H89 Enough is Enough! What Are Validation Studies of Age Estimation Methods Really Telling Us?

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After attending this presentation, attendees will learn about the relevance and construction of age estimation method validation studies and method development with respect to design (phase versus component systems) and statistical considerations.

This presentation will impact the forensic science community by offering suggestions for research on age estimation methods and by demonstrating the need for revising phase systems with component systems.

The literature is flooded with validation studies of various aging methods on different populations. Because of the relative ease and speed with which these studies can be completed, they are ideal student research projects or conference papers and are generally viewed as valuable contributions to the research literature. The present study developed in similar fashion. The primary intent was to test the applicability of the Suchey-Brooks (SB) pubic symphysis method on the modern Colombian population. A secondary goal was to assess whether any features were difficult for a non-native English speaker with limited experience using the system to evaluate (i.e., to gauge whether the definitions and features translated well into Spanish or if any were "English-centric"). To this end, the lead researcher deconstructed the SB system into components by selecting eight key features from the phase descriptions and assigning states of expression to each feature based on the SB descriptions of their age progression morphology.

The following features and states of expression (in parentheses) were scored as components: pubic tubercle (absent, continuous with symphyseal face, separate); symphyseal face topography (billowed, flat, depressed); ventral rampart (absent, partial, complete, deteriorating); dorsal rim (absent, partial, complete, deteriorating); porosity (absent, present); lipping (absent, present on dorsal margin, present on ventral margin, present on both margins); oval outline (incomplete, complete); and, bony ligamentous outgrowths (absent, present). In addition, each pubic symphysis was assigned an SB phase. The sample consisted of right and left pubic symphyses from individuals in the Colombian Modern Skeletal Collection at the Institute of Legal Medicine in Bogota, Colombia (n=60, mean age=45.6 years, SD=23.1, range=24-93). Each observer had >5 years experience with pubic symphyseal aging, though the native English-speaking observer (Observer 1) had more experience with the SB system than the Spanish-speaking observer (Observer 2). Reference casts were used, and the definitions were translated into Spanish by a professional interpreter. Cohen's Kappa coefficients were calculated (SPSS® Version 20) to examine observer agreement and to evaluate whether certain traits were difficult to assess. In addition, a linear regression was run with "phase" as the independent variable, "age" as the dependent variable, and accuracy rates were calculated for each observer's scores.

Phase scores recorded by Observer 1 correctly estimated age in 93% of the sample using the 95% age ranges in the SB system; the corresponding accuracy rate for Observer 2 was 87%. The linear regression R^2 values were 0.64 and 0.49 for Observer 1 and 2, respectively (R=0.80 and 0.70, with no significant difference between correlation coefficients (z=0.834, p=0.404)). Observer agreement was relatively low for the SB phases (0.47), but ranged from relatively strong to very strong for the components (0.71 - 0.98). The component features ranked from highest to lowest Kappa are bony ligamentous outgrowths (0.98), oval outline (0.89), porosity (0.87), symphyseal face topography (0.86), ventral rampart (0.84), dorsal rim (0.80), pubic tubercle (0.75), and lipping (0.71).

The accuracy rates indicate that the SB system is adequate for use on the modern Colombian population. The slight discrepancy between observers could be attributed to experience level and/or language/translation issues. However, the high agreement for individual components indicates that the discrepancies are unlikely due to language problems. Instead, the comparatively low agreement for phase assignment indicates that a phase system is more difficult to apply objectively. With phase scoring, error associated with the individual traits is compounded, there are no suggestions on how to weight traits or how to handle variation from the typical Gestalt, and thus deciding between two phases is often subjective. The Kappa values also indicate that coding possibilities for each component should not exceed two or three states of expression, each with minimal overlap. It is anticipated that component-based methods will reduce observer error and generate more accurate age estimates. However, the soundest age estimates will be derived from multifactorial methods developed using probability statistics and Bayesian estimation.

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Seasoned and burgeoning researchers are encouraged to explore component systems in future research on skeletal age estimation.

Age Estimation, Pubic Symphysis, Validation Studies

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