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Influence of Head Position on Perceived Smile Arc Curvature

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Objectives Smile arc curvature is often assessed on patient facial photographs. The purpose of this study was to determine to what extent the anteroposterior inclination of the head influences smile arc curvature assessment on frontal photographs.
Methods Sixty-three young adult individuals were included in this study. Five standardized facial frontal-view photographs with posed smile, under 5 different anteroposterior inclinations (-20°, -10°, 0°, +10°, +20° using a cervical range of motion device) were taken of each individual. On each photograph two curves were determined, one following the shape of the lower lip and the other following the incisal edge of the maxillary anterior teeth from canine to canine (smile line), using GIMP software. The curvature of the lower lip and the curvature of the smile line were approximated using a quadratic function on the traced points. The two curves were then compared for concordance based on the maximum curvature of the obtained functions and a score was calculated whereby 0 denoting a consonant smile (perfect concordance between the lower lip and smile line) and 2 a non-consonant smile.
Results Among the 63 included participants, 59 of them were finally analyzed with 4 excluded due to lack of sufficient tooth exposition in the photographs to permit smile line assessment. The analysis of the data revealed that the perceived smile line was more consonant (concordant with lower lip curvature) with a -20° head anteroposterior inclination (score 0.146), and the least consonant with +20° anteroposterior inclination (score 1.326). Differences between different head inclinations were statistically significant ($p<0.05$).
Conclusions When assessing the smile arc curvature on facial frontal photographs, one should be aware that the anteroposterior inclination of the head in the photograph may influence this assessment. Three-dimensional imaging may thus be beneficial in this regard.