important, it would be difficult to add photographs of people with and without an orthodontic appliance with and without extractions in sufficient numbers for a study of this type.¹ Moreover, if several photographs were shown to the observers, it would be impossible to simulate the different clinical situations produced in our study because a huge amount of time would be necessary to produce high-quality simulations. The comment on the possible interaction between other unstudied variables and the orthodontic appliances is relevant. In addition, these variables might interact with each other and affect observers' perceptions. The solution for this type of problem can often be found in multivariate statistical models, largely used today.¹

The analysis of many variables brings up another problem: the angle that is used to take the photographs. We used oblique photographs in our study for several reasons. Because it is difficult to obtain morphometric measurements that provide independent, reproducible variables when this view is used, we chose to make all changes in a single photograph. To minimize any positive effective responses to the stimulus,

also called inflation of a type I error rate, we used the Bonferroni correction, as described in our text.²

Unlike Dr Burriss, we do not believe that oblique views favor the analysis of the orthodontic appliance itself. It favors the appreciation of the extraction space, which is often relatively disguised in a frontal view; thus, we did not use that view. The oblique view, conversely, is common in social interactions and conversations of groups of 3 people because of the movement of the head and the changes in gaze direction. Therefore, it gives observers a perspective that the appliance user does not have. To have the same view as the observers, the person with the appliance would have to use at least 2 mirrors.

We believe that the question about a sitter's gaze, whether smiling or not, and its impact on esthetics, is absolutely irrelevant in this study, because photographs with both situations were not shown to our observers.³

The letter raises the hypothesis that we might have inadvertently induced demand characteristics in our sample because we let the study objectives be known. However, it is still unclear in the literature whether this perception by observers has an effect on their scores. At the same time, we agree that the order of the photographs in the album shown to the observers might have affected scores. Three different albums with random sequences of the photographs were produced. Because repeated measures ANOVA did not reject the null hypothesis of differences between the albums, the data were pooled.

Finally, based on the arguments above, we disagree that the conclusions of our study should be seen as tentative. We strongly recommend the clinical use of our findings by orthodontists and patients when they make decisions about the type of fixed orthodontic appliances to be used and how to avoid or disguise premolar extractions.

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Am J Orthod Dentofacial Orthop 2009;136:306
0889-5406/\$36.00

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doi:10.1016/j.ajodo.2009.07.005

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