



G31 Calculating the Standard Deviation: An Innovative Approach for Utilizing Historical Databases

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Learning Overview: After attending this presentation, attendees will understand how a new, proposed method in the calculation of standard deviation combining historical databases with modern populations' databases in the reporting of a dental age assessment can greatly improve the reporting of the age interval.

Impact on the Forensic Science Community: This presentation will impact the forensic science and legal community by improving the accuracy of dental age assessment techniques by combining traditional methods of calculating an age estimation interval using a new, proposed method. A step-by-step process of calculating standard deviation using three different methodologies will be detailed.

Age estimation remains one of the more complicated and difficult aspects of the human biological profile to assess. In addition, when used on living individuals, a dental age assessment has the potential to greatly affect their future and, if done improperly, can potentially violate their human rights. Given the risk involved with flawed reporting, concerns raised over the accuracy of the age estimation interval are justifiable, and scrutiny over its reporting understandable. Finding the most accurate method of calculating the standard deviation for a dental age assessment technique is essential to allow for a precise range calculation, and that the technique will apply an appropriate age interval to an individual. The calculation of a standard deviation is particularly complicated because not only there is variability in the historic dental developmental tables but variability in the rate of development of each of an individual's tooth buds as well. Numerous factors have been hypothesized to influence the rate of dental tooth bud development; however, for many of these factors, there has been no appropriate studies to verify that the effect and, if it exists, its magnitude.

Because of the complexity of these calculations as well as the lack of consensus on calculating of the standard deviation, many dental age estimation techniques, each with its own standard deviation calculation methodology, exist. In this study, different traditional methodologies of calculating a standard deviation, as well as a new innovative approach utilizing both a traditional database as well as a secondary population-specific database, was tested on a Saudi population using three dental age estimation techniques: Moorrees, Fanning, and Hunt's stages, Cameriere's open apices formula, and the London Atlas of tooth development.¹⁻³ A step-by-step process of calculating standard deviation using these different methodologies will be detailed, and the test results will be explained.

Reference(s):

1. Moorrees C.F., Fanning E.A., Hunt E.E., Jr. Age variation of formation stages for ten permanent teeth. *J Dent Res* 1963; 42: 490–502.
2. Cameriere R., Ferrante L., Cingolani M. Age estimation in children by measurement of open apices in teeth. *Int J Legal Med* 2006; 120(1): 49–52.
3. AlQahtani S.J., Hector M.P., Liversidge H.M. Brief communication: The London atlas of human tooth development and eruption. *Am J Phys Anthropol* 2010; 142: 481–490.

Dental Age Estimation, Accuracy, Standard Deviation