A20 Age Estimation in a South African Sample of 224 Living Subjects Using the Cameriere (Bo/Ca) and Tanner–Whitehouse 2 (TW2) Methods

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Learning Overview: The goal of this presentation is to compare the accuracy of skeletal age versus chronological age assessments using the Bo/Ca and TW2 methods in a South African sample of 224 individuals, aged between 6 and 16 years old, focusing on ethnicity and gender.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by verifying the applicability of a new method (Bo/Ca) for forensic age estimation in a specific population.

Hand and wrist X-rays represent the most common and objective method for assessing skeletal age.[1] Several qualitative and quantitative bone-specific methods have been developed, such as the Greulich and Payle atlas and the Tanner and Whitehouse method, refined and updated as TW2 and TW3.[2-5]. A more recent quantitative method was designed by Cameriere et al. in 2006 (Bo/Ca method) using a computer-aided software for the measurements of hand and wrist bones on X-rays.[6] The applicability of this new method has been little investigated and only limited data are available on the accuracy of the Bo/Ca method for specific populations.

The aim of the research was to compare the accuracy of Skeletal Age (SA) versus Chronological Age (CA) assessments using the Bo/Ca and TW2 methods in a large sample of children and adolescents from South Africa.

A retrospective study was performed using a digital database consisting of 224 hand-wrist radiographs. The sample consisted of 110 Black (55 females, 55 males) and 114 White European ethnicity subadults living in South Africa (56 females, 58 males). The CA ranged between 6 and 16 years (yr) with a mean age of 12.3yrs. The SA was estimated by two observers trained in skeletal age assessment, separately and independently, using the Bo/Ca method and the Radius-Ulna-Short bones (RUS), ossa Carpi compartment (CARP) and TW2-20 score methods. The differences between SA and CA estimates were used as indicators of the performance of the applied methods. Accuracy, sensitivity, and specificity of Bo/Ca and TW2 methods were calculated based on the age limit of 13 years. The inter-observer reliability was calculated by means of the Intra-Class Correlation (ICC).

Both methods showed a small discrepancy between SA and CA estimates, since the median values fall mostly within two months either side. Bo/Ca and Tw2 correctly classified both White (-0.08 and 0.18yr, respectively) and Black individuals (-0.07 and -0.20yr, respectively) and both males (-0.19 and 0.19yr, respectively) and females (-0.03 and -0.21yr, respectively). BO/Ca and TW2 methods showed a greater inaccuracy in subadults aged 13yrs or older compared with children younger than 13yrs old. SA estimates performed by Bo/Ca seem to be less influenced by ethnicity or gender than the TW2 method. Finally, the inter-observer reliability was found to be very small to a near-complete agreement, as demonstrated by the ICC (0.998; 95%CI 0.998–0.999).

According to this study, both Bo/Ca and TW2 radiological methods can be reliable for forensic age estimation of living individuals in South Africa. However, limitations dealing with normal variation in skeletal maturation due to nutritional and gender variables must be taken into account as well as the differences in the onset of pubertal development between ethnic groups. According to a holistic and multidisciplinary approach, in any forensic age estimation process it would be appropriate to consider the information on skeletal development provided by Bo/Ca and TW2 methods.

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Age Estimation, Skeletal Age Assessment, Anthropology Population Data

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