A28 A Comparison of Two Dental Age Estimation Methods Using Transition Analysis (TA)

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Learning Overview: After attending this presentation, attendees will be familiar with a revised application of TA for age estimation in subadults. The goal of this study is to validate the application of this method on a new populational dataset using a French dental radiographic sample (*n*=1,380). This study is part of a larger project examining subadult dental age estimation using TA.

Impact on the Forensic Science Community: This study will impact the forensic science community through evaluation of the performance of TA analysis on dental age estimation, using original and revised reference frameworks. The evaluation of the performance of TA on this sample illustrates the complexities of subadult dental age estimation.

The dataset comprises panoramic dental radiographs from the University of Bordeaux.[1] Individuals are from southern France (336 females; 639 males) with ages ranging from 1 to 16 years. Radiographs were obtained from public orthodontist offices and private hospitals, representing a range of variation in socioeconomic status. The data excludes any pathological or anomalies in tooth numbers.

The sample was scored following the Demirjian et al. (DGT) method in which eight mandibular teeth are assigned a value from A to H, corresponding to crown and root development.[2] These scores were converted to the Moorrees et al. (MFH) scoring stages (1–14) following Phillips' conversion chart.[3,4] This system correlated DGT and MFH stages by aligning original definitions for each stage. DGT scores that fell between two MFH stages were compared using both MFH stages (rounding up or rounding down).

The MFH dental development scores were analyzed following the TA method for age estimation based on dental development by Shackelford and colleagues.[5] The data were run again through a revised method, which adapted the Shackelford et al. framework to modern reference sample data.[6] Here, maximum likelihood age estimates and Confidence Intervals (CI) at the 50% and 90% were compared with known age.

CIs were calculated for only 1,351 individuals due to instances of single tooth observations. When rounding scores up to the nearest MFH stage, coverage for the original method was 53.89% at the 50% CI and 90.16% at the 90% CI, while the same scores in the revised method performed at 30.87% and 72.17%, respectively. When rounding down, the original method underperformed at the 50% CI (44.90%) and the 90% CI (84.68%); however, the revised method performed better at 43.30% and 79.79%.

These results suggest that the original MFH transitions, especially when rounding up a stage, are outperforming the revised method for the Bordeaux sample. When compared to an earlier study, the original TA method underestimated age by up to three years on a test sample from the United States, while the modified sample reflected more accurate estimations. The revised method was developed on a geographically diverse sample and was assumed to perform better than the original MFH reference sample. The poor coverages may be due to the direct conversion of the DGT scores, or a lack of appropriate reference data in the revised method sample. Future work will focus on re-scoring the entire Bordeaux sample directly into the MFH system and reexamining CI coverages.

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