F14 Demographic Variation Effects on Human Bite Force

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The goal of this presentation is (1) to add to previously collected data on the levels and variations in bite force within a population with consideration of demographic data (age, sex, and race/ethnicity), and (2) to combine those data with information previously reported as a resource to forensic dentists in the evaluation of bite mark injury patterns.

This augmentation of a pilot study using a gnathodynamometer device will impact the forensic science community by providing attendees a clearer understanding of the forces involved in biting, concentrating on the demographic variation in force created by the anterior teeth most often involved when humans bite humans.

Method: Two hundred forty (240) individuals were randomly selected to participate in the current bite force study. After entry into the study, the participants were then subdivided based on age, sex, and race/ethnicity. The study also took into account the participants' height, weight, dental occlusion classification, presence or absence of TMJ pain/trauma and presence or absence of anterior restorations. Only persons willing to participate and able to give full consent were utilized. There were no incentives offered to participants. The participants were asked to complete a brief questionnaire reporting demographic information. For this study all subjects were examined and had a complete or near complete complement of teeth. Additionally, none of the subjects had removable prosthetics of any kind. Each participant was instructed to bite with maximal force onto the wax covered plates of the transducer of the gnathodynamometer. The gnathodynamometer records the bite force in pounds. Participants were asked to bite an additional time if the bite had errors such as slippage of teeth off the center of the bite pad. This process was repeated up for each participant, if necessary. The highest of the three recorded values were used for statistical analysis. The dental exemplar impressions produced in the wax were maintained with the study, along with the participant identification number and pressure reading (in pounds), as part of the data base. The wax bite pad was then scanned into Adobe® Photoshop® CS2, the surface area of the biting teeth was measured, and the bite force in pounds per square inch (PSI) was calculated. The bite forces in pounds per square inch and grams per square centimeter will be reported along with the age, sex and race/ethnic distribution. The two hundred forty subjects in this study were subdivided into three age ranges (18-27 y.o., 28 - 37 y.o. and 38-47 y.o.) by sex and by one of four race/ethnicities: African/African-American, Asian/Pacific Islander, Caucasian, and Hispanic. In each age group there were no fewer than 20 participants, and in each race/ethnicity group there were no fewer than 60 participants. Additional data acquired from the study participants included height, weight, TMJ dysfunction, history of dento-facial trauma, and overbite/over jet relationship of anterior teeth.

Results: The data recorded in this study will be statistically analyzed and documented to show the range of bite forces for a given demographic of individuals and the variables that affect it. Variations or lack of variations between the groups will be discussed. Additional research is needed to continue to build a database of force levels and factors that influence bite force. Also needed are studies of biting force variations among other groups including, but not limited to, those with different skeletal classifications or periodontal status. Individuals who have lost some or all anterior teeth and those who wear partial or complete dentures should also be studied. Once known force ranges are established and the effect of population variations are better understood, the association of specific bite forces to the types and severity of tissue injuries caused by teeth in skin can be better analyzed.

Forensic Odontology, Bite Force, Bite Mark

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