

The Age-Informative Value Of The Pubic Symphysis Compared To Other Skeletal Traits In A Chilean Sample Using Transition Analysis

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Introduction

We hypothesize that the age-informative value of the pubic symphysis, historically considered one of the most reliable age indicators in the skeleton, has been overvalued compared to other traits in the skeleton. To assess its informative value we compared commonly used pubic symphysis phases and traits to newly proposed Transition Analysis 3 (TA3) traits from throughout the skeleton (Getz 2017; Milner et al. 2019).

Research question: How informative is the pubic symphysis for age-at-death estimation compared to traits throughout the skeleton?

Methods

Variables:

Pubic symphysis: 12 TA3 trait variants, Suchey-Brooks (1990) phases I-VI & Hartnett's (2010) phase VII.

Non-pubic symphysis traits: 89 TA3 trait variants.

Sample: 309 individuals from the Santiago Subadult Osteology Collection, Chile.

Analysis: Relationship between age and trait modeled using logistic regression. Derived predicted probabilities of having a trait at each age plotted as logistic curves (R Core Team 2020).

Interpretation: Curves inform age as they approach extreme probabilities. The steeper the slope the more potentially informative the trait. The more widespread distribution of curves throughout the lifespan, the better coverage the traits collectively obtain.

Uninformed age ranges: used here for age-ranges in which no logistic curve reaches probabilities between 0-0.1 and 0.9-1 for 5 years or more.

Results

- Logistic curves for phases are sparse but more homogeneously distributed along the lifespan than TA3 pubic symphysis traits which concentrate at younger ages. The pubic symphysis mainly informs the ages between 15-46 years (Figure 1).
- Non-pubic symphysis TA3 traits' logistic curves cover the entire lifespan with no uninformed ranges of 5 or more years (Figure 2).

Pubic symphysis TA3 traits & Suchey-Brooks and Hartnett phases Logistic curves

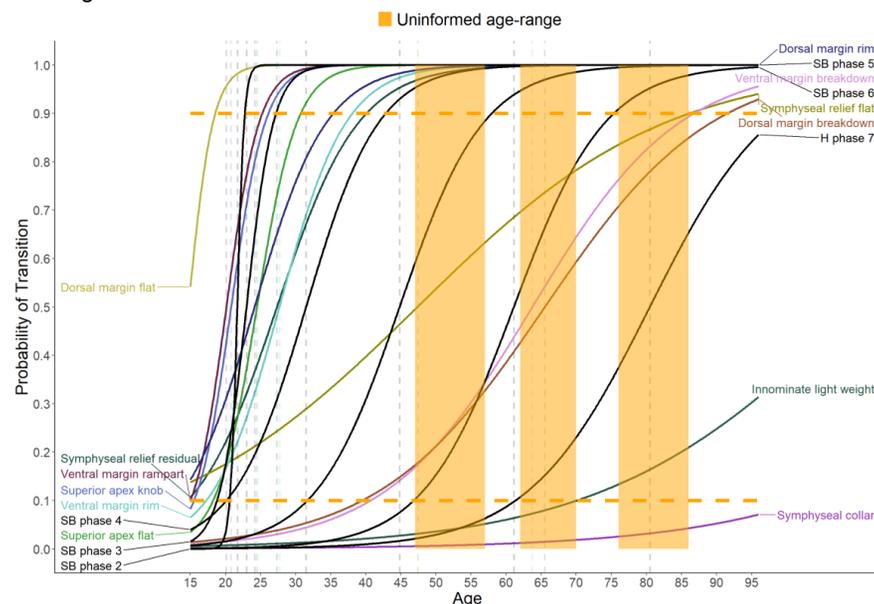


Figure 1: Overlapped logistic curves (colored curves) and ages-at-transition (vertical dashed lines, indicate probability=0.5) for all pubic symphysis TA3 traits and Suchey-Brooks and Hartnett phases.

Transition Analysis 3 (TA3) traits from elsewhere in the skeleton provide more age-information than the pubic symphysis.

Non-Pubic symphysis TA3 traits Logistic curves

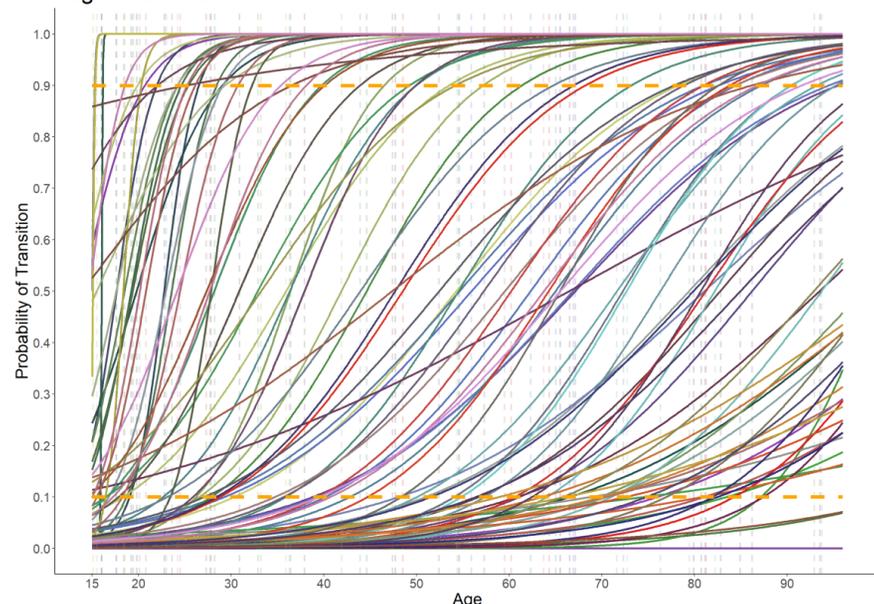


Figure 2: Overlapped logistic curves (colored curves) and ages-at-transition (vertical dashed lines, indicate probability=0.5) for all non-pubic symphysis TA3 traits

Discussion & Conclusions

- Informative value of pubic symphysis:** Collectively, pubic symphysis traits and phases were mostly informative of the first half of the lifespan as originally recognized by Todd (1920), and sparsely informative of the second half.
- Hartnett's phase VII:** Phase VII appears to better inform older age than the corresponding traits analyzed as components (light weight, flat relief, margin breakdown).
- High informative value of non-pubic symphysis TA3 traits:** Non-pubic symphysis TA3 traits provide more age information because they inform age-at-death throughout the entire adult lifespan.

Limitations & Future studies

- Incomplete skeletons and taphonomic damage:** Larger sample to characterize age-information for all traits.
- Limited number of pubic symphysis traits:** Further explore combinations of pubic symphysis traits to inform old age.
- Age-information is only potential:** Further analyses required to determine the best way to move from age information to age estimation.

References

- Brooks, S., and J. M. Suchey. 1990. "Skeletal Age Determination Based on the Os Pubis: A Comparison of the Acsádi-Nemeskéri and Suchey-Brooks Methods." *Human Evolution* 5 (3): 227-38. <https://doi.org/10.1007/BF02437238>.
- Getz, Sara M. 2017. "Improved Skeletal Age-at-Death Estimation and Its Impact on Archaeological Analyses." Doctoral Dissertation, University Park, PA: The Pennsylvania State University.
- Hartnett, Kristen M. 2010. "Analysis of Age-at-Death Estimation Using Data from a New, Modern Autopsy Sample-Part I: Pubic Bone." *Journal of Forensic Sciences* 55 (5): 1145-51. <https://doi.org/10.1111/j.1556-4029.2010.01399.x>.
- Milner, George R., Stephen D. Ousley, Jesper L. Boldsen, Sara M. Getz, Svenja Weise, and Peter Tarp. 2019. "Transition Analysis 3 (TA3) Trait Manual." Public Distribution Version 1.0. https://www.statsmachine.net/software/TA3/docs/TA3_Trait_Scoring_Manual_1.0.pdf.
- R Core Team. 2020. "R: A Language and Environment for Statistical Computing." Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.
- Todd, T. Wingate. 1920. "Age Changes in the Pubic Bone. I. The Male White Pubis." *American Journal of Physical Anthropology* 3 (3): 285-334. <https://doi.org/10.1002/ajpa.1330030301>.

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