INTRODUCTION

Is the accuracy of Rogers’ sex estimation method using the distal humerus dependent on biological ancestry?

Rogers’ (1999, 2009) visual method for sex estimation relies on sexual dimorphism in the following four traits of the distal posterior humerus: trochlear constriction, trochlear symmetry, olecranon fossa size/shape, and angle of the medial epicondyle.

Figure 1. Trochlear constriction (Rogers, 1999)

Figure 2. Trochlear symmetry and olecranon fossa size/shape (Rogers, 1999)

Figure 3. Angle of the medial epicondyle (Rogers, 1999)

This method has the potential for widespread applicability on adults and juveniles. In situations of fragmentation or commingled remains, use of the dominant pelvic and cranial methods may not always be possible, making sex estimation from other bones necessary. Furthermore, visual methods tend to be quicker and easier to apply than metric methods, which is beneficial when time and funding is limited.

However, Rogers’ (1999) initial accuracy rate of 92% has not been replicated by subsequent tests (Wanek, 2002; Faly, et al., 2005; Vance, et al., 2011; Watkinson, 2012; Harrison, 2017). Furthermore, the method was designed from a sample of exclusively white individuals, and many of the tests have also used samples of white individuals (e.g., Faly, et al., 2005, Rogers, Watkinson, 2012). This is problematic, as sex estimation methods are often population-specific (Wright & Yoder, 2003), a point that Rogers (1999:60) herself acknowledges. While Vance et al.’s (2011) and Harrison’s (2017) studies have used samples of individuals of varied backgrounds, so far, only Wanek’s (2002) study has controlled for biological ancestry. Wanek found variation in the accuracy of the method among groups of different ancestral backgrounds (e.g., 78% accuracy for black individuals vs. 85% accuracy for white individuals), but she concludes that the method can still be used on all human populations.

I set out to test Wanek’s conclusion by conducting an additional study evaluating the population-specificity of Rogers’ method but I employed slightly different methods of data collection and analysis.

DATA COLLECTION

Like Wanek, I blindly tested the technique on a sample of humeri (n = 199) that had been randomly selected from the Hamann-Todd Collection at the Cleveland Museum of Natural History.

However, rather than assess all four traits for each bone simultaneously, I instead evaluated each trait independently by repeatedly scrutinizing the entire sample collection and assigning sex on a three-point scale (male, ambiguous, or female). In between evaluations, I shuffled the order of the humeri, better allowing me to evaluate each trait individually without being influenced by my assessment of the previous trait.

Figure 4. Seriation Technique (Specimens Courtesy of the Cleveland Museum of Natural History)

DISCUSSION & CONCLUSIONS

The technique’s accuracy rate established from this study is considerably lower than Rogers’ (1999) initial accuracy rate of 92%, which is consistent with previous tests of the method (Wanek, 2002; Faly, et al., 2005; Vance, et al., 2011, Rogers, 2009; Watkinson, 2012; Harrison, 2017) (Table 3).

Table 3. Comparison of Results Across Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Overall Accuracy (%)</th>
<th>Accuracy of Traits (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simpson (current study)</td>
<td>67</td>
<td>54-67</td>
</tr>
<tr>
<td>Rogers (1999)</td>
<td>92</td>
<td>74-91</td>
</tr>
<tr>
<td>Wanek (2002)</td>
<td>83</td>
<td>65-77</td>
</tr>
<tr>
<td>Faly et al. (2005)</td>
<td>79</td>
<td>69-82</td>
</tr>
<tr>
<td>Rogers (2009)</td>
<td>81</td>
<td>n/a</td>
</tr>
<tr>
<td>Vance (2011)</td>
<td>86</td>
<td>45-70</td>
</tr>
<tr>
<td>Watkinson (2012)</td>
<td>80</td>
<td>65-78</td>
</tr>
<tr>
<td>Harrison (2017)</td>
<td>n/a</td>
<td>60-71</td>
</tr>
</tbody>
</table>

These results also support Wanek’s (2002) findings that there are differences in the accuracy of this method associated with biological ancestry. However, the findings that the odds for a correct classification of sex are 2.027 times more likely for a white individual than for a black individual suggest that application of the technique to non-white populations may be more problematic than Wanek concluded.

Overall, then, while still a useful technique, bioarchaeologists and forensic anthropologists must consider the population specificity of this method within the context of their study.

Future research will examine (1) the ancestry-specific variation in the accuracy of this method in greater detail, (2) how the accuracy established from this study of each of the four traits compare to all other studies’ results, and (3) how skeletal manifestations of diseases, especially osteoarthritis, contribute to misclassification of sex using this method.

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REFERENCES


