FOR HOW LONG DOES THE HAND DEVELOP?

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Abstract

The aim of this study was to acquire data relating to the ontogenetic development of the hand by means of an examination of one length and four width hand measurements in a cross-sectional sample. The sampling was carried out in two semi-endogamous populations (Beszterec and Túrricse), located in the Erdőhát and Rétköz regions, respectively, whose historic-demographic backgrounds suggest that they fully represent the two areas. According to the census in 1990, the sampling involved 24 per cent of the inhabitants in Beszterec and 34 per cent of the inhabitants in Túrricse. The results indicate that in females some measurements become mature sooner, i.e. their dimensional stabilization is manifested earlier. The wrist breadth characteristic of adults has developed between 13 and 14 years of age in both sexes in both populations. There is no significant sexual difference in the stabilization of the hand length either (between 16 and 17 years of age). Thus, it is only the three breadth measurements on the metacarpus that provide an opportunity for estimation of the genetic background and the possible functional adaptation. From this point of view, there is only a slight difference between the two samples. The breadth measurements situated closer to the wrist stabilize at a definitely earlier age in the males of Túrricse than in the males of Beszterec. In females, the ontogenetic difference between the two samples is observed in the breadth measurements closer to the finger tip. The difference in stabilization age of the breadth dimensions are presumed to be moderated from wrist to finger tips in such a way that the adaptation phenomena can be recognized in the metacarpus.

Key words: hand form, age dependency

Introduction

In physical anthropology an individual over 18 years of age is traditionally considered to be an adult. An earlier investigation (ALMÁSI and SZATHMÁRY, 1994) suggested that the stabilization of some hand measurements takes place earlier. The aim of the present study was to contribute further data to the debate concerning whether this age limit can be accepted when examining hand dimensions. Besides determination of the age of stabilization, it was our intention to compare the tendency to stabilization of the hand dimensions in two populations considered to be semi-endogamous for different reasons, both located in the county of Szabolcs-Szatmár-Bereg.

Materials

Since the 1970-s, researchers at Kossuth University in Debrecen have been investigating small populations living in the Erdőhát and Rétköz regions (in the latter region in collaboration with the Bessenyei György Teachers' Training College). Both regions are located in the county of Szabolcs-Szatmár-Bereg (Fig. 1). The Rétköz region is bordered in the north by the River Tisza, and in the south by the Lónyai Canal. The Erdőhát region is part of the Szatmár-Beregi Plain, bordered by the Rivers Túr and Szamos and covered previously by extensive forests
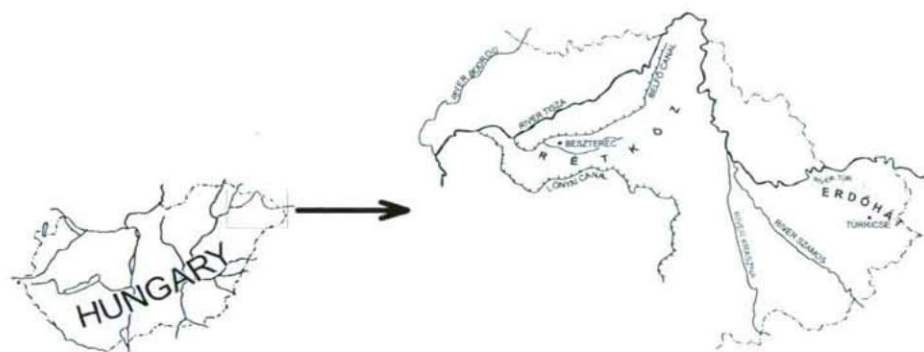

Fig. 1. Area of Rétköz and Erdőhát in Hungary.

Until the end of last century, the Rétköz region was a rather swampy area and the present villages were islands. People could therefore usually contact each other only by boat, and especially in summer. The marriage system was controlled by this hydro-geographical isolation and resulted in a certain degree of endogamy. The drainage of the inland water and flood zone in the Rétköz region by means of canalization was completed in the 1950-s, and thus the previous isolation is progressively disappearing (BORSY, 1961; MAROSI and SZILÁRD, 1969; PÓK, 1992).

Before the general canalization of the waterways started in the early decades of the 20th century, the Erdőhát region was also a marshy woodland. Usually only one-tenth of the fields remained dry during the annual flooding of the Rivers Szamos and Túr. Thus, the geographical isolation must have been an important factor influencing the population structure here, but on the other hand a subethnic differentiation of the population may also have contributed to the development of relative endogamy (MAROSI and MOLNÁR, 1966).

The present project concentrated on the villages of Beszterec and Túrricse. Both villages belong in the small population category. The compositions of the populations are shown in Table 1:

Table 1. Samples examined

Ages (years)	Túrricse						Beszterec					
	Males		Females		Total		Males		Females		Total	
	N	%*	N	%*	N	%*	N	%*	N	%*	N	%*
0-24	46	41	48	49	94	45	77	39	95	44	172	42
25-	24	12	34	15	58	14	74	25	121	34	195	30
Total	70	33	82	20	152	24	151	31	216	38	367	35

*   Percentage of the total number in the given age group (1990 census)

Methods

We measured the dimensions of the hand from an anatomical aspect (SZATHMÁRY 1976) slightly different from the approach of SCHLAGINHAUFEN (1932-33). The examined dimensions are listed in Fig. 2.
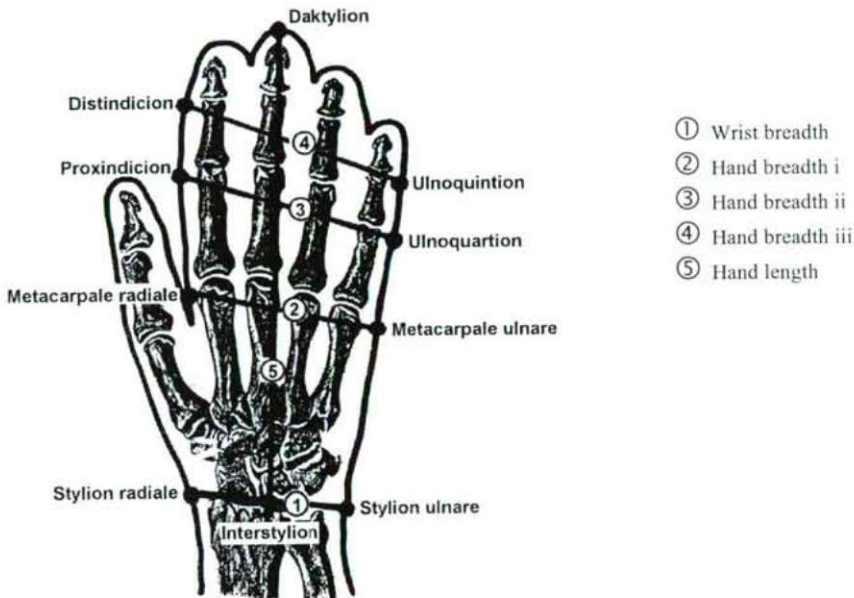

Wrist breadth
Hand breadth i
Hand breadth ii
Hand breadth iii
Hand length

Fig. 2. Hand dimensions examined.

Only the dimensions of the right hand were analyzed, and the bilateral difference was neglected (cf. FUSTE, 1951; THoma, 1952; EIBEN, 1967).

In the first step, for determination of the age of stabilization we charted the distribution of the data for each hand measurement. This set of points was approximated by a six-order polynomial curve.

In the second phase of the accurate calculation of the age of stabilization, the Gauss method was used. The set of ages was divided into two parts, and for both parts a regression line (a first approximation line) and the correlation of the lines were calculated as follows:

$$\eta = \sqrt{1 - \frac{s^2}{s_x s_y}}$$

where s, s_x and s_y are the variances of [y - (ax+b), x, y].

By changing the age limit between the two age groups, we determined the maximum sum of the two correlations; this division age coincides with the accurate age of stabilization (FAUX and PRATT, 1979).

The distribution of the data and their approximation by a six-order polynomial curve are demonstrated in the following Figures:
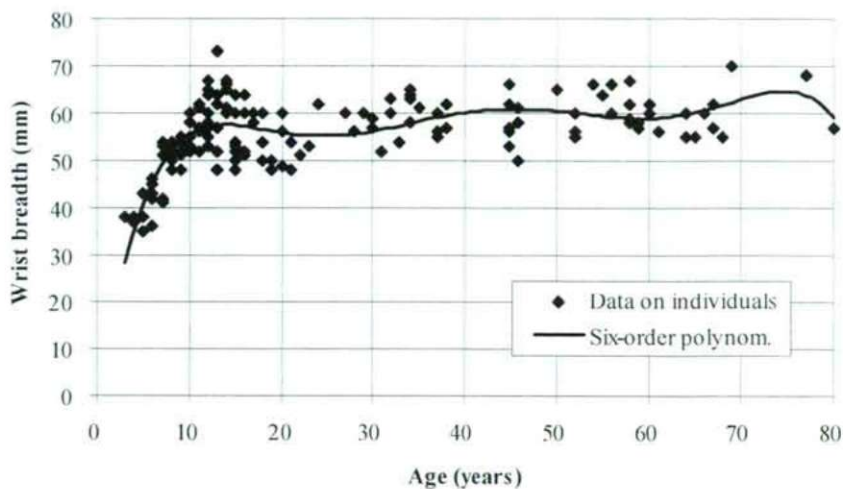
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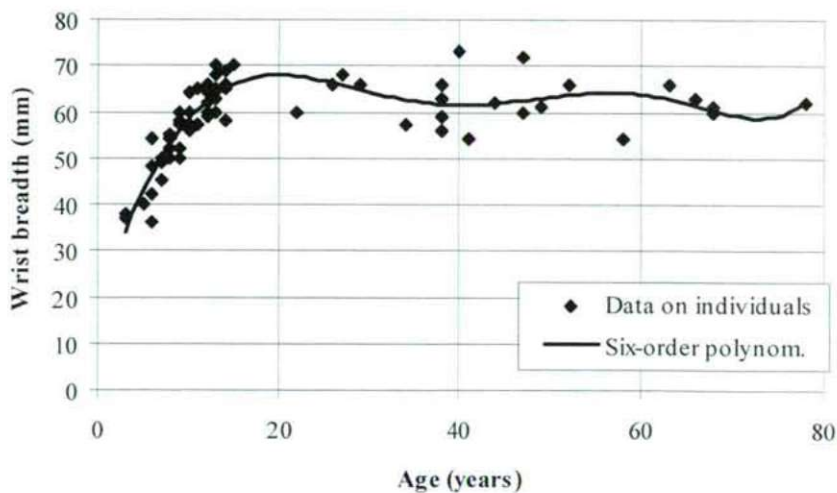Fig. 3. Distribution of data (wrist breadth, males, Beszterec).

Fig. 4. Distribution of data (wrist breadth, males, Túrricse).

Results

The results are shown in the following Table:

Table 2. Age of stabilization in hand

Dimensions	Age of stabilization (years)			
	Túrricse		Beszterec	
	Males	Females	Males	Females
Wrist breadth	13-14*	13-14*	14	13
Hand breadth i	14-15*	13-14*	17	13
Hand breadth ii	15-17*	12-13*	18	13
Hand breadth iii	17-19*	17-18*	17	16
Hand length	16-17*	16-17*	16	16

* The age of stabilization is given only in age intervals because of the small sample size

Conclusions

The following differences were found between the results on the Beszterec and Túrricse samples:
1. Stabilization of the dimensions Hand breadth i and Hand breadth ii takes place at a younger age in the males in Túrricse.
2. Hand breadth iii is stabilized at an older age among the females in Túrricse.
    Besides the differences mentioned above, the two populations exhibit many similarities:
1. Stabilization of the hand dimensions appears systematically at a younger age in females than in males.
2. The wrist breadth becomes stable at a surprisingly early age (between 13 and 14 years) in both sexes.
3. The greatest sexual difference can be observed in the knuckles of the proximal phalanges (Hand breadth ii).
4. No significant sexual difference can be detected in the stabilization of the hand length (between 16 and 17 years of age).
5. Main conclusion: Stabilization of the hand dimensions is completed by the age of 18-19 both sexes.

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