

The genetics of hand-clasping—a review and a familial study

M. REISS

University of Dresden, Dresden, Germany

Received 4 July 1996; accepted 27 April 1998

Summary. Hand-clasping refers to the preferential tendency for individuals to clasp the hands together. This paper reviews the previous literature on family data and twins, and reports new data. In this study about 55% of the population are left-hand-claspers, 44% are right-hand-claspers, and the remaining 1% report that they have no preference or are indifferent. Familial data suggest that hand-clasping may be under genetic control: although the data do not fit any straightforward recessive or dominant Mendelian model, they are compatible with the type of model invoking fluctuating asymmetry which has been used to explain the inheritance of handedness and arm-folding. It is possible that hand-clasping, as for example arm-folding, may be an idiosyncrasy due to or influenced by physical bilateral differences in the hands. All data together are suggestive of a genetic basis, although environmental influences are also evident.

1. Introduction

Certain parts of the human body show a kind of asymmetry. One of these asymmetries is the so-called hand-clasping. When a person is asked to clasp his hands together with the fingers interlocked it is inevitable that one of the thumbs must be on the top of the other. Right hand-claspers (RHC) have the right thumb on the top (Left hand-clasper – LHC). For any individual the particular thumb on top is constant. In a long-term-follow-up of individuals in order to assess test-retest reliability Wiener (1932) found in a limited sample of 22 individuals 100% agreement after an interval of 18 months. The study of Sharma and Nath (1971) suggests a certain inconstancy of sidedness type, of 7%, based on 15 observations per individual at intervals of 2 days.

This paper summarizes the literature on the familial data of hand-clasping, and describes the results of a new survey.

1.1. *Population incidence, sex and generational differences*

Numerous authors have noted ethnic differences in this laterality pattern in man, pointing out the importance in the study of people (Oeser 1969, McManus and Mascie Taylor 1979, Reiss 1998). Reiss (1998) has identified in the literature 97 studies of hand-clasping; the distribution, sex ratio and generational differences have been well described. Estimates of $p(L)$ (proportion with left-thumb on top) have been made for a total of 188 populations (Reiss 1998). These given a mean value of 42.6%. The distribution is shown in figure 1. Figure 2 shows a map of the world with values of $p(L)$ for different populations. Migrant populations are placed at their site of origin.

Many studies have suggested that there are sex differences in the incidence of LHC. Others have failed to find such differences. Table 1 summarizes the findings of studies on 85 populations (Reiss 1998).

There are nine studies in the literature which investigate generational differences (Reiss 1998). The number of the studies demonstrating an increase of LHC is nearly

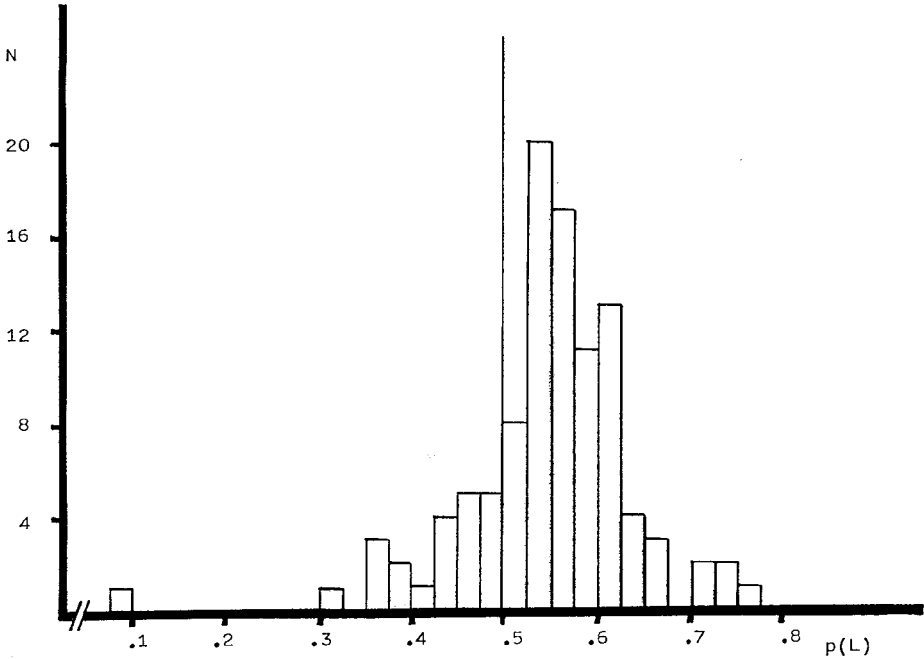


Figure 1. The incidence of left hand-clasping in 186 separate studies of different populations (Reiss 1998).

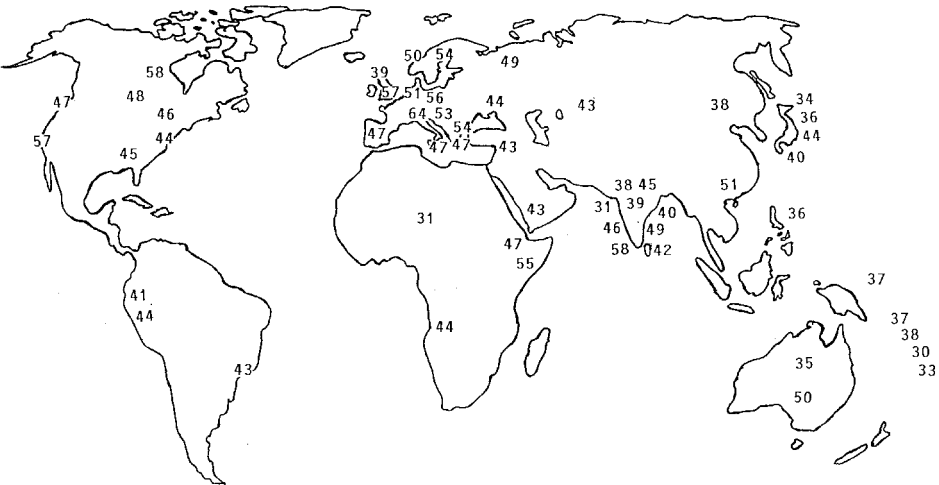


Figure 2. A map of the world on which are placed the individual incidences of left hand-clasping in different populations. Values are expressed as percentages.

the same as the number demonstrating the reverse effect. So there are only small effects.

1.2. Relationships

The extent of the association of hand-clasping with other asymmetries has important implications for the nature of genetic theories of hand-clasping and other asymmetries.

Table 1. Shows the number of populations in which males have a higher incidence of LHC, by population incidence of LHC (greater or less than 50%).

		Sex differences		
		Male > female	Male < female	Total
Population incidence of LHC	< 0.5	32	29	61
	> 0.5	11	13	24
		43	42	85

$\chi^2 = 0.301$, 1 df, NS.

1.2.1. Handedness and hand-clasping. Twenty one studies have looked at the relationship between handedness and hand-clasping (Reiss 1998). Wiener (1932), Ferronato, Thomas and Sadava (1974), McManus and Mascie-Taylor (1979 ICM) and Beckman and Elston (1962) found no correlation between handedness and hand-clasping. The study of Pelecanos (1969) claimed to find a 'highly significant positive correlation'. The study by McManus and Mascie-Taylor (1979) found a significant interrelationship when all individuals were included in the analysis.

Downey (1927), Kobylansky, Micle and Arensburg (1978), Rhoads and Damon (1973), Sakano (1982) and Sovak (1968) also claimed to find a significant correlation. Altogether 13 out of 21 studies found a correlation.

1.2.2. Hand-clasping and arm-folding. Twenty two studies have investigated this relationship (Reiss 1998). Wiener (1932), Falk and Ayala (1971), Ferronato *et al.* (1974), Pelecanos (1969), Beckman and Elston (1962), Rhoads and Damon (1973) and McManus and Mascie-Taylor (1979) found no association. The studies of Arrieta, Aragonés, Gonzalez, Pastor and Lostao (1985), Dvirskij (1975), Kawabe (1949), Kobylansky *et al.* (1978), Plato, Fox and Garruto (1985) and Sakano (1982) claimed to find a significant correlation. Nevertheless the statistical independence of hand-clasping and arm-folding seems fairly secure.

1.3. Familial data

There are 18 studies in the literature which give family data on hand-clasping. Seventeen of them are shown in table 2, the study by Ferronato *et al.* (1974) has been excluded, because they presented only the direct combination between parents and children.

Table 2 also gives the frequency of LHC in parents and children (18 studies and 21 populations). In 14 populations there is a greater frequency of LHC in children than in parents, in four populations the opposite is found and three populations show similar frequency in the two generational groups.

Table 2 also documents the proportion of LHC individuals in relationship to the parental hand-clasping type. Eight populations show a significant increase of LHC offspring as the number of LHC parents increases from none to two parents.

The data by Ferronato *et al.* (1974) show a non-significant relationship between fathers and children, between mothers and children and between fathers and mothers. The other studies analysing sex differences—parental or children influence (Lutz 1908, Wiener 1932, Yamaura 1940, Leguebe 1967, Falk and Ayala 1971, Arrieta, Martinez and Lostao 1988) did not find any relationships.

Table 2. The results of 18 studies (22 populations including the present study) of frequency of left and right-hand clasping in progeny from RX matings. Relative values in parenthesis.

Study	Matings										χ^2 df = 2
	R x R			R x L			L x L				
	p(L) progeny	p(L) parents	R	L	R	L	R	L	R	L	
Arrieta, Martinez and Lostao (1988)	0.46	0.44	65 (0.62)	40 (0.38)	131 (0.53)	118 (0.47)	29 (0.48)	31 (0.52)	NS		
Falk and Ayala (1971)	0.55	0.50	147 (0.50)	145 (0.50)	270 (0.45)	327 (0.55)	118 (0.40)	180 (0.60)	$p < 0.05$		
Freire-Maia (1958)	0.38	0.31	156 (0.70)	67 (0.30)	108 (0.58)	79 (0.42)	27 (0.48)	29 (0.52)	$p < 0.005$		
Kawabe (1949)	0.35	0.32	594 (0.78)	167 (0.22)	244 (0.57)	182 (0.43)	62 (0.30)	143 (0.70)	$p < 0.0005$		
Kawabe (1953)	0.28	0.26	709 (0.80)	180 (0.20)	292 (0.6)	151 (0.34)	72 (0.43)	94 (0.57)	$p < 0.0005$		
Lai and Walsh (1965) New Guinea	0.38	0.53	88 (0.61)	57 (0.39)	84 (0.65)	45 (0.44)	27 (0.57)	20 (0.43)	NS		
Lai and Walsh (1965) Australians	0.55	0.37	23 (0.55)	19 (0.45)	50 (0.56)	40 (0.44)	27 (0.41)	39 (0.59)	NS		
Leguebe (1967)	0.55	0.52	136 (0.61)	86 (0.39)	196 (0.46)	229 (0.54)	126 (0.48)	139 (0.52)	$p < 0.001$		
Lutz (1908)	0.40	0.41	166 (0.72)	63 (0.28)	147 (0.57)	113 (0.43)	46 (0.42)	63 (0.58)	$p < 0.0005$		
McManus and Mascie Taylor (1979)	0.60	0.54	43 (0.48)	47 (0.52)	84 (0.38)	138 (0.62)	50 (0.39)	78 (0.61)	NS		
ICM											
McManus and Mascie Taylor (1979)	0.61	0.55	30 (0.49)	31 (0.51)	61 (0.39)	94 (0.61)	26 (0.31)	59 (0.69)	NS		
CGNM-T											
Pons (1961)	0.32	0.38	28 (0.61)	18 (0.39)	19 (0.41)	27 (0.59)	4 (0.29)	10 (0.71)	NS		
Malapatra (1970)	0.44	0.40	190 (0.65)	101 (0.35)	317 (0.53)	278 (0.47)	62 (0.47)	70 (0.53)	$p < 0.0005$		
Rhoads and Damon (1973)	0.32	0.31	89 (0.71)	36 (0.29)	70 (0.66)	36 (0.34)	15 (0.58)	11 (0.42)	NS		
Shami (1979)	0.41	0.41	26 (0.53)	23 (0.47)	59 (0.61)	37 (0.39)	21 (0.58)	15 (0.42)	NS		
Veerajuu and Satyanarayana (1972)											
-Kapus	0.63	0.59	7 (0.39)	11 (0.61)	21 (0.41)	30 (0.59)	10 (0.30)	23 (0.70)	NS		
-Salis	0.50	0.55	10 (0.38)	16 (0.62)	25 (0.46)	29 (0.54)	22 (0.65)	12 (0.35)	NS		
-Jalaries	0.46	0.60	4 (0.67)	2 (0.33)	20 (0.57)	15 (0.43)	17 (0.49)	18 (0.51)	NS		
-Total	0.55	0.61	21 (0.29)	29 (0.71)	66 (0.47)	74 (0.53)	50 (0.49)	53 (0.51)	NS		
Wiener (1932)	0.48	0.45	76 (0.54)	66 (0.46)	131 (0.56)	103 (0.44)	42 (0.41)	61 (0.59)	$p < 0.05$		
Yamaura (1940)	0.44	0.39	112 (0.70)	47 (0.30)	110 (0.52)	101 (0.48)	21 (0.32)	45 (0.68)	$p < 0.0005$		
Yoshiwara (1957)	0.43	0.36	78 (0.70)	33 (0.30)	70 (0.59)	49 (0.41)	21 (0.33)	43 (0.67)	$p < 0.0005$		
Reiss (<i>this study</i>)	0.59	0.53	38 (0.47)	43 (0.53)	64 (0.42)	88 (0.58)	35 (0.34)	69 (0.66)	NS		
Mathematical sum (22 populations)	0.44	0.41	2815 [0.68]	1298 [0.32]	2573 [0.53]	2309 [0.47]	880 [0.41]	1252 [0.59]	$p < 0.0005$		

L= LAF; R= RAF; RXL= R(F)XL(M) and L(F)XR(M); F= father; M= mother; NS, not significant.

Table 3. Evidence from 18 studies for assortative mating for hand-clasping.

Study	P(L)	<i>n</i>	RxR	RxL*	LxL	χ^2 df = 2	Direction**
Freire-Maia, Quelce-Salgado and Freire Maia (1958)	0.31	159	76	66	17	NS	+
Lai and Walsh (1965)							
White Australians	0.53	89	20	43	26	NS	—
New Guinea	0.37	168	69	73	26	NS	+
Leguebe (1967)	0.52	322	81	148	93	NS	+
Lutz (1908)	0.41	213	75	102	36	NS	+
Kawabe (1949)	0.32	347	179	113	55	$p < 1\%$	—
Kawabe (1953)	0.26	340	201	103	36	$p < 5\%$	
Mahapatra (1970)	0.40	260	81	148	31	NS	
McManus and Mascie Taylor (1979)	0.54	440	90	222	128	NS	+
ICM							
Pons (1961)	0.38	49	20	21	8	NS	+
Rhoads and Damon (1973)	0.31	188	87	85	16	NS	+
Shami (1979)	0.41	57	20	27	10	NS	
Veeraju and Satyangrayana (1972)							
Kapus	0.59	48	9	21	18	NS	
Salis	0.55	51	11	24	16	NS	
Jalaris	0.60	24	4	11	9	NS	
Wiener (1932)	0.45	120	36	61	23	NS	+
Yamaura (1940)	0.39	124	45	61	18	NS	—
Yoshiwara (1957)	0.36	129	56	52	21	NS	

* = R(F)XL(M) and L(F)XR(M). **: + indicates deficit of R(F)XL(M); — indicates excess of R(F)XL(M).

Table 4. The observed numbers of R-R, R-L and L-L pairs of monozygotic and dizygotic twins from two studies.

Study	MZ-twins				DZ-twins			
	p(L)	RR	RL	LL	p(L)	RR	RL	LL
Dahlberg (1926)	0.49	18 (0.26)	34 (0.49)	17 (0.25)	0.50	34 (0.28)	56 (0.45)	33 (0.27)
Forrai and Bankövi (1983)	0.53	27 (0.28)	36 (0.38)	33 (0.34)	0.66	8 (0.12)	30 (0.44)	30 (0.44)
Martin (1975)	0.46	9 (0.32)	12 (0.43)	7 (0.25)	0.66	1 (0.11)	1 (0.11)	7 (0.78)
Verschuer (1932)	0.5	49 (0.28)	75 (0.44)	49 (0.28)	0.54	24 (0.24)	44 (0.45)	31 (0.31)

1.4. Mating patterns

Concerning assortative mating there are 15 studies (18 populations) available. Comparison of observed with expected values on the basis of random mating reveals no significant differences, showing that mating is random and hence non-assortative (table 3).

1.5. Twin data

Four studies have provided data on hand-clasping in monozygotic and dizygotic twins. In neither study are there data from family studies. Data from the studies are shown in table 4. The twin method is often misunderstood. The critical analysis compares monozygotic (MZ) twins, who have identical genes, with (dizygotic) DZ twins, who share only half their genes. An increased concordance of MZ compared with DZ twins may then be attributed to genetic factors. The concordance of the

monozygotic and dizygotic twins is nearly the same (Reiss 1996, 1998 for further details).

2. Materials and methods

Subjects were 292 students of medicine at the University of Halle, Germany. The principal data consisted of information on 292 families of mother, father and offspring, and in addition in those families with more than one offspring, 35 sibling pairs were studied. Two separate generations were therefore studied, the age of the parental generation ranging from 38 to 65 years (mean 40,2 years) and of the offspring generation ranging from 19 to 32 (mean 22,8 years).

Hand-clasping was assessed by means of a self-report inventory. The question was, ‘When clasping your hands, which thumb is on the top? Right, Left or Either’.

3. Results

3.1. Distribution

The majority of subjects (55%) prefer to clasp the left thumb over the right (LHC), with only a small proportion, of about 1%, reporting no preference.

3.2. Relation to handedness

The relationship of hand-clasping to handedness is shown in table 5.

3.3. Family study

The results concerning the family data are shown in table 6, ignoring those subjects who reported no preference for the right or the left thumb resulting in 299 parent-child pairings and considering RXL and LXR families separately (where

Table 5. The association of hand-clasping with handedness and arm-folding, in the total sample and separately for males and females.

		Proportion of LHC (sample size in brackets)		
		Males and females	Males	Females
Handedness	Right	0.55 (631)	0.55 (303)	0.55 (328)
	Left	0.69 (75)	0.72 (50)	0.64 (25)
χ^2		5.97	5.39	0.83
Significance		$p < 0.05$	$p < 0.05$	NS
df = 1				

NS= not significant.

Table 6. Distribution of hand-clasping in offspring as a function of parental hand-clasping type. Parents and offspring without a preference have been omitted from the analysis.

		Offspring					
		Males and females		Males		Females	
Parents	N (pairs)	R	L	R	L	R	L
RxR	75	38 (0.47)	43 (0.53)	17 (0.38)	28 (0.62)	21 (0.58)	15 (0.42)
RxL in total	132	64 (0.42)	88 (0.58)	33 (0.49)	35 (0.51)	31 (0.37)	53 (0.63)
LxL	92	35 (0.34)	69 (0.66)	16 (0.29)	40 (0.71)	19 (0.40)	29 (0.60)
R(F)xL(M)	[62]	34 (0.47)	39 (0.53)	39 (0.58)	15 (0.42)	13 (0.35)	24 (0.65)
L(F)xR(M)	[70]	30 (0.38)	49 (0.62)	12 (0.38)	20 (0.62)	18 (0.38)	29 (0.62)

Table 7. Statistical analysis of the results of table 6 with the χ^2 -test.

Combinations	df	Males and females	Males	Females	
RxR/RxL/LxL	2	3.56	5.18	4.94	$p < 0.05$
RxR/RxL	1	0.50	1.27	4.71	
RxR/LxL	1	3.35	1.00	2.90	
RxL/LxL	1	1.86	5.12	0.10	
R(F)xL(M)/ L(F)xR(M)	1	1.55	2.94	0.09	

RXL indicates that the mother shows LHC, and LXR indicates that the father shows LHC). Data are also reported separately for male and female offspring.

Statistical analysis shows that the proportion of LHC offspring increases as the number of LHC parents increases from none (53% LHC) to one (57% LHC) to two (58% LHC) parents with LHC ($\chi^2 = 3, 56, 2$ df, $p < 0.5$). Chi-squared analysis also shows nearly significant differences between male children and parents and between female children and parents (for further details see table 7).

The analysis of the family-size gives no further aspects.

Table 6 shows also the distribution of the various parental mating patterns (RXR, RXL, LXR and LXL). Comparison of observed with expected values on the basis of random mating shows no significant differences ($\chi^2 = 1, 9, 1$ df, NS), showing that mating is random and hence non-assortative.

The direct comparison of the parents and children, similar to Ferronato *et al.* (1974) shows several significant relationships: Between fathers and children, fathers and sons ($p < 0.05$, df = 1). The combination between mothers and children shows no significant value.

It is also possible to estimate the heritability (Falconer 1965). The analysis shows a value of 28.2% suggesting a relative low genetic component. For handedness there is a value of 76.8% ($\alpha < 0.05$) (Reiss 1997) for further details.

4. Discussion

This study has reviewed the literature on family-studies of hand-clasping, and has contributed some new data.

Twin data (Dahlberg 1926, Verschuer 1932, Martin 1975, Forrai and Bankovi 1983) as well as a great number of family studies (12 from 21) have provided little or no evidence for a genetic component in hand-clasping. It is true that no simple genetic mechanism could explain the family data. The author has shown recently that twin data show a so-called laterality-specific effect and that distribution and concordance is in all examined lateralized signs, i.e. hemispheric specialization, handedness, footedness, eyedness, earedness, hand-clasping and arm-folding, the same. So it seems impossible to prove a genetic control with the twin method (Reiss 1997).

Nevertheless at least the ethnic differences may influence the manifestation of the trait (Reiss 1998). But there is no strong relationship between handedness and hand-clasping, suggesting the independence of hand-clasping (Reiss, Freye and Reiss 1997, Reiss 1998) and a weak concept of 'latent handedness' proposed by Luria (1970) and Sakano (1982). What is the origin of the asymmetrical distribution of non-functional, postural asymmetries such as hand-clasping, arm-folding or leg-crossing? Certainly it is conceivable that morphological differences between the hands may

play a role in determining the direction of hand-clasping. So Freire-Maia (1976) and Geschwind and Galaburda (1985) have suggested that hand-clasping and arm-folding have a morphological substrate. Freire-Maia (1976) assumes that hand-clasping may be an idiosyncrasy due to or influenced by 'physical' bilateral differences in the hands. Freire-Maia and Freire-Maia (1968) have suggested a correlation between the types of hand-clasping and the occurrence of the sesamoid bones in the hands. The time of appearance and distribution of the sesamoid bones are hereditarily determined traits (Sokolowska-Pituchowa and Miaskiewicz 1965). As shown by Garn and Rohmann (1962, 1966) there is evidence that genetic factors control to some extent most aspects of bone growth and genetic factors play a large role in determining postnatal bone growth.

An adequate model of hand-clasping must also explain why, there are only slight differences between the numbers of RHC and LHC individuals. Some data in the literature and also the data reported here suggest a biological basis. It is possible to summarize, all available data including this study, showing the following distribution of LHC in the families in relation to the RXR, RXL and LXL-parents: 32%, 47% and 59% ($\chi^2 = 467.78$, 2 df, $p < 0.0005$). This documents a continuously statistical significant increase of LHC. Of course the increase is only small. The data are not compatible with any simple, conventional Mendelian model, in which one allele produces RHC and the other produces LHC, but they are similar to models based on the concept of fluctuating asymmetry which have been proposed for handedness (Annett 1985, McManus 1985) and for arm-folding (McManus and Mascie Taylor 1979).

The family, populational and twin data presently available in the literature do not permit the exclusion of some kind of genetic factors on hand-clasping. Of course, the majority of the data—on average—are suggestive of a genetic basis of some kind, although environmental influences are also evident. Like arm-folding, LHC runs in families but also not strongly (Reiss 1997).

At the present stage of knowledge it is a very complex trait to study the relation-ship between genetic and environmental factors.

References

- ANNETT, M., 1985, *Left, Right, Hand and Brain: the Right Shift Theory* (Hillsdale: Erlbaum).
- ARRIETA, I., ARAGONES, A., GONZALEZ, E., PASTOR, G., and LOSTAO, C. M., 1985, Hand-clasping and arm folding in the Basque population. *Anthropologischer Anzeiger*, **43**, 227–230.
- ARRIETA, M. I., MARTINEZ, B., and LOSTAO, C. M., 1988, Hand-clasping and arm folding: analysis of familial data. *Human Biology*, **60**, 847–852.
- BECKMAN, L., and ELSTON, R., 1962, Data on bilateral variation in man: Handedness, hand-clasping and arm folding in Swedes. *Human Biology*, **34**, 99–103.
- DAHLBERG, G., 1926, Twin births and twins from a hereditary point of view. Diss.: Stockholm University.
- DOWNY, J. E., 1927, Types of dextrality and their implications. *American Journal of Psychology*, **38**, 317–367.
- DVIRSKIJ, A. E., 1975, Sravnitel'naja charakteristika antropofiziologiceskich priznakov laterl'nosti u russkich i ukraincev. *Voprosy Antropologii*, **51**, 96–100.
- FALCONER, D. S., 1965, The inheritance to certain diseases, estimated from the incidence among the relatives. *Annals of Human Genetics*, **29**, 51–76.
- FALK, C. T., and AYALA, J., 1971, Genetic aspects of arm folding and hand-clasping. *Japanese Journal of Human Genetics*, **15**, 241–247.
- FERRONATO, S., THOMAS, D., and SADAVA, D., 1974, Preferences for handedness, arm folding, and hand-clasping in families. *Human Heredity*, **24**, 345–351.
- FORRAI, G., and BANKÓVI, G., 1983, A Hungarian twin study on hand-clasping, arm folding and tongue curling. *Acta Biologica Hungarica*, **34**, 99–106.
- FREIRE-MAIA, A., 1976, Is there any evidence for a genetic basis of hand-clasping? *Journal of Heredity*, **67**, 111–113.

- FREIRE-MAIA, D. V., and FREIRE-MAIA, A., 1968, Cruzamento de dedos e ocorrência de ossos sesamoides: uma hipótese de trabalho. *Ciencia e Cultura*, **20**, 203–204.
- FREIRE-MAIA, N., QUELCE-SALGADO, A., and FREIRE-MAIA, A., 1958, Hand-clasping in different ethnic groups. *Human Biology*, **30**, 281–291.
- GARN, S. M., and ROHMANN, C. G., 1962, Parent-child similarities in hand-wrist ossification. *American Journal of Diseases of Children*, **103**, 603–607.
- GARN, S. M., and ROHMANN, C. G., 1966, Interaction of nutrition and genetics in the timing of growth and development. *Paediatric Clinics of North America*, **13**, 353–379.
- GESCHWIND, N., and GALABURDA, A. M., 1985, Cerebral lateralization. Biological mechanisms, associations, and pathology: I–III. A hypothesis and a program for research. *Archives of Neurology*, **42**, 428–459, 521–552, 634–654.
- KAWABE, M., 1949, A study of the mode of clasping the hands. *Transactions of the Sapporo Natural History Society*, **18**, 49–52.
- KAWABE, M., 1953, The relationship between the gene and hand-clasping and winging the towel. *Adenzatsu*, **28**, 170.
- KOBYLIANSKY, E., MICLE, S., and ARENSBURG, B., 1978, Handedness, hand-clasping and arm-folding in Israeli males. *Annals of Human Biology*, **5**, 247–251.
- LAI, L. Y., and WALSH, R. J., 1965, The patterns of hand-clasping in different ethnic groups. *Human Biology*, **37**, 312–319.
- LEGUEBE, A., 1967, Hand-clasping: Étude anthropologique et génétique. *Bulletin de la Société Royale Belge d'Anthropologie et de Préhistoire*, **78**, 81–107.
- LURIA, A. R., 1970, Die höheren kortikalen Funktionen des Menschen und ihre Störungen bei örtlichen Hirnschädigungen (Berlin: Verlag der Wissenschaften).
- LUTZ, F. E., 1908, The inheritance of the manner of clasping the hands. *American Naturalist*, **42**, 195–196.
- MAHAPATRA, U. D., 1970, Pattern of hand-clasping and arm folding. *Eastern Anthropologist*, **23**, 57–64.
- MARTIN, N. G., 1975, No evidence for a genetic basis of tongue rolling or hand-clasping. *Journal of Heredity*, **66**, 179–180.
- MCMANUS, I. C., 1985, Handedness, language dominance and aphasia: a genetic model. *Psychological Medicine Monographs Supplement*, **8**, 1–40.
- MCMANUS, I. C., and MASCIE TAYLOR, C. G., 1979, Hand-clasping and arm-folding: a review and a genetic model. *Annals of Human Biology*, **6**, 527–558.
- OESER, R., 1969, Untersuchungen über die Fingerlage beim Falten der Hände (hand-clasping) als Beitrag zum Rechts-Links-Problem. *Ärztliche Jugendkunde*, **60**, 223–237.
- PELECANOS, M., 1969, Some Greek data on handedness, hand-clasping and arm folding. *Human Biology*, **41**, 275–278.
- PLATO, C. C., FOX, K. M., and GARRUTO, R. M., 1985, Measures of lateral functional dominance: foot preference, eye preference, digital interlocking, arm folding and foot overlapping. *Human Biology*, **57**, 327–334.
- PONS, J., 1961, Hand-clasping (Spanish data). *Annals of Human Genetics*, **25**, 141–144.
- REISS, M., 1996, Zur Lateralität bei Zwillingen. *Zeitschrift für Morphologie und Anthropologie*, **81**, 141–155.
- REISS, M., 1997, Genetische Probleme der Händigkeit. *Zeitschrift für Morphologie und Anthropologie*, **81**, 383–398.
- REISS, M., 1998, Händefalten—eine Übersicht. *Anthropologischer Anzeiger*, In press.
- REISS, M., FREYE, H.-A., and REISS, G., 1997, Functional importance of hand-clasping and arm folding. *Percept Motor Skills*, **85**, 1209–1210.
- RHODAS, J. G., and DAMON, A., 1973, Some genetic traits in Solomon Island populations. II. Hand-clasping, arm folding, and handedness. *American Journal of Physical Anthropology*, **39**, 179–183.
- SAKANO, N., 1982, *Latent Left-Handedness. Its Relation to Hemispheric and Psychological Functions* (Jena: Gustav Fischer).
- SHAMI, S. A., 1979, Inheritance of hand-clasping and arm folding. *Pakistan Journal of Zoology*, **11**, 215–220.
- SHARMA, A., and NATH, S., 1971, A methodological assessment of handedness and hand-clasping. *Anthropologist*, **28**, 57–66.
- SOKOLOWSKA-PITUCHOWA, J., and MIASKIEWICZ, C., 1965, Badania nad trzeczczkami rak u mezczyzn. *Folia Morphologica* (Warszawa), **24**, 141–147.
- SOVAK, M., 1968, *Pädagogische Probleme der Lateralität* (Berlin: Volk und Gesundheit).
- VEERAJU, P., and SATYANARAYANA, M., 1972, A study on the inheritance of hand-clasping and arm folding in three endogamous groups of Coastal Andhra Pradesh (India). *Japanese Journal of Human Genetics*, **16**, 257–268.
- VERSCHUER, O. VON, 1932, Die biologischen Grundlagen der menschlichen Mehrlingsforschung. *Induktive Abstammungs- und Vererbungslehre*, **61**, 145–207.
- WIENER, A. S., 1932, Observations on the manner of clasping the hands and folding the arms. *American Naturalist*, **66**, 365–370.

- YAMAURA, A., 1940, On some hereditary characters in the Japanese race including the Tyosenes (Coreans). *Japanese Journal of Genetics*, **16**, 1–9.
- YOSHIWARA, Y., 1957, On the inheritance of the manner of clasping hand. *Japanese Journal of Human Genetics*, **2**, 73–74.

Address for correspondence: M. Reiss, Department of ENT, University of Dresden, Fetscherstr. 74, D-01307 Dresden, Germany.

Zusammenfassung. Hand-clasping bezeichnet die bevorzugte Art des Händeklatschens bei Individuen. In dieser Arbeit wird die vorliegende Literatur zu Daten aus Familien- und Zwillingsstudien zusammenfassend dargestellt und es werden neue Daten mitgeteilt. In dieser Studie klatschen 55% der Bevölkerung bevorzugt mit der linken Hand, 44% mit der rechten und 1% gibt an, keine Seitenpräferenz zu haben bzw. ist indifferent. Familiendaten deuten an, daß es sich beim Händeklatschen um ein genetisch determiniertes Merkmal handeln könnte. Obwohl die Daten sich nicht direkt durch ein rezessives bzw. dominante,ns Modell für ein mendelndes Merkmal anpassen lassen, sind sie mit einem Modell kompatibel, das eine fluktuierende Asymmetrie berücksichtigt, ein Modell das schon zur Erklärung der Erbllichkeit der Händigkeit und des Armfaltens herangezogen wurde. Es ist möglich, daß Händeklatschen, wie z.B. Armfalten, idiosynkratisch durch physikalisch begründete bilaterale Unterschiede in den Händen bedingt oder beeinflußt ist. Obwohl Umwelteinflüsse ebenfalls deutlich sind lassen alle Daten zusammen eine genetische Basis vermuten.

Résumé. Le croisement des doigts désigne la manière préférentielle par laquelle les individus les disposent lorsqu'ils serrent leurs mains l'une contre l'autre. Cet article passe en revue la littérature sur ce sujet impliquant des données familiales et gémellaires et apporte de nouvelles données. Dans cette étude, près de 55% de la population croisent leurs doigts avec dominance à gauche, 44% avec dominance à droite et les 1% restants n'expriment pas de latéralité préférentielle ou sont indifférents. Les données familiales suggèrent que le croisement des doigts peut être sous contrôle génétique : bien que les données ne s'ajustent nettement à aucun modèle mendélien dominant ou récessif, elles sont compatibles avec un type de modèle mendélien dominant ou récessif, elles sont compatibles avec un type de modèle évoquant une asymétrie fluctuante, qui a été utilisé pour expliquer l'hérédité de la latéralité manuelle et du croisement des bras. Il est possible que le croisement des doigts, comme celui des bras, puisse être une idiosyncrasie due ou influencée par les différences bilatérales des mains. Toutes les données rassemblées suggèrent une base génétique bien que les influences environnementales soient également évidentes.