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# THE GROWTH OF CERTAIN EXTERNAL DIMENSIONS OF THE HAND AND THE OPERATION PERIOD OF ITS CONGENITAL DEFECTS

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The human hand is an organ which in its complexity has undoubtedly been influenced by physical and mental activities in the course of its evolutionary development. On the other hand, the abilities of this organ as a practically universal instrument, were reflected in the creation of some cerebral junctions, as well as in the development of the qualitative properties of the cortex. It is surprising, from the viewpoint of ontogenetic growth, that such an important organ has not yet been studied in a satisfactory manner.

Only few authors in international literature have dealt with the growth of certain dimensions of the hand. They are still much fewer in number than those who published various findings on its anatomical structure. For example, Korsunská (1956) also reports on the growth of two basic characters of the proper hand in her studies of the general physical development of 3 to 8-year-old children, and Tanner in Human Biology (see Harrison et al., 1964) generally says that the length of the hand for the entire period of postnatal development in both sexes is closer to the state in the adult individual than the length of the antebrachium and the brachium. The same author also reports that girls to their 18th year are nearer to the adult state than boys as regards the length of the hand.

Beneš (1961, 1962a, b) in his papers occupies himself with the growth dynamics and the relative proportions of the main dimensions of the hand in youth and also with the correlation between the dimensions of the hand and its muscular strength. The disappearance of growth changes on the left and right hands of seven hundred 19 to 25-year-old Chinese probands of both sexes was studied by Ho Gwang-Tsi et al. (1966). Matzdorff (1966, 1967) dealt in detail with the dimensional changes of the hand in German juveniles and adults from Bavaria and Schleswig-Holstein. The author of this paper also occupied herself with these changes in 0 to 20-year-old German children and juveniles from the Rheinland and Holstein (Hajniš, prepared paper).

The growth dynamics of the hand from birth till the 18th year of age in probands of Prague has been dealt with in detail by Křečková (1966), Jägerová (1966), and Šimůnková (1966). However, most investigators solving the problem of growth, e.g. Ecker (1875), Kollmann (1886), Ranke (1887), Virchow (1895), Weissenberg (1895), Rauber (1897), Volockij 1924), Ruggles (1930), George (1930), Romich (1932), Koenner (1938), Huizinga (1949), Phelps (1952), Rösler (1957a, b), Blincoe (1962), and others, in fact, studied merely the mutual relations of the lengths of the individual fingers in various ethnic groups and constitutional types and their possible changes with advancing age and the effects of manual labour.

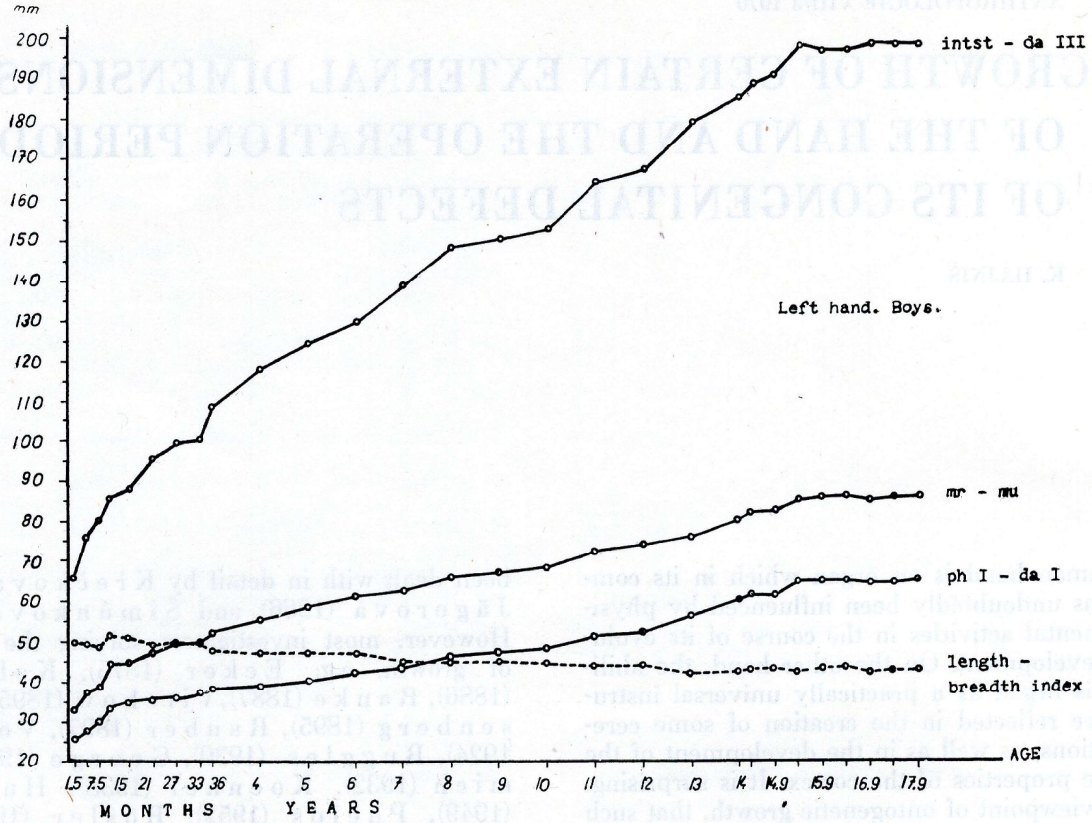
These studies in Czechoslovak literature are continued by the papers of Jelínek (1950), Pospíšil (1959), and Drobný (1959).

Most recently, Oshima (1964) studied the changes in the shape and the function of the human hand in dependence on brachiation. Yet, as early as 1903, the differences in the racial structure of the human hand had been studied by Kollmann, and still later by Loth (1931).

The influence of working load on the shape of the hand was also the subject of dissertation theses written by Chochol (1949) and Tihelková (1966).

## MATERIAL AND METHODS

We have studied the growth dynamics of the hands of children and adolescents from their birth till the age of 18 on the basis of examinations of 1707 children of both sexes in Prague. The number of examined persons consisted of 854 boys and 853 girls. Both, boys and girls, were divided into 28 age groups, whose range follows from the relevant tables and graphs. For age classification, data of birth and examinations of each person were used. According to both specified data, each age group comprised of individuals within the range of ± half of the respective age group. For example, the five-year-age group contains all the individuals from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intst - da III
Left hand. Boys.
mr - mu
ph I - da I
length -
breadth index
AGE
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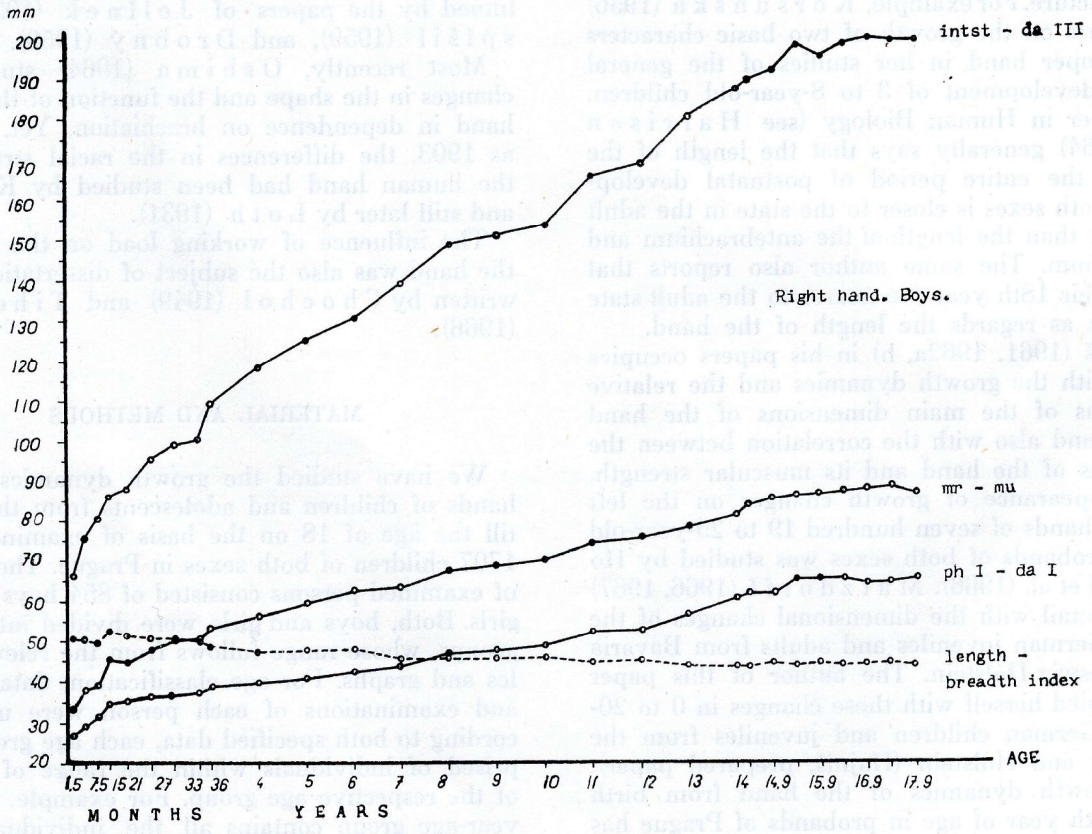
MONTHS
YEARS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Right hand. Boys.
mr - mu
ph I - da I
length -
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MONTHS
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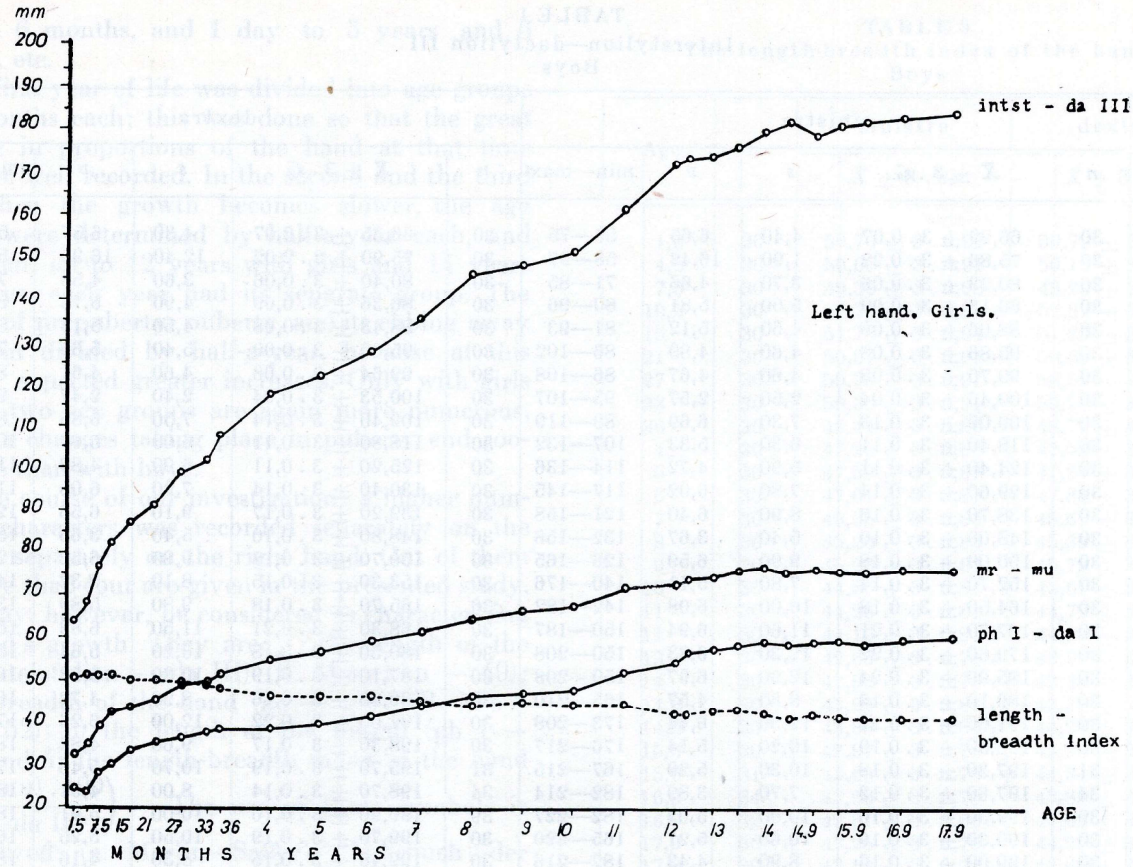
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Left hand. Girls.
mr - mu
ph I - da I
length - breadth index
AGE
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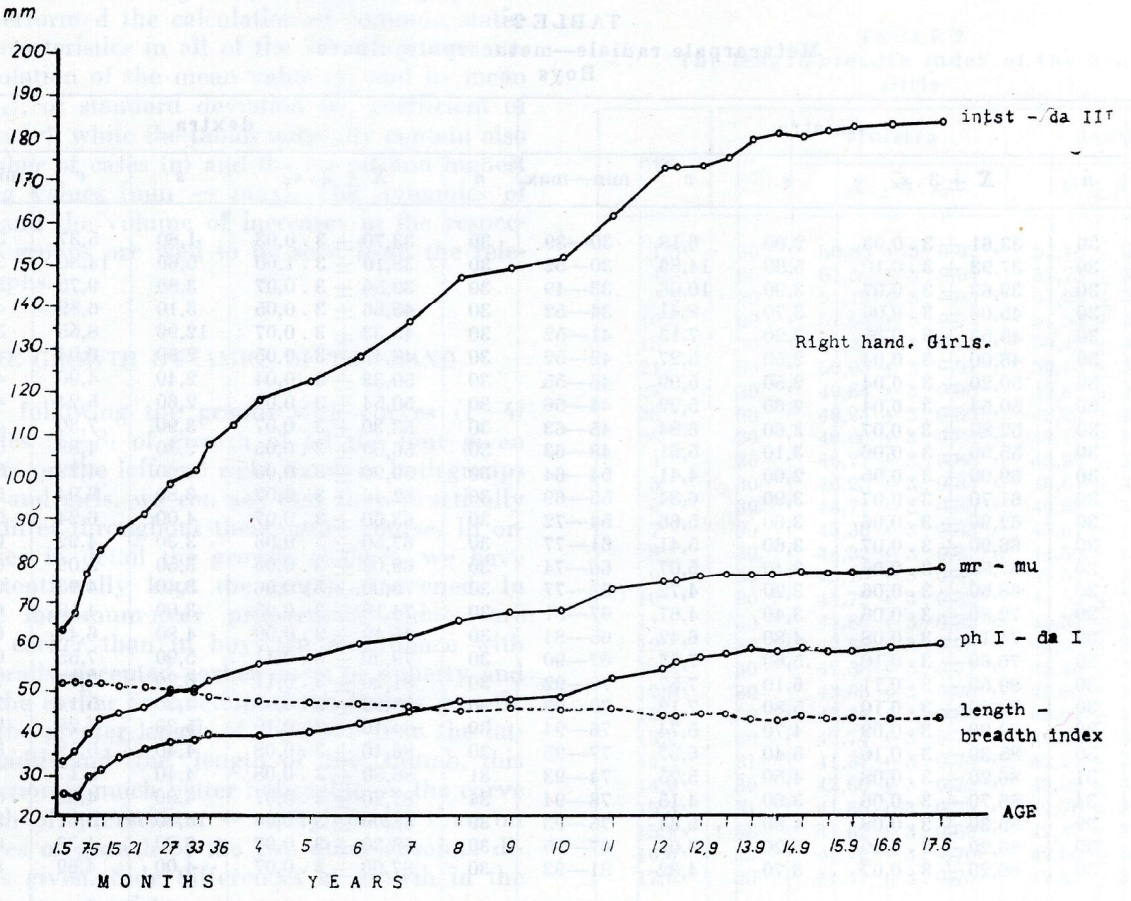
MONTHS
YEARS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intst - da III
Right hand. Girls.
mr - mu
ph I - da I
length - breadth index
AGE
1.5 7.5 15 21 27 33 36 4 5 6 7 8 9 10 11 12 12.9 13.9 14.9 15.9 16.6 17.6
MONTHS
YEARS

TABLE 1

Interstylion—dactylion III

Boys

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 \cdot s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 \cdot s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 66,29 ± 3 . 0,07 | 4,40 | 6,65 | 59—75 | 30 | 66,35 ± 3 . 0,07 | 4,30 | 6,57 | 58—75 |
| 4,5 | 30 | 75,86 ± 3 . 0,22 | 1,90 | 16,42 | 58—97 | 30 | 75,90 ± 3 . 2,02 | 12,40 | 16,36 | 58—97 |
| 7,5 | 30 | 80,23 ± 3 . 0,06 | 3,70 | 4,66 | 71—85 | 30 | 80,40 ± 3 . 0,06 | 3,60 | 4,56 | 72—84 |
| 10,5 | 30 | 86,13 ± 3 . 0,09 | 5,00 | 5,81 | 80—96 | 30 | 86,36 ± 3 . 0,09 | 4,90 | 5,73 | 81—96 |
| 15 | 30 | 88,06 ± 3 . 0,08 | 4,50 | 5,12 | 81—93 | 30 | 88,43 ± 3 . 0,08 | 4,50 | 5,13 | 82—100 |
| 21 | 30 | 95,86 ± 3 . 0,08 | 4,60 | 4,89 | 86—102 | 30 | 95,60 ± 3 . 0,09 | 5,40 | 5,65 | 78—102 |
| 27 | 30 | 99,70 ± 3 . 0,08 | 4,60 | 4,67 | 86—108 | 30 | 99,64 ± 3 . 0,08 | 4,60 | 4,61 | 86—107 |
| 33 | 30 | 100,46 ± 3 . 0,04 | 2,50 | 2,57 | 95—107 | 30 | 100,53 ± 3 . 0,04 | 2,40 | 2,47 | 95—106 |
| 36 | 30 | 109,00 ± 3 . 0,13 | 7,30 | 6,69 | 89—119 | 30 | 109,40 ± 3 . 0,14 | 7,50 | 6,85 | 89—119 |
| 4 | 30 | 118,40 ± 3 . 0,11 | 6,30 | 5,33 | 107—132 | 30 | 118,80 ± 3 . 0,11 | 6,00 | 5,07 | 108—132 |
| 5 | 30 | 124,40 ± 3 . 0,11 | 5,90 | 4,72 | 114—136 | 30 | 125,20 ± 3 . 0,11 | 6,00 | 4,80 | 114—137 |
| 6 | 30 | 129,60 ± 3 . 0,14 | 7,80 | 6,02 | 117—145 | 30 | 130,40 ± 3 . 0,14 | 7,90 | 6,05 | 118—147 |
| 7 | 30 | 138,70 ± 3 . 0,16 | 8,90 | 6,40 | 121—158 | 30 | 139,20 ± 3 . 0,17 | 9,10 | 6,56 | 120—159 |
| 8 | 30 | 148,00 ± 3 . 0,10 | 5,40 | 3,67 | 132—158 | 30 | 148,80 ± 3 . 0,10 | 5,40 | 3,65 | 135—158 |
| 9 | 30 | 150,00 ± 3 . 0,18 | 9,90 | 6,59 | 126—165 | 30 | 150,70 ± 3 . 0,18 | 9,80 | 6,52 | 129—164 |
| 10 | 30 | 152,70 ± 3 . 0,14 | 7,80 | 5,11 | 140—176 | 30 | 153,30 ± 3 . 0,15 | 8,10 | 5,32 | 140—176 |
| 11 | 30 | 164,50 ± 3 . 0,18 | 10,00 | 6,08 | 142—182 | 30 | 165,70 ± 3 . 0,18 | 9,80 | 5,89 | 137—182 |
| 12 | 30 | 167,70 ± 3 . 0,21 | 11,60 | 6,94 | 150—187 | 30 | 168,30 ± 3 . 0,21 | 11,50 | 6,83 | 151—189 |
| 13 | 30 | 179,60 ± 3 . 0,22 | 12,30 | 6,83 | 150—208 | 30 | 180,50 ± 3 . 0,18 | 10,20 | 5,64 | 154—196 |
| 14 | 30 | 185,90 ± 3 . 0,24 | 12,90 | 6,97 | 159—208 | 30 | 187,10 ± 3 . 0,19 | 10,30 | 5,53 | 166—211 |
| 14,3 | 30 | 189,10 ± 3 . 0,16 | 8,60 | 4,57 | 165—210 | 30 | 189,60 ± 3 . 0,16 | 8,90 | 4,72 | 163—212 |
| 14,9 | 30 | 191,60 ± 3 . 0,22 | 12,30 | 6,44 | 173—208 | 30 | 192,00 ± 3 . 0,22 | 12,00 | 6,26 | 172—210 |
| 15,3 | 30 | 198,50 ± 3 . 0,19 | 10,20 | 5,14 | 176—217 | 30 | 198,30 ± 3 . 0,17 | 9,60 | 4,82 | 180—215 |
| 15,9 | 31 | 197,30 ± 3 . 0,18 | 10,30 | 5,20 | 167—215 | 31 | 195,70 ± 3 . 0,19 | 10,70 | 5,46 | 170—215 |
| 16,3 | 34 | 197,60 ± 3 . 0,13 | 7,70 | 3,89 | 182—214 | 34 | 198,70 ± 3 . 0,14 | 8,00 | 4,01 | 184—215 |
| 16,9 | 39 | 199,30 ± 3 . 0,16 | 10,00 | 5,03 | 182—227 | 39 | 199,90 ± 3 . 0,16 | 10,00 | 5,01 | 185—229 |
| 17,3 | 30 | 199,30 ± 3 . 0,19 | 10,60 | 5,21 | 165—220 | 30 | 199,70 ± 3 . 0,19 | 10,50 | 5,25 | 168—222 |
| 17,9 | 30 | 199,00 ± 3 . 0,16 | 8,90 | 4,43 | 182—216 | 30 | 199,40 ± 3 . 0,15 | 8,30 | 4,16 | 180—215 |

TABLE 2

Metacarpale radiale—metacarpale ulnare

Boys

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 \cdot s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 \cdot s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 33,61 ± 3 . 0,03 | 2,00 | 6,18 | 30—39 | 30 | 33,70 ± 3 . 0,03 | 1,80 | 5,37 | 30—37 |
| 4,5 | 30 | 37,93 ± 3 . 0,10 | 5,60 | 14,89 | 30—52 | 30 | 38,10 ± 3 . 1,00 | 5,60 | 14,80 | 30—52 |
| 7,5 | 30 | 39,63 ± 3 . 0,07 | 3,90 | 10,06 | 33—49 | 30 | 39,56 ± 3 . 0,07 | 3,80 | 9,75 | 33—49 |
| 10,5 | 30 | 45,06 ± 3 . 0,06 | 3,70 | 8,41 | 34—52 | 30 | 45,66 ± 3 . 0,05 | 3,10 | 6,89 | 41—52 |
| 15 | 30 | 45,53 ± 3 . 0,05 | 3,20 | 7,13 | 41—52 | 30 | 45,33 ± 3 . 0,07 | 12,90 | 8,55 | 34—52 |
| 21 | 30 | 48,00 ± 3 . 0,04 | 2,50 | 5,27 | 42—52 | 30 | 48,43 ± 3 . 0,05 | 2,90 | 6,04 | 42—53 |
| 27 | 30 | 50,20 ± 3 . 0,04 | 2,50 | 5,09 | 46—55 | 30 | 50,33 ± 3 . 0,04 | 2,40 | 4,90 | 46—55 |
| 33 | 30 | 50,54 ± 3 . 0,04 | 2,60 | 5,22 | 44—56 | 30 | 50,54 ± 3 . 0,04 | 2,60 | 5,24 | 44—55 |
| 36 | 30 | 52,80 ± 3 . 0,07 | 3,60 | 6,84 | 45—63 | 30 | 53,30 ± 3 . 0,07 | 3,90 | 7,30 | 45—65 |
| 4 | 30 | 55,90 ± 3 . 0,06 | 3,10 | 5,61 | 48—63 | 30 | 56,50 ± 3 . 0,05 | 2,80 | 4,88 | 51—61 |
| 5 | 30 | 59,00 ± 3 . 0,05 | 2,60 | 4,41 | 54—64 | 30 | 59,90 ± 3 . 0,05 | 2,60 | 4,29 | 55—62 |
| 6 | 30 | 61,70 ± 3 . 0,07 | 3,90 | 6,34 | 55—69 | 30 | 62,40 ± 3 . 0,07 | 3,80 | 6,04 | 56—69 |
| 7 | 30 | 62,90 ± 3 . 0,06 | 3,60 | 5,66 | 54—72 | 30 | 63,60 ± 3 . 0,07 | 4,00 | 6,24 | 53—74 |
| 8 | 30 | 66,90 ± 3 . 0,07 | 3,60 | 5,41 | 61—77 | 30 | 67,50 ± 3 . 0,06 | 3,30 | 4,92 | 63—77 |
| 9 | 30 | 67,80 ± 3 . 0,06 | 3,40 | 5,07 | 60—74 | 30 | 69,00 ± 3 . 0,06 | 3,50 | 5,09 | 62—72 |
| 10 | 30 | 68,50 ± 3 . 0,06 | 3,20 | 4,72 | 63—77 | 30 | 70,00, ±,3 . 0,06 | 3,40 | 4,93 | 63—80 |
| 11 | 30 | 72,80 ± 3 . 0,06 | 3,40 | 4,67 | 67—81 | 30 | 74,10 ± 3 . 0,05 | 3,00 | 4,10 | 65—81 |
| 12 | 30 | 74,10 ± 3 . 0,08 | 4,80 | 6,42 | 65—84 | 30 | 75,40 ± 3 . 0,09 | 4,80 | 6,42 | 67—86 |
| 13 | 30 | 76,60 ± 3 . 0,10 | 5,60 | 7,27 | 67—90 | 30 | 78,30 ± 3 . 0,11 | 5,90 | 7,55 | 68—92 |
| 14 | 30 | 80,50 ± 3 . 0,11 | 6,10 | 7,57 | 70—92 | 30 | 81,20 ± 3 . 0,11 | 6,20 | 7,77 | 70—91 |
| 14,3 | 30 | 82,20 ± 3 . 0,10 | 5,80 | 7,12 | 70—93 | 30 | 83,90 ± 3 . 0,08 | 4,30 | 5,14 | 75—90 |
| 14,9 | 30 | 82,90 ± 3 . 0,09 | 4,70 | 5,74 | 76—94 | 30 | 84,40 ± 3 . 0,10 | 5,30 | 6,28 | 71—95 |
| 15,3 | 30 | 85,30 ± 3 . 0,10 | 5,40 | 6,37 | 77—95 | 30 | 86,40 ± 3 . 0,08 | 4,40 | 5,19 | 80—94 |
| 15,9 | 31 | 86,20 ± 3 . 0,08 | 4,50 | 5,25 | 74—93 | 31 | 86,80 ± 3 . 0,08 | 4,40 | 5,17 | 75—95 |
| 16,3 | 34 | 86,70 ± 3 . 0,06 | 3,60 | 4,15 | 78—94 | 34 | 87,20 ± 3 . 0,07 | 4,00 | 4,63 | 80—86 |
| 16,9 | 39 | 85,30 ± 3 . 0,08 | 4,80 | 5,64 | 75—93 | 39 | 88,00 ± 3 . 0,08 | 4,80 | 5,51 | 80—100 |
| 17,3 | 30 | 86,20 ± 3 . 0,09 | 5,20 | 6,05 | 67—95 | 30 | 88,30 ± 3 . 0,07 | 3,80 | 4,36 | 80—97 |
| 17,9 | 30 | 86,20 ± 3 . 0,07 | 3,70 | 4,32 | 81—93 | 30 | 87,00 ± 3 . 0,07 | 4,00 | 4,69 | 81—99 |

4 years, 6 months, and 1 day to 5 years and 6 months, etc.

The first year of life was divided into age groups of 3 months each; this was done so that the great increase in proportions of the hand at that time might be well recorded. In the second and the third year, when the growth becomes slower, the age groups were determined by half-a-year each, and from then, up to 12 years with girls and 14 years with boys, each year had its separate group. The periods of prepuberty, puberty, and its ebbing away are again divided by half-a-year, because at this time we expected greater increases. Only with girls the last two age groups are again more numerous, since the changes taking place in puberty end sooner here than with boys.

In the course of our investigations a higher number of characters was recorded separately on the left and separately on the right hand. Out of them not more than four are given in the presented study. They may, however, be considered as characterizing the hand's growth. They are: 1) the length of the hand (interstylion — da III) (R. Martin — 49); 2) the breadth of the hand (mr — mu) (R. Martin — 52); 3) the length of the thumb (ph I — da I); and 4) the length-breadth index of the hand $\left(\frac{(mr-mu)\,.\,100}{intst-da\ III}\right)$. The use of these symbols is standardized in Martin—Saller's "Lehrbuch der Anthropologie" (1957).

The point called interstylion is abbreviated as "intst" in the following text, tables, and graphs.

We performed the calculation of common statistical characteristics in all of the 28 age groups, i.e. the calculation of the mean value ($\bar{x}$) and its mean error ($s_{\bar{x}}$), of standard deviation (s), coefficient of variation (v), while the tables naturally contain also the number of cases (n) and the lowest and highest occurring values (min — max). The dynamics of growth and the volume of increases in the respective age groups are well to be seen from the relevant graphs.

## THE GROWTH DYNAMICS OF THE HAND

When following the graphs with curves (1—4) and tables (1—8) of growth of all the four given characters on the left and right hands in both groups of boys and girls, we can see that they practically do not differ throughout their entire course. In order to see in detail the growth changes, we have quite intentionally kept the graphs unevened. In girls the maximum-near proportional values are reached earlier than in boys, in accordance with the generally accepted earlier onset of puberty and so also the earlier completion of the body's growth. Due to the greater length of the hand than the latter's breadth and the length of the thumb, this phenomenon is much better noticeable on the curve of growth of interstylion — dactylion III than on the curves of growth of the two other absolute dimensions given. Side differences in growth in the same sex do not exist.

TABLE 3
The length-breadth index of the hand
Boys

| Age | n | sinistra | dextra |
|---|---|---|---|
| | | $\bar{X} \pm 3\,.\,s_{\bar{x}}$ | $\bar{X} \pm 3\,.\,s_{\bar{x}}$ |
| 1,5 | 30 | 50,70 ± 3 . 0,92 | 50,79 ± 3 . 0,92 |
| 4,5 | 30 | 50,00 ± 3 . 0,91 | 50,19 ± 3 . 0,91 |
| 7,5 | 30 | 49,39 ± 3 . 0,90 | 49,20 ± 3 . 0,89 |
| 10,5 | 30 | 52,31 ± 3 . 0,95 | 52,87 ± 3 . 0,96 |
| 15 | 30 | 51,70 ± 3 . 0,94 | 51,26 ± 3 . 0,93 |
| 21 | 30 | 50,07 ± 3 . 0,91 | 50,65 ± 3 . 0,92 |
| 27 | 30 | 50,35 ± 3 . 0,91 | 50,51 ± 3 . 0,92 |
| 33 | 30 | 50,30 ± 3 . 0,91 | 50,27 ± 3 . 0,91 |
| 36 | 30 | 48,44 ± 3 . 0,89 | 48,72 ± 3 . 0,89 |
| 4 | 30 | 47,29 ± 3 . 0,86 | 47,56 ± 3 . 0,87 |
| 5 | 30 | 47,59 ± 3 . 0,87 | 47,84 ± 3 . 0,87 |
| 6 | 30 | 47,61 ± 3 . 0,87 | 47,86 ± 3 . 0,88 |
| 7 | 30 | 45,35 ± 3 . 0,83 | 45,69 ± 3 . 0,83 |
| 8 | 30 | 45,20 ± 3 . 0,83 | 45,39 ± 3 . 0,83 |
| 9 | 30 | 45,20 ± 3 . 0,83 | 45,79 ± 3 . 0,84 |
| 10 | 30 | 44,86 ± 3 . 0,82 | 45,61 ± 3 . 0.83 |
| 11 | 30 | 44,26 ± 3 . 0,81 | 44,72 ± 3 . 0,82 |
| 12 | 30 | 44,19 ± 3 . 0,81 | 44,80 ± 3 . 0,82 |
| 13 | 30 | 42,65 ± 3 . 0,78 | 43,91 ± 3 . 0,80 |
| 14 | 30 | 42,90 ± 3 . 0,79 | 43,38 ± 3 . 0,80 |
| 14,3 | 30 | 43,29 ± 3 . 0,89 | 43,38 ± 3 . 0,79 |
| 14,9 | 30 | 43,85 ± 3 . 0,80 | 44,24 ± 3 . 0,80 |
| 15,3 | 30 | 42,97 ± 3 . 0,78 | 43,55 ± 3 . 0,79 |
| 15,9 | 31 | 43,69 ± 3 . 0,78 | 44,34 ± 3 . 0,79 |
| 16,3 | 34 | 43,90 ± 3 . 0,75 | 43,88 ± 3 . 0,75 |
| 16,9 | 39 | 42,81 ± 3 . 0,68 | 44,02 ± 3 . 0,70 |
| 17,3 | 30 | 43,25 ± 3 . 0,78 | 44,20 ± 3 . 0,80 |
| 17,9 | 30 | 43,14 ± 3 . 0,78 | 43,64 ± 3 . 0,79 |

TABLE 7
The length-breadth index of the hand
Girls

| Age | n | sinistra | dextra |
|---|---|---|---|
| | | $\bar{X} \pm 3\,.\,s_{\bar{x}}$ | H ± 3 . $s_{\bar{x}}$ |
| 1,5 | 30 | 50,85 ± 3 . 0,92 | 51,16 ± 3 . 0,93 |
| 4,5 | 30 | 51,59 ± 3 . 0,94 | 51,78 ± 3 . 0,94 |
| 7,5 | 30 | 51,19 ± 3 . 0,93 | 51,22 ± 3 . 0,93 |
| 10,5 | 30 | 51,54 ± 3 . 0,94 | 51,54 ± 3 . 0,94 |
| 15 | 30 | 50,24 ± 3 . 0,91 | 50,42 ± 3 . 0,92 |
| 21 | 30 | 50,03 ± 3 . 0,91 | 50,10 ± 3 . 0,91 |
| 27 | 30 | 49,64 ± 3 . 0,90 | 49,89 ± 3 . 0,91 |
| 33 | 30 | 49,24 ± 3 . 0,89 | 49,23 ± 3 . 0,89 |
| 36 | 30 | 48,00 ± 3 . 0,88 | 48,19 ± 3 . 0,88 |
| 4 | 30 | 46,77 ± 3 . 0,86 | 46,99 ± 3 . 0,86 |
| 5 | 30 | 46,23 ± 3 . 0,84 | 46,61 ± 3 . 0,85 |
| 6 | 30 | 46,71 ± 3 . 0,85 | 46,88 ± 3 . 0,86 |
| 7 | 30 | 45,30 ± 3 . 0,83 | 45,67 ± 3 . 0,83 |
| 8 | 30 | 44,32 ± 3 . 0,81 | 44,59 ± 3 . 0,81 |
| 9 | 30 | 45,10 ± 3 . 0,82 | 45,57 ± 3 . 0,83 |
| 10 | 30 | 44,72 ± 3 . 0,82 | 44,93 ± 3 . 0,82 |
| 11 | 30 | 44,80 ± 3 . 0,82 | 45,30 ± 3 . 0,83 |
| 12 | 30 | 42,68 ± 3 . 0,78 | 43,22 ± 3 . 0,79 |
| 12,3 | 30 | 42,38 ± 3 . 0,77 | 43,40 ± 3 . 0,79 |
| 12,9 | 30 | 43,05 ± 3 . 0,78 | 43,88 ± 3 . 0,80 |
| 13,3 | 30 | 43,36 ± 3 . 0,80 | 43,92 ± 3 . 0,81 |
| 13,9 | 30 | 42,74 ± 3 . 0,77 | 42,85 ± 3 . 0,78 |
| 14,3 | 31 | 41,37 ± 3 . 0,74 | 42,21 ± 3 . 0,75 |
| 14,9 | 30 | 42,60 ± 3 . 0,79 | 43,32 ± 3 . 0,80 |
| 15,3 | 31 | 41,85 ± 3 . 0,75 | 42,70 ± 3 . 0,77 |
| 15,9 | 36 | 41,62 ± 3 . 0,69 | 42,47 ± 3 . 0,70 |
| 16,6 | 35 | 41,72 ± 3 . 0,70 | 42,55 ± 3 . 0,71 |
| 17,6 | 30 | 41,41 ± 3 . 0,75 | 42,92 ± 3 . 0,78 |

TABLE 4

The length of the thumb (Ph I—da I)

Boys

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 26,90 ± 3 . 0,03 | 2,10 | 8,14 | 21—31 | 30 | 26,96 ± 3 . 0,04 | 2,30 | 8,53 | 20—30 |
| 4,5 | 30 | 28,43 ± 3 . 0,07 | 3,90 | 13,89 | 21—38 | 30 | 29,36 ± 3 . 0,07 | 3,90 | 13,52 | 22—39 |
| 7,5 | 30 | 30,63 ± 3 . 0,03 | 2,00 | 6,66 | 27—35 | 30 | 31,26 ± 3 . 0,03 | 1,90 | 6,20 | 28—35 |
| 10,5 | 30 | 34,20 ± 3 . 0,05 | 3,10 | 9,23 | 29—41 | 30 | 34,56 ± 3 . 0,05 | 2,80 | 8,18 | 29—40 |
| 15 | 30 | 35,36 ± 3 . 0,04 | 2,60 | 7,55 | 30—39 | 30 | 35,33 ± 3 . 0,04 | 2,40 | 7,01 | 30—40 |
| 21 | 30 | 36,30 ± 3 . 0,03 | 1,60 | 4,49 | 33—39 | 30 | 36,40 ± 3 . 0,03 | 1,50 | 4,04 | 33—39 |
| 27 | 30 | 36,46 ± 3 . 0,03 | 1,60 | 4,52 | 34—40 | 30 | 36,70 ± 3 . 0,02 | 1,60 | 4,46 | 34—40 |
| 33 | 30 | 37,80 ± 3 . 0,04 | 2,20 | 6,00 | 34—45 | 30 | 37,51 ± 3 . 0,04 | 2,40 | 6,47 | 34—45 |
| 36 | 30 | 38,80 ± 3 . 0,05 | 2,70 | 7,06 | 34—45 | 30 | 38,80 ± 3 . 0,05 | 2,70 | 6,90 | 34—44 |
| 4 | 30 | 39,33 ± 3 . 0,05 | 3,10 | 7,95 | 33—45 | 30 | 39,66 ± 3 . 0,05 | 2,80 | 7,16 | 33—45 |
| 5 | 30 | 40,70 ± 3 . 0,04 | 2,30 | 5,72 | 36—46 | 30 | 40,70 ± 3 . 0,04 | 2,20 | 5,42 | 36—46 |
| 6 | 30 | 42,30 ± 3 . 0,06 | 3,20 | 7,46 | 36—48 | 30 | 42,30 ± 3 . 0,06 | 3,30 | 7,71 | 36—48 |
| 7 | 30 | 43,80 ± 3 . 0,06 | 3,10 | 7,04 | 35—52 | 30 | 43,90 ± 3 . 0,05 | 2,70 | 6,10 | 38—52 |
| 8 | 30 | 46,80 ± 3 . 0,07 | 3,70 | 7,93 | 41—53 | 30 | 46,90 ± 3 . 0,07 | 3,70 | 7,91 | 41—54 |
| 9 | 30 | 47,60 ± 3 . 0,06 | 3,40 | 7,23 | 41—55 | 30 | 47,60 ± 3 . 0,06 | 3,40 | 7,16 | 41—55 |
| 10 | 30 | 48,50 ± 3 . 0,07 | 3,70 | 7,71 | 42—58 | 30 | 48,70 ± 3 . 0,06 | 3,50 | 7,21 | 42—56 |
| 11 | 30 | 51,70 ± 3 . 0,05 | 2,60 | 4,95 | 45—56 | 30 | 52,10 ± 3 . 0,04 | 2,40 | 4,67 | 44—61 |
| 12 | 30 | 52,20 ± 3 . 0,06 | 3,20 | 6,13 | 47—61 | 30 | 52,40 ± 3 . 0,06 | 3,20 | 6,16 | 47—61 |
| 13 | 30 | 56,40 ± 3 . 0,07 | 3,90 | 6,87 | 50—66 | 30 | 56,70 ± 3 . 0,07 | 4,00 | 7,08 | 50—66 |
| 14 | 30 | 60,80 ± 3 . 0,10 | 5,20 | 8,64 | 48—70 | 30 | 60,60 ± 3 . 0,11 | 5,80 | 9,65 | 48—72 |
| 14,3 | 30 | 61,80 ± 3 . 0,08 | 4,50 | 7,25 | 53—75 | 30 | 61,60 ± 3 . 0,08 | 4,70 | 7,57 | 52—75 |
| 14,9 | 30 | 61,60 ± 3 . 0,09 | 4,90 | 8,06 | 54—70 | 30 | 61,50 ± 3 . 0,08 | 4,20 | 6,78 | 52—70 |
| 15,3 | 30 | 65,30 ± 3 . 0,07 | 4,00 | 6,17 | 58—75 | 30 | 65,20 ± 3 . 0,07 | 3,90 | 5,96 | 58—74 |
| 15,9 | 31 | 65,40 ± 3 . 0,07 | 4,00 | 6,10 | 57—74 | 31 | 65,20 ± 3 . 0,07 | 3,70 | 5,77 | 53—71 |
| 16,3 | 34 | 65,50 ± 3 . 0,08 | 4,80 | 7,38 | 57—81 | 34 | 65,50 ± 3 . 0,07 | 4,10 | 6,44 | 57—72 |
| 16,9 | 39 | 64,90 ± 3 . 0,09 | 5,60 | 8,70 | 54—78 | 39 | 64,20 ± 3 . 0,09 | 5,40 | 8,48 | 52—75 |
| 17,3 | 30 | 65,00 ± 3 . 0,07 | 3,90 | 6,04 | 58—73 | 30 | 64,70 ± 3 . 0,07 | 3,70 | 5,77 | 60—74 |
| 17,9 | 30 | 65,60 ± 3 . 0,07 | 3,60 | 5,54 | 56—72 | 30 | 65,10 ± 3 . 0,07 | 3,90 | 6,09 | 56—72 |

TABLE 5

Interstylion—dactylion III

Girls

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 63,87 ± 3 . 0,06 | 3,80 | 6,09 | 56—73 | 30 | 63,54 ± 3 . 0,06 | 3,50 | 5,61 | 58—72 |
| 4,5 | 30 | 67,23 ± 3 . 0,08 | 4,50 | 6,79 | 57—73 | 30 | 67,40 ± 3 . 0,08 | 4,50 | 6,79 | 57—73 |
| 7,5 | 30 | 76,83 ± 3 . 0,07 | 4,30 | 5,66 | 68—84 | 30 | 77,03 ± 3 . 0,07 | 4,10 | 5,40 | 69—84 |
| 10,5 | 30 | 82,90 ± 3 . 0,08 | 4,70 | 5,72 | 74—91 | 30 | 82,96 ± 3 . 0,08 | 4,90 | 5,90 | 74—92 |
| 15 | 30 | 87,25 ± 3 . 0,11 | 6,20 | 7,19 | 75—98 | 30 | 87,18 ± 3 . 1,01 | 6,30 | 7,31 | 74—99 |
| 21 | 30 | 91,33 ± 3 . 0,12 | 7,00 | 7,74 | 78—107 | 30 | 91,33 ± 3 . 1,03 | 7,10 | 7,82 | 78—107 |
| 27 | 30 | 98,70 ± 3 . 0,07 | 4,20 | 4,30 | 92—107 | 30 | 98,80 ± 3 . 0,07 | 3,90 | 4,01 | 92—107 |
| 33 | 30 | 101,40 ± 3 . 0,05 | 2,90 | 2,89 | 94—105 | 30 | 101,36 ± 3 . 0,05 | 2,80 | 2,80 | 94—105 |
| 36 | 30 | 107,30 ± 3 . 0,14 | 8,00 | 7,50 | 90—122 | 30 | 107,70 ± 3 . 0,14 | 7,90 | 7,33 | 92—122 |
| 4 | 30 | 117,60 ± 3 . 0,12 | 6,50 | 5,55 | 106—132 | 30 | 118,30 ± 3 . 0,12 | 6,50 | 5,53 | 106—132 |
| 5 | 30 | 122,00 ± 3 . 0,12 | 6,80 | 5,56 | 110—136 | 30 | 122,50 ± 3 . 0,13 | 7,10 | 5,84 | 110—138 |
| 6 | 30 | 127,60 ± 3 . 0,14 | 7,50 | 5,88 | 115—146 | 30 | 128,40 ± 3 . 0,13 | 7,00 | 5,42 | 118—145 |
| 7 | 30 | 135,10 ± 3 . 0,15 | 8,40 | 6,22 | 120—151 | 30 | 136,20 ± 3 . 0,15 | 8,50 | 6,24 | 120—151 |
| 8 | 30 | 146,00 ± 3 . 0,17 | 9,60 | 6,58 | 129—164 | 30 | 147,10 ± 3 . 0,17 | 9,40 | 6,36 | 130—165 |
| 9 | 30 | 147,90 ± 3 . 0,12 | 6,40 | 4,35 | 128—160 | 30 | 149,00 ± 3 . 0,12 | 6,40 | 4,30 | 128—160 |
| 10 | 30 | 150,70 ± 3 . 0,20 | 11,10 | 7,38 | 128—177 | 30 | 151,80 ± 3 . 0,20 | 11,00 | 7,22 | 130—177 |
| 11 | 30 | 160,50 ± 3 . 0,20 | 10,80 | 6,72 | 135—183 | 30 | 161,80 ± 3 . 0,19 | 10,60 | 6,58 | 145—182 |
| 12 | 30 | 171,40 ± 3 . 0,21 | 11,70 | 6,87 | 144—190 | 30 | 172,90 ± 3 . 0,21 | 11,60 | 6,71 | 148—191 |
| 12,3 | 30 | 172,90 ± 3 . 0,17 | 9,60 | 5,55 | 151—194 | 30 | 173,30 ± 3 . 0,17 | 9,20 | 5,31 | 151—193 |
| 12,9 | 30 | 173,20 ± 3 . 0,17 | 9,60 | 5,52 | 151—191 | 30 | 173,50 ± 3 . 0,14 | 7,90 | 4,57 | 158—185 |
| 13,3 | 30 | 175,30 ± 3 . 0,21 | 11,30 | 6,44 | 144—194 | 30 | 175,10 ± 3 . 0,23 | 12,20 | 6,99 | 145—195 |
| 13,9 | 30 | 179,20 ± 3 . 0,18 | 10,10 | 5,65 | 153—201 | 30 | 179,60 ± 3 . 0,19 | 10,50 | 5,88 | 147—200 |
| 14,3 | 31 | 181,80 ± 3 . 0,15 | 8,60 | 4,72 | 162—194 | 31 | 181,20 ± 3 . 0,16 | 8,70 | 4,82 | 163—196 |
| 14,9 | 30 | 178,60 ± 3 . 0,17 | 9,30 | 5,22 | 160—198 | 30 | 179,80 ± 3 . 0,17 | 9,40 | 5,25 | 161—200 |
| 15,3 | 31 | 180,70 ± 3 . 0,18 | 10,10 | 5,60 | 160—198 | 31 | 181,40 ± 3 . 0,16 | 8,80 | 4,88 | 165—198 |
| 15,9 | 36 | 181,30 ± 3 . 0,13 | 7,70 | 4,23 | 160—199 | 36 | 182,10 ± 3 . 0,12 | 7,00 | 3,84 | 166—195 |
| 16,6 | 35 | 182,60 ± 3 . 0,12 | 7,10 | 3,88 | 165—195 | 35 | 183,00 ± 3 . 0,11 | 6,80 | 3,74 | 168—195 |
| 17,6 | 30 | 183,30 ± 3 . 0,13 | 7,10 | 3,90 | 172—209 | 30 | 183,10 ± 3 . 0,15 | 8,20 | 4,48 | 166—205 |

TABLE 6

Metacarpale radiale—metacarpale ulnare

Girls

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 32,48 ± 3 . 0,02 | 1,50 | 4,89 | 28—35 | 30 | 32,51 ± 3 . 0,02 | 1,30 | 4,18 | 30—36 |
| 4,5 | 30 | 34,69 ± 3 . 0,06 | 3,40 | 9,86 | 31—43 | 30 | 34,90 ± 3 . 0,05 | 3,20 | 9,31 | 31—43 |
| 7,5 | 30 | 39,33 ± 3 . 0,05 | 3,00 | 7,62 | 32—43 | 30 | 39,46 ± 3 . 0,05 | 3,10 | 7,95 | 32—44 |
| 10,5 | 30 | 42,73 ± 3 . 0,05 | 2,90 | 6,81 | 34—47 | 30 | 42,76 ± 3 . 0,05 | 2,90 | 6,87 | 34—48 |
| 15 | 30 | 43,84 ± 3 . 0,05 | 2,90 | 6,63 | 36—48 | 30 | 43,96 ± 3 . 0,05 | 2,80 | 6,55 | 36—48 |
| 21 | 30 | 45,70 ± 3 . 0,05 | 3,20 | 7,15 | 39—50 | 30 | 45,76 ± 3 . 0,06 | 3,40 | 7,62 | 39—52 |
| 27 | 30 | 49,00 ± 3 . 0,05 | 2,90 | 5,91 | 45—55 | 30 | 49,30 ± 3 . 0,05 | 3,00 | 6,18 | 45—56 |
| 33 | 30 | 49,93 ± 3 . 0,03 | 1,80 | 3,74 | 47—53 | 30 | 49,90 ± 3 . 0,03 | 1,90 | 3,80 | 47—54 |
| 36 | 30 | 51,50 ± 3 . 0,05 | 3,00 | 5,78 | 46—59 | 30 | 51,90 ± 3 . 0,05 | 2,80 | 5,34 | 46—58 |
| 4 | 30 | 55,00 ± 3 . 0,06 | 3,50 | 6,45 | 50—63 | 30 | 55,60 ± 3 . 0,06 | 3,30 | 5,86 | 50—63 |
| 5 | 30 | 56,40 ± 3 . 0,06 | 3,20 | 5,59 | 49—65 | 30 | 57,10 ± 3 . 0,05 | 3,00 | 5,26 | 50—63 |
| 6 | 30 | 59,60 ± 3 . 0,07 | 3,50 | 5,83 | 52—67 | 30 | 60,20 ± 3 . 0,06 | 3,60 | 5,96 | 55—68 |
| 7 | 30 | 61,20 ± 3 . 0,07 | 4,10 | 6,66 | 53—68 | 30 | 62,20 ± 3 . 0,07 | 4,00 | 6,43 | 55—68 |
| 8 | 30 | 64,70 ± 3 . 0,06 | 3,40 | 5,30 | 58—71 | 30 | 65,60 ± 3 . 0,06 | 3,10 | 4,78 | 61—72 |
| 9 | 30 | 66,70 ± 3 . 0,07 | 3,70 | 5,49 | 60—76 | 30 | 67,90 ± 3 . 0,06 | 3,40 | 5,08 | 61—76 |
| 10 | 30 | 67,40 ± 3 . 0,07 | 4,10 | 6,16 | 60—78 | 30 | 68,20 ± 3 . 0,07 | 4,10 | 5,95 | 61—79 |
| 11 | 30 | 71,90 ± 3 . 0,08 | 4,20 | 5,82 | 63—82 | 30 | 73,30 ± 3 . 0,07 | 4,00 | 5,47 | 69—82 |
| 12 | 30 | 72,60 ± 3 . 0,09 | 5,10 | 7,01 | 64—83 | 30 | 74,90 ± 3 . 0,08 | 4,20 | 5,66 | 67—83 |
| 12,3 | 30 | 73,70 ± 3 . 0,08 | 4,60 | 6,25 | 66—84 | 30 | 75,00 ± 3 . 0,09 | 4,70 | 6,36 | 65—84 |
| 12,9 | 30 | 74,60 ± 3 . 0,07 | 4,00 | 5,45 | 67—82 | 30 | 76,10 ± 3 . 0,07 | 3,70 | 4,93 | 67—82 |
| 13,3 | 30 | 76,00 ± 3 . 0,09 | 4,80 | 6,36 | 63—86 | 30 | 76,90 ± 3 . 0,09 | 4,60 | 6,09 | 70—86 |
| 13,9 | 30 | 76,60 ± 3 . 0,08 | 4,20 | 5,52 | 70—83 | 30 | 77,00 ± 3 . 0,07 | 4,00 | 5,23 | 68—85 |
| 14,3 | 31 | 75,20 ± 3 . 0,06 | 3,60 | 4,87 | 70—85 | 31 | 76,50 ± 3 . 0,07 | 3,90 | 5,11 | 70—85 |
| 14,9 | 30 | 76,10 ± 3 . 0,07 | 3,80 | 5,09 | 69—85 | 30 | 77,90 ± 3 . 0,07 | 3,80 | 4,95 | 71—85 |
| 15,3 | 31 | 75,60 ± 3 . 0,08 | 4,50 | 5,93 | 68—85 | 31 | 77,40 ± 3 . 0,07 | 3,80 | 4,98 | 70—87 |
| 15,9 | 36 | 75,50 ± 3 . 0,07 | 4,30 | 5,73 | 56—83 | 36 | 77,30 ± 3 . 0,05 | 3,10 | 3,49 | 72—84 |
| 16,6 | 35 | 76,20 ± 3 . 0,05 | 3,20 | 4,22 | 69—83 | 35 | 77,80 ± 3 . 0,07 | 4,20 | 5,39 | 71—90 |
| 17,6 | 30 | 75,90 ± 3 . 0,09 | 4,70 | 6,22 | 61—87 | 30 | 78,60 ± 3 . 0,08 | 4,50 | 5,77 | 71—90 |

TABLE 8

The length of the thumb (Ph I—da I)

Girls

| Age | sinistra | | | | | dextra | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max | *n* | $\bar{X} \pm 3 . s_{\bar{x}}$ | *s* | *v* | min—max |
| 1,5 | 30 | 24,80 ± 3 . 0,03 | 1,90 | 6,77 | 22—29 | 30 | 25,25 ± 3 . 0,02 | 1,50 | 6,17 | 22—29 |
| 4,5 | 30 | 23,80 ± 3 . 0,03 | 2,10 | 8,90 | 18—29 | 30 | 24,83 ± 3 . 0,03 | 1,70 | 6,88 | 22—29 |
| 7,5 | 30 | 28,50 ± 3 . 0,04 | 2,60 | 9,33 | 23—35 | 30 | 29,26 ± 3 . 0,04 | 2,30 | 7,96 | 24—35 |
| 10,5 | 30 | 30,50 ± 3 . 0,05 | 2,90 | 9,60 | 25—38 | 30 | 30,83 ± 3 . 0,05 | 2,80 | 9,11 | 26—30 |
| 15 | 30 | 33,78 ± 3 . 0,04 | 2,70 | 8,14 | 29—39 | 30 | 33,87 ± 3 . 0,04 | 2,50 | 7,64 | 31—35 |
| 21 | 30 | 35,30 ± 3 . 0,05 | 2,80 | 7,80 | 30—42 | 30 | 35,60 ± 3 . 0,04 | 2,50 | 6,96 | 32—42 |
| 27 | 30 | 36,43 ± 3 . 0,03 | 1,90 | 5,18 | 35—43 | 30 | 37,20 ± 3 . 0,04 | 2,40 | 6,50 | 33—42 |
| 33 | 30 | 37,76 ± 3 . 0,03 | 2,00 | 5,44 | 33—40 | 30 | 37,70 ± 3 . 0,03 | 1,90 | 5,06 | 34—42 |
| 36 | 30 | 38,63 ± 3 . 0,03 | 1,90 | 5,04 | 35—43 | 30 | 38,66 ± 3 . 0,03 | 1,80 | 4,75 | 36—43 |
| 4 | 30 | 38,60 ± 3 . 0,04 | 2,40 | 6,35 | 34—44 | 30 | 38,60 ± 3 . 0,04 | 2,50 | 6,50 | 34—44 |
| 5 | 30 | 39,80 ± 3 . 0,05 | 2,50 | 6,33 | 36—45 | 30 | 39,80 ± 3 . 0,04 | 2,40 | 6,16 | 35—44 |
| 6 | 30 | 41,70 ± 3 . 0,06 | 3,10 | 7,44 | 37—50 | 30 | 41,60 ± 3 . 0,06 | 3,10 | 7,52 | 37—50 |
| 7 | 30 | 44,00 ± 3 . 0,06 | 3,10 | 7,04 | 37—48 | 30 | 44,40 ± 3 . 0,05 | 2,90 | 6,64 | 39—48 |
| 8 | 30 | 46,50 ± 3 . 0,07 | 3,70 | 8,00 | 40—53 | 30 | 46,50 ± 3 . 0,07 | 3,70 | 7,88 | 41—52 |
| 9 | 30 | 47,20 ± 3 . 0,06 | 3,40 | 7,29 | 40—54 | 30 | 47,10 ± 3 . 0,06 | 3,20 | 6,88 | 40—54 |
| 10 | 30 | 47,70 ± 3 . 0,09 | 4,80 | 10,12 | 39—56 | 30 | 47,90 ± 3 . 0,09 | 4,80 | 9,97 | 39—56 |
| 11 | 30 | 52,00 ± 3 . 0,08 | 4,40 | 8,38 | 44—61 | 30 | 52,10 ± 3 . 0,08 | 4,20 | 8,07 | 46—56 |
| 12 | 30 | 54,30 ± 3 . 0,07 | 3,90 | 7,14 | 48—63 | 30 | 54,50 ± 3 . 0,07 | 3,60 | 6,70 | 48—62 |
| 12,3 | 30 | 56,70 ± 3 . 0,07 | 3,70 | 6,64 | 48—64 | 30 | 56,20 ± 3 . 0,07 | 3,80 | 6,77 | 46—65 |
| 12,9 | 30 | 57,30 ± 3 . 0,08 | 4,30 | 7,62 | 45—63 | 30 | 57,20 ± 3 . 0,07 | 3,70 | 6,51 | 50—66 |
| 13,3 | 30 | 58,40 ± 3 . 0,06 | 3,10 | 5,45 | 53—65 | 30 | 57,80 ± 3 . 0,07 | 3,70 | 6,34 | 50—66 |
| 13,9 | 30 | 59,20 ± 3 . 0,07 | 3,70 | 6,28 | 52—70 | 30 | 59,20 ± 3 . 0,05 | 3,00 | 5,15 | 54—67 |
| 14,3 | 31 | 58,70 ± 3 . 0,07 | 3,80 | 6,48 | 50—67 | 31 | 58,40 ± 3 . 0,06 | 3,40 | 5,86 | 51—65 |
| 14,9 | 30 | 59,00 ± 3 . 0,07 | 3,50 | 6,06 | 50—64 | 30 | 59,60 ± 3 . 0,07 | 3,60 | 6,33 | 52—67 |
| 15,3 | 31 | 59,30 ± 3 . 0,07 | 3,70 | 6,36 | 53—67 | 31 | 58,40 ± 3 . 0,06 | 3,40 | 5,87 | 52—64 |
| 15,9 | 36 | 58,90 ± 3 . 0,06 | 3,60 | 6,10 | 53—64 | 36 | 58,40 ± 3 . 0,06 | 3,90 | 6,62 | 51—65 |
| 16,6 | 35 | 59,80 ± 3 . 0,05 | 3,00 | 5,14 | 54—64 | 35 | 59,70 ± 3 . 0,06 | 3,50 | 5,78 | 53—67 |
| 17,6 | 30 | 60,30 ± 3 . 0,07 | 3,70 | 6,19 | 54—70 | 30 | 60,20 ± 3 . 0,06 | 3,60 | 5,92 | 50—69 |

In accordance with the growth curves analysis we point out that both capital dimensions of the hand, i.e. its length and breadth (see Tables 1, 2, 5, 6) present, in a virtually rapid dynamics of growth, somewhat smaller accretions in both sexes in the third year of life, more strictly speaking between 27th and 33rd months of life. The increase in the length of the hands of boys bilaterally at that time does not make even one per cent, and that of the breadth of the hand (especially of the right one) does not reach even a half per cent. Though it is somewhat higher in girls (length about 2.5 per cent, breadth one to two per cent), it is still very low when considering both the preceding and the following values of increase. Another decrease in the growth of the hand of boys can be observed between 8 and 10 years, while in girls only between 9 and 10 years with respect to the growth of the handbreadth. Both the length and the breadth of the hand presents, at that time, not more than about one to two per cent of the total size in boys; they range from 0,5 to 2 per cent in girls. More striking increases of both dimensions cease some time around 16 years in girls and, as already stated, later, around 17 years in boys, respectively.

The mutual length/breadth ratio of the hand, given by the length/breadth index, proves an evolutionary-ontogenetic change in the shape of the hand. Newborn children and those up to the second (girls) and third (boys) years of life have significantly very short and broad hands, thus hyperbrachycheirous according to R. Martin and K. Saller (1957). In the course of further development, as can be seen from our Tables 3, 7 and from the graphs, a faster growth of the length of the hand occurs, as compared with its breadth, resulting in a decrease of the values of the length/breadth index. The latter's final values between 17 and 18 years show clearly a dolichocheirous, i.e. narrow and long hand. Also worth attention is the fact that the hands of 18-year-old boys are broader than those of girls. In addition, Table 7 tells us that 18-year-old girls have a distinctly broader right hand than the left. Boys show such a tendency as well, though naturally to a far lesser extent.

The rapid growth of the length of the thumbs of boys (see Table 4) somewhat slows down around the second year. It gets still slower between 8 and 10 years and after 15 and a half years the thumb remains practically unchanged in its length. Also in girls (see Table 8) a slow-down in the growth of the thumb can be observed between 8 and 10 years, but unlike boys the length stabilizes in fact as early as the 15th year of age. A virtually calm period of growth of the thumb of girls has been found between the 3rd and the 4th year of age.

## COMPARISON WITH OTHER GROUPS

We have not found any other comparative data in the relevant literature for the length of the thumb, besides our own for German children and adolescents (Hajniš, prepared paper). The length of the thumb (ph I — da I) in German probands appears somewhat greater in almost all age classes than with Czech children; this fact is more distinct in boys than in girls.

Only very few authors have dealt with the two principal characters of the hand, i.e. its length and breadth and also its length/breadth index for the age period to 18 years, too. Therefore we can compare merely the data for children of Northern Greece (Jelínek, 1950), for children of the Lusatian Serbs (Pospíšil, 1959), for German children and adolescents examined by Matzdorff (1966, 1967) and the author of this paper (Hajniš, prepared paper). The data for the length of the hand of Swiss children from Schaffhausen was published by Schwerz (cit. according to Martin, 1928). All compared groups (with the exception of our data on German children and adolescents and Matzdorff's data) naturally have only certain age classes of a greater range and contain, moreover, a smaller number of cases than our groups.

If we compare the mean values of the hand length in the cited groups of children from Northern Greece, from Serbian Lusatia, and from Schaffhausen, we can see that our data is considerably higher than these means. The cause lies, no doubt, in the fact that Jelínek (1950) and Pospíšil (1959), and apparently also Schwerz (cit. according to Martin, 1928) performed measurements of the external, but not of what is called the skelettal length of the hand. They delimited the length in the carpal direction by the joining line of the lower border of the thenar and hypothenar ridges so that it was considerably shorter than the joining line between the points interstylion — dactylion III.

From the comparison of the mean values of the hand length measured by Matzdorff (1966, 1967) for the German population, it is to be seen that beginning with the age of about 8 years with boys and of 7 years with girls, the length of the proper hand of Czech children and adolescents appears somewhat greater. As far as the comparison of the preceding three groups is concerned, this difference is naturally very small. The same results are obtained when comparing Czech and German children and adolescents from our already cited paper (Hajniš, prepared paper).

From the comparison of the mean data on the handbreadth (mr — mu) of children from Northern Greece, from Serbian Lusatia, and from Schaffhausen it follows that the overwhelming majority of our cases, corresponding in age to the groups compared, have broader hands. Only the hands of girls in the 15—16 and 17—18 age groups of Lusation Serbs are about equally broad as those of our examined girls, while the left hand of 17—18 years old girls is even a little broader. On the other hand, the comparison of the mean values with the two German groups (Matzdorff, 1966, 1967; Hajniš, prepared paper) tells us that the differences are by no means very great; all these three groups can practically be regarded as identical in the described character.

The considerably smaller mean handlength in all age classes of the compared groups from Greece and from Lusatia is naturally also influenced by the values of their length/breadth indices. All age classes of both groups, with the exception of the 10—11 year old Greek girls show, according to this index, a relatively broader hand than the equally old children and adolescents in our groups. Also in our German children and adolescents (Hajniš, prepared paper), especially in the periods of puberty and postpuberty, the hands are somewhat (even though not so markedly as in the two preceding groups) broader, than in the just described Czech population. Matzdorff (1966, 1967) does not give the length/breadth index of the hand of German children and adolescents.

## DISCUSSION

The hitherto performed investigations of the hand have focused very comprehensively on normal and comparative anatomy (see e.g. Borovanský and Hněvkovský 1930; Orlov 1935; Koenner 1938; Salter and Darcus 1952; Mörike 1954; and of the more recent publications, e.g. Goff's "Comparative Anthropology of Man's Hand" (1959); Miaśkiewicz's paper on The State of Maturity of the Hand and Forearm Skeletons in Youth of both Sexes in the Age from 17 to 23 years (1964); the paper by Garn et al. on Skewness in the Ossification Centres of the Elbow (1965); the paper written by Dreizen, Spirakis and Stone (of the same year) on The Distribution and Disposition of Anomalous Notches in the Non-epiphyses Ends of Human Metacarpal Shafts; Čihák's paper on Onto-phylogenetic Development of Musculus Manus (Čihák 1963, 1967; Čihák et al. 1963); and other authors as well).

It goes without saying that anatomy is of first-rate practical importance for surgery. Therefore, it finds application, as a rule, to a considerable extent, also in monographs on the surgery of the hand, as e.g. in Bunnell's "Surgery of the Hand" from the year 1944 and in its new edition by Boyes from 1964; moreover, it also plays a certain role in Iselin's monograph of 1928 and in its further editions as well as elsewhere.

The described growth dynamics of the capital dimensions of the human hand, and the thumbs of children and adolescents from their birth to 18th year of age, can be of certain practical significance to plastic surgery. Pešková and Vejvalka (1956) rightly draw our attention to the fact that an operation on congenital defects of the hand in infancy is very difficult, because the hand is still in the stage of growth. Therefore, the established periods of lower growth activity or relative growth rest, though it is necessary to treat them very carefully, are important. They may indicate the time which, in all probability, could be most suitable for performing surgical interventions, preferably on the skeleton of the hand. Our study naturally is not concerned with urgent, i.e. accident states, nor with cases where a further delay in surgery would result in irreparable defects of shape or function.

So far we have found only very little information in the relevant literature on operation dates for the removal of congenital defects on the hand. For example, Neumann (1965) recommends the end of the second and the beginning of the third year as suitable for operating on the thumb in the case of triphalangia. The period suggested covers exactly the time of reduced growth activity of the thumb as established in boys, but precedes by one year the period of relative growth rest in girls.

H. Pešková and J. Vejvalka (1956) aussume in the already cited paper that a functional therapy of the operated hand is best performed between the age of 10 and 13 years. This period follows immediately that of a reduced growth of both the length and the breadth of the hand between 8 and 10 years in boys and girls respectively, as has been pointed out above.

Certain authors have also reported data concerning the period of operating on syndactilies (e.g. B. Rypáčková, 1951; H. Millesi, 1965; G. Micali, 1965; and others). The question of their correctness, however, is to be solved only on the basis of the growth of the individual fingers of the hand, as it was published in Anthropologie (Hajniš 1969).

## SUMMARY

On the basis of anthropometric examinations of the greatest handlength (intst — da III), the greatest handbreadth (mr — mu), the length/breadth index, as well as of the length of the thumb (ph I — da I) of 1707 children of Prague from their birth to 18 years of age, we have established relevant tables and graphs of growth. According to them two periods of reduced growth activity, presented in Table 9, have been determined for both boys and girls concerning the hand length and breadth and also the length of the thumb. The mentioned periods could perhaps be utilized for performing certain operations on the hand.

However, the size of the hand characterized, first and foremost, by both capital dimensions presented, i.e. length and breadth, reaches definite values earlier in girls than in boys. Still earlier than the hand, the thumb reaches its definite size, as can be seen from Table 9. Even in the case of the thumb, two periods of slower growth can be determined, of which the earlier one is sexually different, because it starts about three quarters of a year later in girls than in boys.

TABLE 9
The times of the smallest growth of the hand and thumb

| | | | | |
|---|---|---|---|---|
| Boys | Hand | 2 1/4—2 3/4 | 8—10 | 17 ——→ |
| | Thumb | 1 2/3—2 1/4 | 8—10 | 15 1/2 ——→ |
| Girls | Hand | 2 1/4—2 3/4 | 9—10 | 16 ——→ |
| | Thumb | 3—4 | 8—10 | 15 ——→ |

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