FREQUENCY OF CLINODACTYLY IN CHILDREN BETWEEN THE AGES OF 5 AND 12

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Introduction

The following report is on the frequency of clinodactyly and other finger variations observed on 1387 school children between the ages of 5 and 12.

Clinodactyly generally implies crooked or bent fingers as deviations from the normal straight fingers. However, the term clinodactyly as used in the literature applies strictly to the curving of the 5th finger only; sometimes it has been referred to as « crooked little finger ». Typical clinodactyly involves a shortening of the middle phalanx of the 5th finger, showing a more marked reduction on its radial side. As a result of this radial shortening, the normal distal phalanx sets in a radially inclined position. This has been clearly shown by X-ray studies presented by Pol (1921), Tomesku (1928), Sachs (1940), Wilddervanck (1948), and Hersh et al. (1953). In typical cases of clinodactyly, only the 5th finger is affected in this manner, while the rest of the fingers of the hand are normal. Moreover, this conditions does not impair the movement of the little finger in any serious way. This trait is so sharply contrasted from the many other forms of brachydactyly that Bell (1951), in reviewing the many types of digital anomalies, has placed it in a separate and distinct group designated as A_3. Hersh et al. (1953) have shown that clinodactyly is due to an autosomal dominant gene with a high penetrance and produces a developmental arrest of the ossification center of the middle phalanx.

The amount of evidence on the anomalies of the fingers is steadily accumulating (Bell, 1951; Werthemann, 1952), and is becoming an important phase of human heredity. The work which follows adds to this phase by showing the extent to which the dominant gene for clinodactyly is widely spread in the population of children between the ages of 5 and 12.

Data

The collection of the data was based on the visual inspection of the hands of 1387 school children between the ages of 5 and 12 in the Cleveland area. This sample represents a fairly heterogeneous group of children, typical of any large city in the United States. In collecting the data the major objective was to determine the frequency of clino-

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dactyly in childrem. However, other finger variations were recorded which will also be reported here.

In recording the cases of clinodactyly it was necessary to classify them into three groups, based on the degree of bending of the little finger(5th). (1) Those with slight but definite radial bending, ranging between 10 and 20 degrees, are indicated here as

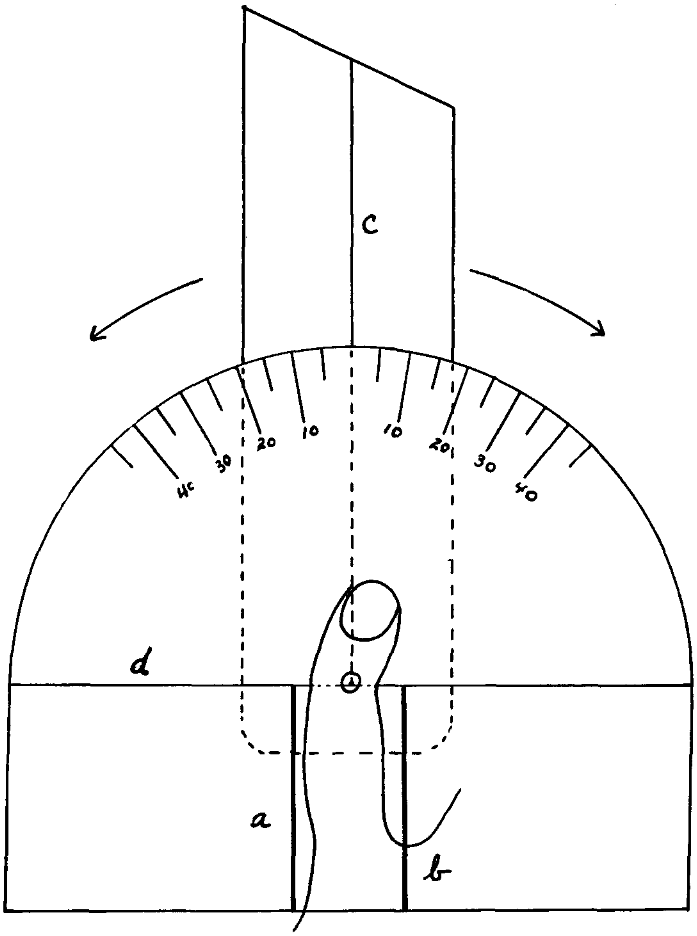

Figure 1. Diagram showing the instrument used for taking angle measurements of clinodactyly. The little finger (5th) is shown in position and ready for measurement.

« slight clinodactyly », and constitutes a doubtful group genetically. (2) Those with the characteristic radial bending, ranging between 20 and 30 degrees, typical of clinodactyly (Hersh, et al, 1953), are referred to simply as « clinodactyly ». (3) Those with an extreme angle of bending of over 30 degrees are referred to as « extreme clinodactyly ». All other fingers with angles of less than 10 degrees are considered as normal straight fingers. The basis of this classification is dependent upon the work of Hersh et al (1953) who found that definite cases of clinodactyly range between 15 and 30 degrees. This range, however, was based on only a few measurements taken with a regular protractor. The results obtained with the new improved method of mesuring the angles which will be described later, have indicated this new range (20 to 30 degrees). A number of cases were found which were difficult to judge as to which group they belong on mere visual inspection only. Adding to the difficulty, cases were found which had slight clinodactyly in one hand and clinodactyly in the other. Much of this doubt was overcome by taking measurements of the angle of radial inclination of the crooked little finger.

A simple instrument was constructed to measure the angle of radial inclination of the crooked little fingers (see figure 1). This consists of a large celluloid protactor to which a movable celluloid bar was connected at the center which describes the 180° arc of the protractor. The bar was free to rotate about this common center. A hair line was scribed along the middle of the movable bar and was used to read the angles on the scale. An extension was added to the base of the protractor on which were drawn two straight lines about one inch apart, and equidistant from the common center of the arc. These two lines served to center the base of the little finger on the vertical zero axis when taking measurements. Another straight line was scribed 90° to the vertical axis and passing through the common center. This horizontal line serves to locate the interphalangeal joint between the distal and the middle phalanx. These two axes serve to locate the approximate center of the interphalangeal joint. In practice, measuring the angle of the crooked finger is relatively simple. The finger is placed on the protractor face down, as shown in figure 1, so that the base of the finger lies equidistant between the two parallel lines *a* and *b*, and the base of the distal portion of the finger lies just above the horizontal axis *d*. Now, the celluloid bar with line *c* is moved until line *c* coincides with the approximate mid-line of the distal phalanx. The angle is read off the scale in degrees. Estimating the mid-line of the distal phalanx is difficult at first, but with a little practice the accuracy of the measurements improves. This method of measuring angles of crooked fingers is by no means totally satisfactory. However, it is a beginning to the approach of quantitative study of minor human traits.

Table 1 lists the percent frequencies of the different types of clinodactyly and other digital variations as found in a sample population of 1261 white school children between the ages of 5 and 12. The first three types listed, slight clinodactyly, clinodactyly, and extreme clinodactyly are strictly bilateral. Each group is based on the degree of inclination of the crooked little finger (the angle measurements are given in table 4). The next two are strictly unilateral and indicate their frequency in the left and right hand. Following these is listed the occurrence of bilateral clinodactyly in combination with bilateral curved index finger. The second from the bottom, shows the frequency of bilateral curved index only. The last, gives the frequency of bilateral flexed 5th finger or streblomicrodactyly (Stoddard, 1939). These have been listed in this manner for the purpose of discussion a little later on. Table 2 lists all the other miscellaneous digital variations not included

Tab. 1 - Frequency of clinodactyly and other digital variations as fond in 1261 white school children between the age of 5 and 12

	Males		Females		Males and Females	
	No. of individuals	Percent frequency ± S. E.	No. of individuals	Percent frequency ± S. E.	No. of individuals	Percent frequency ± S. E.
Total Affected and Unaffected	641	—	620	—	1261	—
Bilateral Slight Clinodactyly	54	8.42±1.10	46	7.42±1.05	100	7.93±0.76
Bilateral Clinodactyly	68	10.61±1.22	30	4.84±0.86	98	7.77±0.75
Bilateral Extreme Clinodactyly	2	0.31±0.22	3	0.48±0.28	5	0.40±0.18
Unilateral Clinodactyly Left Hand	4	0.62±0.31	7	1.13±0.43	11	0.88±0.26
Unilateral Clinodactyly Right Hand	14	2.18±0.58	9	1.45±0.48	23	1.82±0.38
Bilateral Clinodactyly plus Curved Index	5	0.78±0.35	2	0.32±0.23	7	0.56±0.21
Bilateral Curved Index	6	0.94±0.38	3	0.48±0.28	9	0.70±0.24
Bilateral Flexed 5th Finger	0	0 ± 0	2	0.32±0.23	2	0.16±0.11
All other anomalies Listed in Tab. 2	12	—	7	—	19	—

in table 1. Table 3 summarizes the total occurrence of clinodactyly, including all unilaterals and bilaterals in combination with and without other digital variation as listed in tables 1 and 2. For reasons which will be explained later, the group of slight clinodactyly is treated as normal. In this table we note that clinodactyly occurs more frequently in the males than in females, 15.2±1.41 and 8.06±1.09 percent, respectively. Moreover, we note that the occurrence of clinodactyly among the males is approximately twice that of females. This significant difference ($\chi^2 = 14.6$) seems to indicate that the factor for clinodactyly may be associated in some way with sex, at least expressing itself as such during this stage of development i.e. between the ages of 5 and 12.

The group of extreme clinodactyly, with an angle of inclination of over 30 degrees, while it represents a relatively small group, nevertheless throws some new light on this genetic trait. The cases of extreme clinodactyly are so noticeably crooked that they may easily reach the attention of a clinician. In our observations we found only 5 such cases out of the total of 1261 whithe children, 2 out of 641 males and 3 out of 620 females. This small group of extreme clinodactyly most likely represents the homozygotes of the population. Not considering the influence of sex for the moment and treating them as a single group, the extreme clinodactyly occurs in the frequency of 1 in 252 or about

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Tab. 2 - Other finger variations found among white school children between the ages of 5 and 12

Males

Bilateral

1 radially and dorsally bent 5th finger
1 slight Clinodactyly with curved index finger
1 large wide thumb
1 Clinodactyly with radially curved 4th finger

Unilateral

2 right, turned out 5th (opposite angle of Clinodactyly)
1 left, Clinodactyly with dorsally bent index
1 left, Clinodactyly with curved index and 3rd finger
1 right, Clinodactyly with curved index and 3rd finger
2 right, Clinodactyly with curved index finger
1 left, curved index

Females

Bilateral

2 slight Clinodactyly with curved index finger
1 slight Clinodactyly with slight curved index finger
1 slight curved index
1 deeply recessed between index and 3rd fingers

Unilateral

1 right, Clinodactyly with curved index finger
1 left, Clinodactyly with curved out index

Tab. 3 - Condensed table showing the occurrence of clinodactyly and extreme clinodactyly among 1261 white children between the ages of 5 and 12

Phenotype and Genotype	Males		Females		Males and Females	
	No. of individuals	Percent frequency S. E.	No. of individuals	Percent frequency S. E.	No. of individuals	Percent frequency S. E.
Non-Clinodactyly cc	542	—	567	—	1109	—
Clinodactyly Cc	97	15.2 ± 1.41	50	8.06 ± 1.09	147	11.7 ± 0.89
Extreme Clinodactyly CC	2	0.31 ± 0.22	3	0.48 ± 0.28	5	0.40 ± 0.18
Total	641	—	620	—	1261	—

Tab. 4 - Angle measurements of clinodactyly

Types of Little Finger	No. Measurements	Degree radial Bending M. $\pm$ S. E.
Normal straight finger	16	8.5 $\pm$1.0
Slight Clinodactyly	28	16.5 $\pm$0.5
Clinodactyly	23	21.3 $\pm$0.7
Extreme Clinodactyly	2	over 30

3.6 in 1000. The regular form of clinodactyly, with an angle of inclination of 21.7$\pm$0.7, however, occurs in about 11% of the population, as shown in table 3, and are most likely the heterozygotes of the population. The probability of marriage of two heterozygotes in a panmictic population would be approximately 1.2%, and one child in four in such marriages will be homozygous dominant, or about 3 homozygotes in 1000. We found about 3.6 in 1000. Although the correction for sex difference has not been included in this rough approximation, the general results, nevertheless, seem to support the hypothesis that extreme clinodactyly may represent the homozygotes of the population, while the regular form of clinodactyly with an angle of inclination of 21.3$\pm$0.7 degrees represents the heterozygotes of the population. The frequency of 1 in 1000 as estimated by Hersh et al (1953) is most likely for the extreme clinodactyly, since only the extreme cases of crooked little finger were recorded by Stecher (1940), whose main objective at that time was the study of Heberden's nodes. These were the best data available at the time, and it was this incomplete information which led to the present study.

Referring to table 1, there is no apparent real difference in the slight clinodactyly between males and females. This group, whose average angle of inclination is 16.5$\pm$0.5 degrees, is probably composed of the mixture of two groups, the normal straight finger, 8.5$\pm$1.0, and clinodactyly, 21.3$\pm$0.7, whose extreme ends of the normal curves of distribution overlap each other (see table 4). This group could be broken down into normal and clinodactyly if we arbitrarily change the range of clinodactyly say from 20-30 to 10-30 degrees. The latter range is not too reliable, in our opinion, since many of the genetically normal fingers with slight angle of inclination would be included as clinodactyly. Moreover, a complete separation would be impossible since these measurements involve a sample of the total number reported; the remainder were classified on visual inspection only. Therefore, this group has been considered along with the normal for the practical purpose of facilitating calculations and discussion. The alternate method of solving this problem would have been to trace each of these cases back to the respective family to see if either parent was clinodactylous. This was impractical at the time these data were collected.

Table 5 summarizes all of the cases of bilateral and unilateral forms of clinodactyly. There are a total of 146 cases of clinodactyly, 105 of which are bilateral and 41 are unilateral. The bilateral form of clinodactyly, therefore shows up in the ratio of 105 to 146 or 0.72. This ratio is referred to here as the *bilateral penetrance ratio.* Clinodactyly has a bilateral penetrance ratio of 0.77 in males and 0.64 in females. The difference is not highly significant. This ratio expresses more conveniently the relative proportion between the bilaterals and the total bilaterals and unilaterals in the expression of this specific gene. To the best of our knowledge this is the first time the unilateral and bilateral expression of a genetic trait is brought under the common point of view of penetrance. The fundamental understanding of the problem of bilaterality and unilaterality of traits in human as well as in animal genetics still remains obscure.

The curved index (2nd) finger occurs in the frequency of 1.03 ± 0.28 percent in combination with clinodactyly (from tables 1 and 2). The general characteristic of this finger is that it inclines inwardly toward the middle (3rd) finger, forming an angle of about 20 to 30 degrees between the distal and middle phalanx. Stiles and Schalck (1945) have studied this trait and found it to occur both unilaterally and bilaterally and their evidence indicates that it is most likely due to a dominant gene. The authors also point out that this trait has a fairly high incidence in the population without giving any specific figures. The results of our studies (from tables 1 and 2) show a total of 28 cases of curved index fingers in a total 1261 children; 21 of these were bilateral and 7 unilateral. Simple calculations show thet the curved index finger occurs in the frequency of 2.22 ± 0.41 percent, and has a bilateral penetrance ratio of 0.75.

The flexed 5th finger is less common than clinodactyly. Only three cases of flexed little finger have been observed in this survey. Two of these were female identical twins and have been listed as one in table 1. These individuals are unable to straighten out the little finger between the middle and proximal joints when placing the palm of the hand down on a flat surface. This abnormal trait of the little finger which sometimes is referred to in the literature as streblomicrodactyly (Stoddard, 1939), has been well described and illustrated by Hefner (1924, 1929, 1941), Ashley (1947), and Scheff and Schafer (1948) who have shown it to be due to a dominant gene. Moore and Messina (1936) likewise showed that this trait is due to a dominant gene and that it may express itself unilaterally or bilaterally. Spears (1946) gives a pedigree showing flexing ranging from the little finger only to all four fingers of the hand. Maurer (1938) who made a study of some 6000

Tab. 5 - Occurrence of bilateral and unilateral forms of clinodactyly and their respective bilateral penetrance ratios as found in 1261 white children between the ages of 5 and 12

	Number of Bilateral Clinodactyly	Number of Unilateral Clinodactyly	Total	Bilateral Penetrance Ratio
Males	73	23	96	0.76
Females	32	18	50	0.64
Total	105	41	146	0.72

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school children found 21 cases of camptodactyly (flexion of the 4th and 5th fingers mainly). This gives a higher frequency than ours. The difference may not be significant however, since we have only 3 cases for comparison. The combined data place the frequency of flexed fingers at approximately 1 in 320, which is considerably lower than that of clinodactyly.

Table 6 lists similar cases of clinodactyly found among the total of 124 Negro school children between the ages of 5 and 12. The number observed are too few to give an accurate frequency of each type. However, the indication is that clinodactyly is not peculiar to white children. It would be difficult to say how many Negro clinodactyly are due to the genetic mixture of white. It has been estimated that about 72% of the American Negro has some white mixture (as cited by Trevor, 1953). If one were to assume that clinodactyly is strictly a white trait, then one could, on the basis of the above data, estimate the frequency of clinodactyly among the Negro to be about 10.9% for males and 5.8% for females. But the assumption may not be correct at all, in which case, only the collection of more data from the Negro population could ultimately give us a truer picture. The more extensive data on clinodactyly collected from the Negro population might also lead to some interesting race crossing studies. It should be mentioned also that one Japanese case of clinodactyly has been brought to our attention, but has not been recorded in the tables. Clinodactyly might prove to be a more generalized trait among the human population than has been previously suspected.

Referring to table 2, there are two unusual cases of unilateral clinodactyly in males in which the angle of inclination is in the opposite direction of regular clinodactyly. The distal phalanx inclines about 20 degrees outwardly. Freese (1921) proposed « digitus valgus » to express the radial and ulnar type of inclinations. Another rare type of clinodactyly was found bilaterally in a male, whose distal phalanx inclinde radially and dor.

Tab. 6 - Occurrences of clinodactyly among Negro school children between the ages of 5 and 12

	Males	Females	Males and Females
Total Affected and Unaffected	51	74	125
Bilateral Slight Clinodactyly	3	5	8
Bilateral Moderate Clinodactyly	1	4	5
Bilateral Extreme Clinodactyly	1	0	1
Unilateral Clinodactyly Left Hand	0	0	0
Unilateral Clinodactyly Right Hand	2	1	3

1 female with flexed thumb, bilateral (has been included under « slight clinodactyly »)
1 male with a wide flat thumb (has been included under « slight clinodactyly »)

Tab. 7 - The occurrence of bending in the different finger of the hand as found among 1261 white school children between the ages of 5 and 12

Name of finger	Total number of Bilateral and unilateral bent fingers
Little finger(5th)	157
Index finger(2nd)	28
Middle finger(3rd)	3
Ring finger(4th)	1
Thumb(1st)	0

sally. Two other uncommon types of digital anomalies are, a male with bilateral wide thumbs, approximately one and one-half times the normal width of the thumb, and a female with a bilaterally, deeply recessed interdigital space between the 2nd and 3rd fingers.

Table 7 gives the name of each finger in the order of the occurrence of bending from the greatest number to the least. It is obvious from these data that the little finger is most prone to defects while the thumb is least affected. Drinkwater (1916) suggested, and Iltis (1944) agreed on the general hypothesis that the fingers are undergoing the evolutionary process of « thumbfication », since the majority of the digital anomalies involve some sort of shortening or reduction of the middle phalanges. This explanation, of course, is not in line with the present genetic view of evolutionary trends. All we can conclude from these data is that the middle phalanx of the little finger is the one most affected. We have no evidence to show that the reduction of the middle series of phalanges is the expression of a common gene.

Discussion

Clinodactyly occurs much more frequently them has been previously suspected. In children between the ages of 5 and 12 clinodactyly occurs in 15.2% of the males and 8.06% of the females. The χ^2 tests shows a significant difference between the two groups. Since the total number of affected males is approximately twice that of the affected females it seems to indicate that the factor for clinodactyly may in some way be influenced by sex. The exact mechanism is not clear at present. In view that Bell (1951) and Hersh et al (1953) did not find any sex difference among the cases studied (mostly adults), it is suggested that the difference found in our present report may possibly be due to other accessory genetic factors which may come into play during this formative stage (between the ages of 5 and 12). X-ray study (Greulich and Pyle, 1950) of the different stages of growth of the finger bones indicates that the process of elongation of the phalanges and their final fusion with their respective epiphysis extends well beyond the age of 12. The genetic ratio of clinodactyly as found in children of this age group may possibly change on completion of growth. This is mere speculation and requires definite developmental data of clinodactyly in order to get the complete picture. Such an approach to the problem has already been suggested by Hersh et al (1953).

Evidence indicates the possibility that the group of clinodactyly with an angle of inclination of 21.3 ± 0.7 may represent the heterozygotes of the population, Cc, while the extreme clinodactyly, CC, with an angle of inclination of over 30 degrees may represent the homozygotes of the population. This possibility is offered only as working hypothesis for future investigation.

In this study the unilateral and bilateral clinodactyly have been kept separate in order to point out the possible existence of a *bilateral penetrance ratio*. This ratio is simply the number of bilaterals divided by the total number of bilaterals and unilaterals. The males show 73 bilaterals and 23 unilaterals, or a bilateral penetrance ratio of 0.76; the females show 32 bilaterals and 18 unilaterals or a penetrance ratio of 0.64. These ratios are not used to attempt to explain in any way the cause of unilateral expression of the genetic trait. They simply express numerically the proportion of bilaterals to the sum of bilaterals and unilaterals in terms of penetrance. Many genetic traits in man could be conveniently expressed in terms of this ratio. For example, Thomsen (1928) made a study of the short thumb and found 20 cases of bilateral and 17 cases of unilateral. In this case the dominant gene for short thumb has a bilateral penetrance ratio of 0.54. It must be admitted that the concept of penetrance as used in human genetics is rather vague, and serves only to shield ignorance.

It has been shown that about 2.22% of the children have curved index finger and approximately half of these (1.03%) show this trait in combination with clinodactyly. Whether these two traits are controlled by two separate genes or a common gene, is not clear at present. Stiles and Schalck (1945) traced the curved index finger through four generations. They concluded that the trait seems to depend on a dominant gene. They also observed that the curved index was usually associeted with some curvature of the little finger. The authors further concluded that « The frequency with which persons with curved forefingers married other individuals with curved forefingers (fig. 11) makes it reasonable to assume that there is a fairly high incidence of curved index fingers in the general population ». The authors did not state any specific frequency. Our data show a percent frequency of 2.22 ± 0.42 which includes both the number of single and the combined form, as well as the unilateral and bilateral types of curved index fingers. The curved index finger might well be a variable expression of the same gene for clinodactyly. Moreover, all of the digital anomalies in which the middle phalanx is involved, might be the expression of a common gene, having pleotropic effects, with a varying degree in different fingers (see table1). The inheritance of different grades of digital anomalies in which the middle phalanx is specifically affected, might be the expression of a group of accessory recessive factors acting as modifiers of the common dominant gene. At present it is the common practice to assign a different gene for each new variable trait of the middle phalanx discovered in a family line. Bell (1951), in summarizing the work on brachydactyly, was hesitant in formulating an hypothesis to explain the different forms of bra-

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chydactyly. Bell was justified in her conclusion, since brachydactyly may involve the shortening of any of the phalanges or metacarpals of the hands and feet. Shortening may occur in the distal phalanges (McArthur and McCullough, 1932), or in the middle phalanges of the 3rd and 4th fingers (Drey, 1912), of the index and the little finger (Iltis, 1944), of all four digits of the hands and feet (Lewis, 1909), of the index and 3rd fingers (Drinkwater, 1916), of the index 3rd, and 5th (Johnston and Davis, 1953), or in the metacarpals (Gillette, 1931, and Koenner, 1943). The growth of an extra triangular bone near the base of the proximal phalanx of the index may also cause the finger to shorten and turn in (Cohn and Ravin, 1941). Ankylosing, or fusion between the interphalangeal joints has elso been found associated with the shortening of fingers (Lameris, 1906, and Goldflam, 1906). The reason for the difficulty in trying to bring the various forms of shortening under one common hypothesis is obvious. There still remains the possibility however, of formulating a single gene hypothesis for all the finger and toe anomalies which involve a developmental arrest of the ossification centers of the middle series of phalanges. This is a problem yet to be untangeled.

Although the frequency data on the Negro clinodactyly is meager, (table 6) indications are that this trait also occurs in the Negro population. Wether the existence of this trait is due to the white mixture, or, is inherent to the Negro race, is problematic. Further study of this simple trait in other racial types may lead to more information on the evolution of man. This is especially true for traits which involve one-gene-one-character of study.

Summary

A study of fingers characteristics was made on 1387 school children.

1. Clinodactyly (5th finger) with an angle of inclination of 21.3 ± 0.7 degrees, was found in 15.2% of the male and 8.06% of the female white children between the ages of 5 and 12. These represent the heterozygotes of the population, Cc, while the extreme form of clinodactyly, with an angle of inclination of over 30 degrees, most likely represents the homozygotes of the population, CC.
2. Curved index finger (2nd) occurs less frequently than clinodactyly (in 2.22% of the group studied).
3. Flexed little finger (5th) occurs least often, about 1 in 320.
4. *Bilateral penetrance ratio* has been defined. Clinodactyly has a bilateral penetrance ratio of 0.77 in males and 0.64 in females. The curved index finger has a bilateral penetrance ratio of approximately 0.75.
5. Clinodactyly also occurs in Negro children.
6. An instrument is described for measuring the angle of inclination of clinodacyly.

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SOMMARIO

È stato eseguito uno studio delle caratteristiche delle dita su 1387 scolari.

1. Clinodattilia (5° dito) con un angolo di inclinazione di 21,3 ± 0,7 gradi è stato trovato nel 15,2% dei maschi e nell'8,06% delle femmine nei bambini bianchi fra l'età di 5 e 12 anni. Essi rappresentano gli eterozigoti della popolazione Cc, mentre la forma estrema di clinodattilia con un angolo di inclinazione di oltre 30 gradi, rappresenta molto probabilmente gli omozigoti della popolazione CC.

2. Il dito indice ricurvo (2°) si verifica meno frequentemente della clinodattilia (2,22% del gruppo studiato).

3. Il mignolo (5°) ricurvo si verifica meno spesso circa una volta in 320.

4. È stato definito il *rapporto bilaterale di penetranza.* La clinodattilia ha un rapporto bilaterale di penetranza di 0,77 nei maschi e di 0,64 nelle femmine. Il dito indice ricurvo ha un rapporto bilaterale di penetranza di circa 0,75.

5. La clinodattilia si verifica anche nei bambini negri.

6. Viene descritto uno strumento per misurare l'angolo di inclinazione della clinodattilia.

RESUMÉ

Une étude des caractéristiques des doigts a été effectuée sur 1387 élèves.

1. Clinodactylie (5ème doigt) avec un angle d'inclination de 21,3 ± 0,7 degrés a été constatée chez 15,2% des garçons et 8,06% des filles, de race blanche, âgés de 5 à 12 ans. Ceux-ci représentent les hétérozygotes de la population Cc, tandis que la forme extrême de clinodactylie avec un angle d'inclination de plus de 30°, représente très probablement les homozygotes de la population CC.

2. L'index recourbé (2ème) se constate moins fréquemment que la clinodactylie (2,22% chez le groupe examiné).

3. L'auriculaire (5ème) se constate encore moins fréquemment, environ 1 sur 320.

4. Le *rapport bilatéral de pénétration a été défini.* La clinodactylie a un rapport bilatéral de pénétration de 0,77 chez les garçons et de 0,64 chez les filles. L'index recourbé a un rapport bilatéral de pénétration d'environ 0,75.

5. La clinodactylie se constate également chez les enfants nègres.

6. Un instrument permettant de mesurer l'angle d'inclination de la clinodactylie, est décrit.

ZUSAMMENFASSUNG

Es wurde eine Untersuchung über die Eigenarten der Finger bei 1387 Schulkindern ausgeführt.

1. Klinodaktylie (5. Finger) mit einem Neigungswinkel von 21,3 ± 0,70 wurde in 15,2% der weissen Knaben und in 8,06% der weissen Mädchen im Alter zwischen 5 und 12 Jahren gefunden. Sie bilden die Heterzygoten der Bevölkerung, Cc, während die äusserste Form von Klinodaktylie mit einem Neigungswinkel von über 30° die Homozygoten CC der Bevölkerung darstellen.

2. Krümmung des Zeigefingers (2. Finger) ist weniger häufig als Zeigefingerdaktylie (2,22% der untersuchten Gruppe).

3. Krümmung des kleinen Fingers kommt selten vor, ungefähr einmal auf 320.

4. Das *bilaterale Penetranzverhältnis* wurde bestimmt. Klinodaktylie hat ein bilaterales penetranzverhältnis von 0,77 bei Knaben und 0,64 bei Mädchen. Zeigefingerkrümmung hat ein bilaterales Penetranzverhältnis von ungefähr 0,75.

5. Klinodaktylie kommt auch bei Negerkindern vor.

6. Ein Instrument zur Messung des Neigungswinkels bei Klinodaktylie wird beschrieben.