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To the Graduate Council:

I am submitting herewith a dissertation written by Letitia Lowe Oliveira entitled "Dermatoglyphics of University of Tennessee Students: Effects of Parental Age and Birth Order." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Anthropology.

Richard L. Jantz, Major Professor

We have read this dissertation and recommend its acceptance:

Rhoda Grell, Fred H. Smith, William M. Bass

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Rhoda F. Grell

Fred [illegible]

William M. Bass

Accepted for the Council:

Vice Chancellor
Graduate Studies and Research

DERMATOGLYPHICS OF UNIVERSITY OF TENNESSEE STUDENTS: EFFECTS OF PARENTAL AGE AND BIRTH ORDER

A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville

Letitia Lowe Oliveira

August 1978

To my parents

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ABSTRACT

The effect of parental age and birth order on dermatoglyphic variation was investigated in a sample of 460 phenotypically normal, Caucasian Americans. The sample consisted of students enrolled in introductory physical anthropology classes at The University of Tennessee, Knoxville, during 1976-77. Twenty finger ridge counts, interdigital ridge counts, interdigital pattern ridge counts, and ridge width in the a-b area were utilized in this study.

In order to remove intercorrelations among dermatoglyphic variables, the dermatoglyphic data were factor analized, fingers and palms separately, for each sex. Twelve factors for fingers and 11 for palms were subjected to varimax rotation, and the resulting factor scores for each individual were used in subsequent analyses in lieu of the original dermatoglyphic data. Factor analysis was also used to decorrelate maternal age, paternal age, and birth order.

Factor analysis of dermatoglyphic data indicated that there is an interaction between radial counts on the fourth and fifth fingers, lending support to the idea that they form a distinct functional or biological unit. Factor analysis also indicated that independent mechanisms may be responsible for the development of interdigital ridge counts and interdigital pattern size. Moreover, pattern size seems to function independently on right and left hands, whereas ridge

counts for each interdigital area are more closely correlated between hands.

This study revealed a number of significant parental age and birth order effects on dermatoglyphic variation. Effects on ridge count vary considerably between sexes and between fingers and palms, but several areas tend to be affected more often than others; these include the interdigital ridge counts, pattern ridge counts in the fourth interdigital area, ulnar counts on digits one and two and on the fourth and fifth digits (acting as a unit). Dermatoglyphic asymmetry tends to be increased on fingers of individuals in high risk categories; intermediate parental ages and intermediate birth orders appear to be optimal in terms of developmental stability of finger ridge counts. A tendency for asymmetry to decrease was observed on male palms with advancing birth order and on female digits with increasing parental ages. Ridge width in the a-b area of the palm was found to be greatest in both males and females of intermediate birth orders.

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CHAPTER I

INTRODUCTION

The purpose of this study is to investigate the influence of parental age and birth order on dermatoglyphic variation in a sample of phenotypically normal, Caucasian Americans. The sample consisted of University of Tennessee students enrolled in introductory physical anthropology classes during 1976-77. For many years researchers have noticed that age of parents and parity of the mother (the number of children she has borne) have an effect upon the variability and viability of offspring. There is a widely recognized relationship between advancing maternal age and the incidence of some human congenital anomalies, including trisomies such as mongolism, hydrocephaly, cleft lip (with or without cleft palate) and anencephaly (Murphy 1954, Penrose 1961, Fraser and Mitchell 1876, Benirschke and Busch 1973). Few clearcut correlations exist with respect to advancing paternal age, although existence of a paternal age effect has been demonstrated for achondroplasia and several other dominant mutations (Penrose 1955).

Various developmental anomalies have been shown to manifest abnormal dermatoglyphic configurations; these include congenital malformations of the hands and feet, autosomal trisomies, aberrations of sex chromosomes, thalidomide embryopathy, and structural chromosomal

aberrations (Schaumann and Alter 1976). Since parental aging has an effect upon the incidence of congenital abnormalities, it would not be surprising to find that it also affects the variable expression of traits within what is considered the range of normal development, including dermatoglyphic configurations.

Variation in dermatoglyphic patterning may be broken down into two basic components: (1) the hereditary makeup of an individual, and (2) influences of the intrauterine environment producing stress and tension in growth during fetal life. In 1952, Holt studied the heritability of total finger ridge count (TRC) and found that correlations fit remarkably with theoretical values for polygenes with additive effect (Holt 1952). (For description of dermatoglyphic variables, refer to the third chapter.) Since Holt's classic study on inheritance of TRC, other researchers have proposed modes of inheritance for several dermatoglyphic traits. Sekla (1963) suggested that radial loops on the fingers are inherited as a simple dominant trait, while Loesch (1971) has postulated that loops on the second interdigital area and hypothenar area ($\hat{H}$) of the palm are determined mainly by single genes. Pons (1964), using a sample of 400 unrelated Spaniards showed that variation in a-b ridge count on the palm has a strong genetical determination.

Dermal ridges are formed during the third and fourth months of fetal life and are therefore subject to environmental pressures only during the first trimester of

pregnancy. The initial stage of differentiation of dermal ridges occurs when the hand is about 3.5 mm. long and is completed when it is about 15.6 mm. long, after which time no change in pattern seems to occur during intrauterine growth. After the seventh prenatal month the dermal papillae develop, and epidermal ridges are completed (Cummins 1929, Holt 1968, Okajima 1975). After birth, dermal ridge patterns persist unchanged throughout an individual's life (Galton 1892), with the only changes in ridges being those of size, as ridges keep pace with the growth of hands and feet.

The variable alignment of ridges is caused by differential growth, which produces characteristic irregularities in the form of hands and feet. Ridge configurations occur on the sites of the volar pads, which in the fetus are areas of differential growth. Early in the fourth prenatal month these pads begin to subside, and a pattern results if subsidence is incomplete before ridge formation begins. Patterns, therefore, occur in specific areas of the palm and sole, as shown in Figure 1 (Cummins and Midlo 1943).

From our present state of knowledge about the inheritance of dermal ridges, it appears that environmental factors affect configurations on the fingers to a lesser extent than those on palms. This may be because dermal ridges appear first on the balls of the fingers and later on the palms and soles (Holt 1968, Okajima 1975). One aspect of

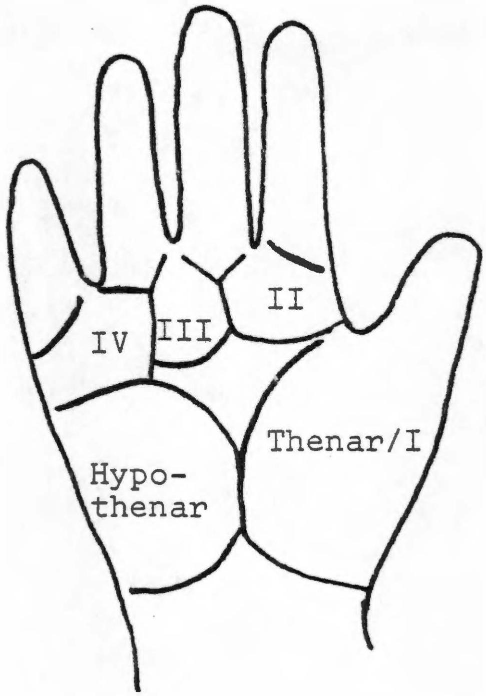


Figure 1. Areas of the palm corresponding to fetal mounds.

dermatoglyphic variation which has been attributed to environmental influences is bimanual asymmetry, which is discussed more fully in the next chapter. Bimanual asymmetry refers to deviations from perfect bilateral symmetry in homologous bilateral structures. Holt (1954) suggested that asymmetry in ridge counts between fingers on the right and left hands is caused by environmental influences. Singh (1970) showed that asymmetry of finger ridge count has a low heritability, with most of the observed asymmetry probably due to the effect of the environment and of chance.

The nature of the interaction between hereditary

and environmental forces which act upon dermatoglyphic variation is still poorly understood. Parental age is a variable which can affect both the hereditary makeup of the offspring (as demonstrated by an increased frequency of chromosomal non-disjunction in offspring of aged mothers) and the fetal environment, which is altered by aging of the paternal and maternal reproductive tracts and hormonal changes that occur within the aging parents.

The major purpose of this study is to investigate the effects of parental age on dermatoglyphic variation by examining (1) ridge counts, which have a high hereditary component, and (2) level of bimanual asymmetry, which appears to be a response to environmental stresses on the developing organism. Since parental age is closely related to the number of offspring produced, effects of birth order on dermatoglyphics will also be analyzed. Birth order refers to the order in which siblings are born, e.g., the first born has a birth order of one, the second child has a birth order of two, etc.. It is hoped that this study will be useful in elucidating the effects of parental aging on fetal growth and development, with possible implications for genetic counseling of aging parents. A secondary purpose of this study is to provide a comprehensive quantitative description of the dermatoglyphics of a sample of Caucasian Americans.

CHAPTER II

REVIEW OF THE LITERATURE

In order to better understand the potential effects of parental age and birth order on dermatoglyphic variation, it is necessary to present some background information about the way in which they affect other aspects of human variability. In this chapter, parental age and birth order effects are examined in detail in the first three sections. In the first section, known effects of aging and birth order on the variability and viability of offspring are discussed. The second section presents some mechanisms of aging which alter the gametes or the fetal environment; such changes could be responsible for some of the parental age effects found in offspring of older parents. The third section reviews dermatoglyphic characteristics which are associated with several abnormal conditions (such as autosomal trisomies and cleft palate) which show a maternal or paternal age effect. Previous studies of the relationship between parental age or birth order and dermatoglyphics are discussed in section four. The fifth section of this chapter discusses the theoretical framework which forms the basis for the idea that parental age and birth order can affect the nature of dermatoglyphic variation.

I. EFFECTS OF PARENTAL AGING AND PARITY ON OFFSPRING

After conception, the living organism undergoes a process of maturation and then aging. The reproductive life span in humans extends for several decades, during which time the organism undergoes various changes associated with completion of the maturation process and commencement of the aging of cells. Since the living organism deteriorates somatically as it grows older, and aging ultimately terminates its reproductive capacity, it is not surprising that aging also has a deteriorating effect upon the germ cells (Murphy 1954). Although the exact modes by which aging affects germ cells are not well understood at the present, researchers have noticed for many years that age of parents and parity of the mother have an effect upon the variability and viability of their offspring. They are known to affect sex ratio, incidence of twin births, longevity of offspring, prenatal growth rates, and frequency of abortion, stillbirths, and congenital malformations. These are discussed more fully in the following paragraphs.

Sex Ratio

From the Japanese vital statistics during the period 1937-43, Takahashi (1954) concluded that sex ratio of births has a variation according to mother's age. The sex ratio (proportion of males to females) is higher when the mothers are under 20 years of age. The ratio gradually decreases until the mothers are about 40-49 years old, but the sex

ratio of births by mothers over 50 years old is the highest. However, Takahashi suggested that the high sex ratio for mothers over 50 may be an artifact of social practices, rather than a biological fact (e.g., adoption of a young daughter's illegitimate children, which would include more males). Nearly the same tendency was found when births were examined by paternal age classes.

Novitski and Sandler (1956) also observed a change in the secondary sex ratio as the age of parents and birth order increase. Their study showed that age of the father and birth order are significantly correlated with the change in sex ratio, while mother's age is not. Their data suggested that the sex ratio decreases linearly as paternal age and birth order increase. When the changes with increasing birth order and paternal age were compared, they were so similar that the authors suggested that they appear likely to be caused by the same underlying factor.

Twin Deliveries

There is an increased frequency of dizygotic twinning in older mothers. Bulmer (1958) showed that the average binovular twinning rates increase almost five-fold from the women under 20 years of age to the women over 35 years of age, while monovular twinning rates remain unchanged. An earlier study by Yerushalmy and Sheerar (1940) showed similar results; paternal age was only slightly related to frequency of monozygotic twins, while frequency of dizygotic

twins did not vary consistently with age. They also noted an increase of dizygotic twinning with increasing birth order. James (1976) has shown that the maternal age of unlike sexed twins is lower than that of like sexed dizygotic twins.

A slightly different approach was taken by Renkonen (1966), who suggested that the essential characteristic of mothers with twins is high fertility. The average number of deliveries of mothers with twins exceeded the normal average of 3.3 by 0.5 deliveries in Australia (1910-14) and the normal 2.5 by 0.5 deliveries in New York state (1936-37). Renkonen evaluated the influence of birth order and age of mother on twinning rate in a series of families with twins and/or triplets collected from Finland and Sweden. Within the first three birth orders the rate increased with the mother's age, but it increased negligibly within the late birth orders.

Abortions and Stillbirths

Older mothers have been found to have a higher risk of spontaneous abortions than younger mothers (Javert 1957, Murphy 1954, Parsons 1964, Boué *et al.* 1973, Nishimura 1973). Javert (1957) found a positive correlation between spontaneous abortion rates and birth order, as well as between abortion rate and maternal age. In an examination of 30,200 embryos and 2900 early fetuses, Nishimura (1973) observed that the embryonic population showed an unusually

high incidence of most types of malformation and the presence of some anomalies without exact counterpart in newborns. In spite of a limited number of specimens from the extreme-aged group (over 40 years), a significantly increased tendency was recognized with respect to early embryonic death in older mothers. Also, a tendency for malformation seemed to occur in the older mothers with a long interval between the last two pregnancies.

Boué et al. (1973) studied abortions in which the development of the embryo was less than 12 weeks (14 weeks gestational age). Eighty percent of all spontaneous abortions occur before the twelfth embryonic week, and pathologic studies have clearly shown that it is in these abortions that abnormalities in the development of the embryo are the most frequent. A large number of chromosomal disorders are found in human spontaneous abortions. The role of maternal age, which has been clearly demonstrated in Down's syndrome, was found by Boué et al. (1973) to be significant only in trisomies, and mainly in trisomies involving an acrocentric chromosome (D,G chromosomes).

The frequency of stillbirths follows a U-shaped curve, with stillbirths occurring frequently in very young mothers, less frequently in the middle of the reproductive life span and then in gradually increasing numbers as the age of the mother increases. It has been suggested that a major factor responsible for stillbirths in young mothers is the improper or incomplete functioning of the endocrine system, and that

in older mothers the increase in percentage of stillbirths is largely due to the gradual cessation of proper functioning of the endocrine system near the end of the reproductive life span (Strandskov and Einhorn 1948). Several other reasons have been suggested to account for the higher abortion rate in older mothers, including a gradual deterioration of the intrauterine environment, degradation of the ovum during the interval between differentiation of the primary oocytes and ovulation, disturbances in the timing of fertilization, and a cumulative susceptibility of the maternal gonads to lethal mutagenic agents (Javert 1957, Boue et al. 1973, Nishimura 1973).

It is possible that the noted increase in spontaneous abortion rates with maternal age and parity may be partially accounted for by other factors. James (1963) found that abortion probability varies from woman to woman but remains relatively constant within a given woman. Abortion prone women have more pregnancies, on the average, than other women, and they tend to have their pregnancies at higher ages. James suggests that these facts, rather than a direct causal nexus, account to some extent for the correlation of abortion rates with maternal age and gravidity. Also, selective application of contraceptive techniques after families have reached their desired number of births interferes with the randomness assumed by interpolations based on curve-fitting procedures. However, a definite maternal age effect has been shown in the abortion rates of women who had

never previously aborted. Such women would not be attempting to compensate for previously aborted pregnancies (Parsons 1964).

There exists an apparent variation in intrauterine selective pressures during fetal life. When the sex ratio among abortions for different months of uterogestation was examined by Strandskov and Bisaccia (1949), the highest percentage of males was found during the second and third months combined (78.61 percent). The sex ratio of abortuses decreased for the next four months to 53.53 percent for the seventh month and increased up to 57.84 percent for the tenth month. Thus, when selection pressures against males and females were compared for each month, the highest relative pressure was against males during the earliest months, lowest during the seventh month and relatively high at or near full term. Since the dermal ridges develop during the early months of gestation, it is possible that such intense selective pressures against males might be reflected in the dermatoglyphics.

The role of paternal age in the incidence of stillbirths is still uncertain. Resseguie (1976) studied paternal age effects in groups of women selected to be homogeneous for education, previous pregnancy outcomes, age, race, and marital status. He concluded that stillbirth rates do not increase with father's age independently of maternal variables, and that neither accumulation of mutations in the paternal germ line nor other biological changes associated

with father's age can be inferred to cause an increase in risk of stillbirth. However, Sonneborn (1956, 1960) found a significantly higher fetal death rate for offspring from old fathers. Yerushalmy (1939) noted that stillbirth and premature birth rates vary in the form of a U-shaped distribution with parental age; rates are high for young and old parents, both father and mother, and low for intermediate ages. Increased mutations of dominant autosomal genes should have some effect, however slight and difficult to measure.

Congenital Malformations

The incidence of human congenital malformations varies with seasons, with geographic locations, with sex, with birth order, and with parental age. In general, there is a correlation between abnormalities and primogeniture, and between abnormalities and increasing maternal age. The maternal age effect has been found to be marked in hydrocephaly, mongolism, and cleft lip (with or without cleft palate), slight in anencephaly, and absent in isolated cleft palate, spina bifida, and patent ductus arteriosus; a U-shaped curve with maternal age has been found for anencephaly (Benirschke and Busch 1973, Penrose 1954). Elevated paternal age has been shown for the dominant mutations achondroplasia, acrocephalosyndactyly, and arachnodactyly (Penrose 1961).

Murphy (1954) made a study of the outcome of every conception of a series of mothers, each of whom had a

congenitally malformed child. A defect was diagnosed as a malformation involving the body surface or, if solely internal, one which had been disclosed by operation or autopsy. The average maternal age at the birth of the first normal child was 23 years and at the birth of the first defective child was 28.4 years. After the births of their first normal children, the women who married at an earlier age waited almost twice as long before giving birth to their malformed children than did women who married later. Murphy also found that the proportion of defective to normally developed children remained more or less constant for births occurring between maternal ages of 15 and 29 years. Beginning at the age of 30, or even a little earlier, there was an increase in the proportion of defective children. Each succeeding five-year period revealed a progressive increase in the proportion of defective children. Between the maternal ages of 45 to 49 years, the proportion of defective to normal children was approximately three times as great as that observed when mothers were under 30 years old.

One of the most frequently cited examples of the effect of parental aging on offspring is that of Down's syndrome, or mongolism. Over 90 percent of affected individuals have three free 21 chromosomes (Papp _et al_, 1977). The chromosome number is therefore 47, instead of the normal 46 chromosomes. This aneuploidy probably is a result of meiotic non-disjunction. Other persons with Down's syndrome have only 46 chromosomes, including two chromosomes 21, one normal D chromosome,

and a long chromosome consisting of almost all of a D chromosome plus almost all of chromosome 21 (D/21); thus, effective trisomy for chromosome 21 exists. In these cases the long chromosome arises by Robertsonian translocation. There may also exist a reciprocal translocation involving chromosome 21 and any other heterolog. Where Down's syndrome occurs repeatedly within a family, it is likely that translocation is the cause, since it is heritable through unaffected 45-chromosome carriers; in these cases maternal age is not likely as an etiological factor (Parsons 1964).

The increased risk for an older mother to have a child affected with Down's syndrome was observed long before the chromosomal basis of the disorder was discovered (Fraser and Mitchell 1876). About one quarter of affected births are born to mothers aged 40 years and over, with the risk of having an affected child greater than one percent at this stage (Parsons 1964, Penrose 1954). Penrose (1933, 1954) has shown maternal age to be the most critical factor and that the effect of birth order, or parity, by itself is negligible.

Since 1970 new chromosome staining techniques have made possible the determination of maternal versus paternal origin of the extra chromosome 21 in individuals affected with Down's syndrome. Recent studies have shown that in a significant percentage of cases, the extra chromosome comes from the paternal side. Wagenbichler et al. (1976) found paternal non-disjunction in eight out of 18 cases of Down's

syndrome; Mikkelsen et al. (1976) found five examples of paternal non-disjunction out of 16; and Magenis et al. (1977) found seven out of 31. These three studies show also that non-disjunction occurs in both the first and second meiotic divisions. Data suggest that most cases result from an error in the first meiotic division in the mother, but that a significant number originate in the father (Magenis et al. 1977). The implication of a paternal effect in Down's syndrome was suggested earlier by Glanville (1964), who found a tendency for male mongols to resemble their fathers with respect to A-d ridge count on the palm, and for females to resemble their mothers. The effect of paternal age on the frequency of non-disjunction is still unclear. Penrose (1933) and Mikkelsen et al. (1976) found no paternal age effect, while Stene et al. (1976) demonstrated an increasing incidence of Down's syndrome with advancing paternal age.

Several hypotheses have been proposed concerning the etiology of chromosome errors. It has been suggested that mothers who give birth to a Down's child at a chronologically early age may in some respects be characterized by an acceleration of the biological aging process (Emanuel 1972). Studies have shown that the prevalence of nearly all antibodies increases with age; an increase in the relative presence of various antibodies in young mothers of affected children, as well as an increase in prevalence of grey hair, was cited by Emanuel as evidence for accelerated aging in these young mothers.

As in Down's syndrome, elevated maternal age has been observed in cases involving sex chromosome aneuploidies, notably triplo-X (XXX) and Klinefelter's syndrome (XXY). It is possible that low maternal estrogen levels very early in pregnancy may affect the frequency of chromosomal errors. When the pH (acid-base relationship, or hydrogen ion concentration) is raised for 15 to 30 minutes in laboratory cultures of actively dividing human fetal fibroblasts, numerical chromosomal errors are induced in up to 60 percent of the cells. Most cells have either additions or deletions of only one or two chromosomes, although errors include polyploidy and aneuploidy. In most parts of the body the pH balance is buffered from changes, but in the female reproductive tract, pH can vary by more than 0.2 units if exposed to only slight changes in estrogen concentration. A decrease in estrogen causes an increase in pH, which *in vitro* results in numerical chromosomal errors. Gonadotropin and estrogen levels are lower than average in menstrual cycles of women at the beginning and end of the reproductive period, and it is these women who appear to produce offspring with a high incidence of chromosomal errors (Ford 1973). However, since fertilization occurs after meiosis I in the ovum, and since most maternal errors seem to have occurred in meiosis I, this hypothesis concerning estrogen levels in early pregnancy can be eliminated as a major factor in the etiology of Down's syndrome (Magenis *et al.* 1977).

Grell (1971) has suggested that distributive pairing of chromosomes can cause numerical errors in chromosomes. In distributive pairing, chromosomes which have not undergone crossovers with their homologs in the earlier exchange pairing enter a distributive pool. Within this pool, chromosomes pair according to size, a condition which generally favors pairing of homologs. However, non-homologous chromosomes of similar size may pair at this time. This involvement of non-homologs could lead to non-disjunction and aneuploidy. Since it appears that the frequency of chiasmata, where crossing over occurs, is decreased in ova of older females (Donahue 1973, Luthardt et al. 1973, Henderson et al. 1972), it is possible that there is an increased number of univalent chromosomes in the distributive pool of older mothers and thus a higher risk of aneuploidy in their offspring.

Another anomaly for which a parental age effect has been noted is facial clefting. The pathogenesis of clefts is controlled not by any single factor but by several factors, both hereditary and environmental, and the interactions between them (Fraser and Calnan 1961). Clefts occur when the embryonic palate shelves fail to fuse, usually due to failure of the shelves to move into position at the critical time when fusion can occur. There appear to be two distinct disorders: (1) cleft palate (CP) and (2) cleft lip with or without cleft palate (CL(P)) (Fogh-Anderson 1942). There appears to be an increase in incidence of CL(P) with advancing maternal age (Woolf 1963, Fraser and Calnan 1961, Niswander et al.

1975, Benirschke and Busch 1973) and paternal age (Fraser and Calnan 1961, Woolf 1963). It is interesting that there appears to be no evidence for an association with parental age or birth rank for isolated cleft palate (Parsons 1964, Benirschke and Busch 1973). Although positive associations have been found between facial clefts and advancing age of parents, birth order does not appear to influence the incidence of the abnormality (Green et al. 1964).

A significant maternal age effect has been noted for clefts which are associated with multiple congenital malformations (Emanuel et al. 1973, Niswander et al. 1975). In a study by Emanuel et al. (1973), the maternal age distribution was different among mothers whose children were affected only by an orofacial cleft as compared with those whose children were multiply affected; an increased proportion of the latter mothers were found at both low and high maternal ages, resulting in a U-shaped distribution.

A significant difference between males and females has been shown for the incidence of facial clefts. There is an excess of males with CL(P), the proportion ranging from 60 to 80 percent in various studies. The excess of males appears to be greater in the more severe defects, i.e., for CLP than for CL and for bilateral than unilateral defects. Females which are affected are more likely to have an additional malformation than affected males (Fraser 1970, Greene et al. 1964, Fraser and Calnan 1961, Emanuel et al. 1973).

Longevity of Offspring

Studies on animals have indicated that the life span of offspring from older mothers is shorter than that of offspring of young mothers. A study of mice by Russell (1954) showed that the average survival is longer in litters from younger mothers and in the first of several litters produced by a single mother; longevity decreased with advancing age of the mother and with parity. However, Russell also found two advantageous aspects of maternal aging in mice: a decrease in susceptibility of offspring to a juvenile disease affecting the suckling young, and an increase in postnatal growth of offspring (determined by weight).

Lansing (1954, 1959) took a clone of the parthogenetically reproducing rotifer, Philodina citrina, and established three lines: (1) eggs taken each generation from a young mother, (2) eggs taken from a middle-aged mother, and (3) eggs taken from a mother in the senile age group. In the offspring of middle-aged and senile mothers, the mean life span was reduced successively in each generation until the lines became extinct, and extinction occurred more rapidly in the offspring from senile mothers. However, in the young mother line, the life span of offspring increased slowly but significantly. Lansing concluded that in middle-aged and older mothers there exists some non-genic factor which can be concentrated in successive generations to increase the rate of aging, such that eventually egg production no longer

occurs and the lines become extinct. This factor, which is cumulative, is presumably cytoplasmic and is transmissible through the egg. Lansing also found that accelerated aging is accompanied by accelerated growth but decreased maximal size, while retarded aging is accompanied by retarded growth but increased maximal size. He concluded that the aging factor appears at the cessation of growth, since longevity in the offspring of growing mothers increased rather than decreased.

Prenatal Growth

It is well known that birth weight increases with order of birth (Karn and Penrose 1951, Roberts 1969, McKeown and Record 1953, Cawley *et al.* 1954). This association must be related to rate of fetal growth, since the correlation between parity and gestation length is negligible (Karn and Penrose 1951). McKeown and Record (1953) examined birth weights of 13,020 English infants and found that from 30 to 31 weeks' gestation (the earliest period examined), males are heavier than females. They found no evidence for a difference between growth rates of first and later born until about 36-37 weeks of gestation, but from this time on, later born are heavier than first born.

Birth weight shows a small but significant negative correlation with maternal age and length of gestation (Karn and Penrose 1951). The proportion of low birth weight infants has been found to be greatest for the first and late

pregnancies, the minimum being at the third rank. Young mothers in an Indian population have shown a tendency to have an increasing proportion of low birth weight infants with increasing birth order, whereas for older mothers (over 30 years) a general U-shaped dependence of the proportion on parity was found. In other words, in younger mothers the weight of successive offspring tended to decrease, while in older mothers there was an increased occurrence of low birth weight infants among first and later born, with higher birth weight infants occurring in the third pregnancy (Chakraborty et al. 1975). Selvin and Garfinkel (1972) also found that the proportion of low birth weight infants varies with age and parity of the mother. In their study, young mothers showed a tendency to have an increasing proportion of low birth weight infants with increasing birth order, whereas, the exact opposite was true for mothers older than 45. They found that the intermediate maternal age categories reflected a transition from an association of increasing proportion of low birth weight infants with increasing birth order to a pattern of decreasing proportion of low birth weight infants with increasing birth order. Selvin and Garfinkel also observed a paternal age effect on the proportion of low birth weight infants; the distribution of low birth weight infants was described by a flat U-shaped curve, with higher proportions of low birth weight infants born to fathers in low and high age categories.

The probability of survival shows a parabolic relationship to parity such that there is slightly more risk for first and late pregnancies than for those between these extremes (Karn and Penrose 1951, Namboodiri and Balakrishnan 1958). There appears to be a difference in variability among offspring of younger and older mothers, as shown in a tendency for the standard deviation of birth weight to increase with maternal age. A similar observation has been found for parity, although the first born are more variable than second and third born (Namboodiri and Balakrishnan 1958).

The change in birth weight with birth order and maternal age is presumably due to changes in the prenatal environment. Mother's physique seems important in determining fetal growth rates, i.e., small maternal stature is associated with a reduced rate of fetal growth. Cawley, McKeown and Record (1954) have shown that at birth, and during the two years after birth, infant weight increases with height of the mother, but it is only slightly affected by paternal height. This result is independent of duration of gestation and birth order, and the authors suggest that it must be attributed to the influence of the maternal environment on the rate of fetal growth. Further study showed that the association between birth weight and parental height is more marked for first than for later born (McKeown and Record 1954). The difference in fetal growth rates between first and later born may be partly, although not entirely,

explained by the fact that the placenta is larger for later born than for first born (McKeown and Record 1953).

Low birth weight has been found in association with mental subnormality. In a study by Barker (1966), low intelligence (I.Q. below 50) was associated with both a slower rate of intrauterine growth and a higher incidence of birth before 38 weeks of gestation than are found in the general population. Low fetal growth rates can be caused by various genetic, chromosomal and environmental abnormalities. Down's syndrome provides an example of an abnormality causing both slow growth and subnormality (Barker 1966, Smith and McKeown 1955, Papp et al. 1977). Low birth weight of Down's syndrome infants is not entirely explained by early onset of labour but must in part be attributed to slow rate of prenatal growth (Smith and McKeown 1955).

II. EFFECTS OF AGING ON GAMETES

In light of the number of effects upon offspring due to aging in the parents, it seems appropriate to examine the influence of advancing age on gametes. In most mammalian species, including humans, the development of egg cells, or oogenesis, is limited to the prenatal or neonatal period of life in the female ovary. Meiosis is initiated in all oogonia during the fetal period and proceeds to the dictyate stage (late prophase I) of the oocyte; then it becomes dormant until maturation of the ovarian follicles. Dictyate is

not a complete resting stage, however, since ribonucleic acid (RNA) and protein are manufactured and growth of the oocyte occurs (Baker 1972). All oocytes remain in prophase for at least 12 years (until puberty), and many are dormant much longer, since normally only one ovarian follicle matures each month during the menstrual cycle. With maturation of a follicle, a primary oocyte completes the first meiotic division to become a secondary oocyte, and the oocyte plus the corona of cells constitute the ova released from the follicles. Immediately after penetration of the ovum by a spermatozoan, the secondary meiotic division occurs (Sutton 1975).

The early fetal period is characterized by the build-up of a large stock of primary oocytes and is followed by a continual loss of the primordial oocytes and follicular populations until reproductive life ceases. Some oocytes, selected randomly, undergo follicular development, and a small number of these may ovulate and thereby potentially contribute to the next generation. The remaining oocytes eventually degenerate and thereby limit reproductive life (Foote 1973).

Meiosis occurs in the testes of most male animals. Two types of testicular tissue exist in vertebrates: seminiferous tubules and interstitial tissue. Sperm are produced in the seminiferous tubules, while interstitial tissue functions in the synthesis of male hormones. The stem cells of the germinal tissue line the seminiferous tubules and are

known as spermatogonia. The spermatogonia replicate mitotically, thereby maintaining a supply of cells for the production of gametes. During each cell cycle, half of the spermatogonia undergo meiosis, forming spermatocytes. When meiosis is completed the haploid cells, or spermatids, contain a nucleus and appreciable quantities of cytoplasm. Eventually virtually all of the cytoplasm is lost and a long tail is formed, conferring motility on the mature spermatozoan.

Since research on human gametes has obvious experimental limitations, most of the information known about the effects of aging on gametes comes from research on animals. Developmental defects which occur as a result of overripening of gametes before fertilization have been studied in the invertebrates and lower vertebrates, especially fish and amphibian eggs. Overripeness, or aging, of the ovum refers to degenerative change in the ovum following arrest of the meiotic process. Overripeness caused by delayed fertilization has been well established as a teratogenic factor. Some developmental anomalies due to the overripeness of amphibian eggs include (1) polymelia and polydactyly, (2) tendency to produce axial duplications, especially in the head, (3) deficiencies in organogenesis leading especially to acephaly and microcephaly, and (4) failure of the normal differentiation of various tissues and organ systems (Blandau 1954).

Under laboratory conditions the frog Xenopus does not

maintain its seasonal periodicity of oogenesis; instead, its ovaries always contain oocytes in all stages of oogenesis. Unless ovulation is induced, fully grown follicles accumulate in the ovaries and eventually degenerate. Evidently there is a point at which follicular eggs switch their status from ripe to overripe, and data suggest that deterioration of the egg due to aging happens at the end of the germinal vesicle stage. Under laboratory conditions, developmental anomalies are common in Xenopus and are closely related to this arrest of the maturation process of oocytes associated with the lack of sufficient stimulus to induce ovulation of fully developed follicles; anomalies include trisomy, monosomy and mosaicism. Observations in Xenopus and also in the rat strongly suggest that preovulatory overripeness of the oocytes due to delayed ovulation results in reduced fertility of the ovum, its lessened capacity for development, and an increase in developmental abnormalities, thus increasing the risk of early embryonic death (Mikamo and Hamaguchi 1973).

Henderson and Edwards (1972) have suggested that oogonia which are slower to enter meiosis in the fetal ovary form fewer chiasmata and are the last to ovulate in older females. This idea finds support in the observation of fewer chiasmata and more univalents in metaphase I of older female mice, and in a decrease of genetical recombination in older female mice (Luthardt et al. 1973, Donahue 1973, Fowler and

Edwards 1973).

Whereas female gametes originate in the fetus and continue to develop and age throughout the reproductive life span of the female, the time required to go from spermatogonia to mature spermatozoa is approximately 64 days. Therefore, the effect of aging on spermatozoa must be manifested within a much shorter time span. Sperm aging has been studied in three distinct environmental situations: (1) the male reproductive tract, i.e., prior to ejaculation of semen; (2) the female reproductive tract, i.e., after semen deposition in the vagina, cervix or uterus; and (3) under conditions in vitro. In the male reproductive tract, interest has centered on the changes in sperm in the epididymis, the vas deferens and the ampulla of the vas. It is difficult to determine to what extent changes that occur during the passage in the epididymis and vas are influenced by age of the individual. Although male fertility declines with advancing age, in man viable sperm are produced over a remarkably long period of years. However, the overall quality of semen is distinctly inferior to that of younger and sexually more active individuals, as assessed by combined morphological, functional and biochemical criteria. This is partially due to a deterioration with age in the quality of sperm; it is also due to some extent to changes in the endocrine status of the aging male, which bring about a decline in the testosterone-dependent activities of male accessory organs

concerned with formation and secretion of seminal plasma. After about 50 years of age, testosterone levels decline in the male; this, together with a decreasing excretion of testosterone and marked alterations in the rates of steroid conversion, may cause the age-dependent changes in human seminal plasma. Other factors may include changes leading to a diminished supply of blood and nutrients to the testes and accessory organs, progressive tubular fibrosis, focal hyalinization of seminiferous tubules and a reduced number of capillaries, all of which are commonly found in aging men (Mann and Lutwak-Mann 1973).

In the female reproductive tract the survival potential of spermatozoa diminishes rapidly. In the rabbit, sperm do not acquire the capacity to fertilize until after they have spent a few hours in the female genital tract. The most striking changes which sperm undergo in the uterus of the rabbit doe are increased respiration and aerobic glycolysis. These metabolic increases appear to be due to changes within the sperm cells, rather than to the nutrient effect of uterine secretion. Information is lacking at present about the effects of aging in the female on the life span and performance of sperm in her own reproductive tract. However, such effects are highly likely because of hormonal changes which occur in the aging female, as well as because of alterations in the chemistry of the aging uterus as such. Certain uterine enzymes become less active with age, probably

as a result of declining hormone levels and of a diminishing response of aging tissues to hormonal stimulation (Mann and Lutwak-Mann 1973).

Laboratory studies of sperm aging indicate that the early stages of sperm senescence in vitro and in vivo have certain features in common. Biochemical research indicates that the initial defect which triggers degenerative changes in sperm occur in the sperm membranes and the acrosome. Early in degeneration, the acrosome swells and structural changes occur in the acrosomal and plasma membranes. An increase in cellular permeability leads to loss of intracellular constituents and penetration by substances from outside the sperm cell. Losses of vital enzymes and coenzymes result in exhaustion of energy sources, less effective control of energy utilization, and disturbances in metabolism. Nuclear instability has also been implicated in sperm aging (Mann and Lutwak-Mann 1973).

Through biochemical and physiological studies on gametes, it is becoming evident that unless the sperm penetrates the egg within a short interval of time after ovulation and insemination, rapid degeneration of the sex products occurs. In both domestic mammals and man, there is evidence that at least 30 percent of the ovulated eggs either fail to be fertilized or produce abnormal embryos which die during the early stages of pregnancy. Studies on guinea pigs have shown that principal effects of aging were early death

of the ovum in the preimplantation period and retardation in the rate of development in the ova which had been implanted (Blandau 1954). A slower rate of cleavage among fertilized eggs has also been observed in older mice and hamsters (Adams 1973). This retardation in the prenatal growth rate of offspring of aging parents may affect the developmental timing of growth and thereby affect normal variation or lead to developmental abnormalities such as cleft palate.

III. DERMATOGLYPHIC CONFIGURATIONS IN ABNORMAL CONDITIONS ASSOCIATED WITH PARENTAL AGE

Dermatoglyphic variation is an expression of developmental processes controlled by heredity and influenced by environmental factors. To the extent that aging in parents can affect the genes or the reproductive environment, it has the potential of producing variation in the expression of dermatoglyphic characters. Many of the abnormal conditions in offspring of very young and older parents have shown unusual dermatoglyphic features. This is especially true of the autosomal trisomies and sex chromosome aneuploidies. The unusual dermatoglyphic configurations probably result from the abnormal number of chromosomes, while the conditions themselves are related to parental age. However, if age of parents is found to affect dermatoglyphic variation in normal offspring, it is possible that some of the same or similar dermatoglyphic traits found in these abnormal

states would appear with increasing frequency in otherwise normal children of older parents. Dermatoglyphic configurations which are associated with these abnormal conditions are discussed in the following paragraphs. (Definitions of dermatoglyphic variables may be found in the third chapter).

Autosomal Trisomies

Trisomy refers to the presence in triplicate of a chromosome which normally appears as a homologous pair. Three well-defined pathological conditions caused by an extra autosome show characteristic peculiarities of ridge configuration. The three syndromes are: (1) Down's syndrome (trisomy 21), (2) trisomy 18, and (3) trisomy 13.

Trisomy 21. Also called Down's syndrome or mongolism, trisomy 21 causes a retardation in growth of most parts of the body, resulting in multiple anomalies, including mental defect. The limbs are characteristically short, and the hands are short and broad with thick, stubby fingers. A single transverse crease, or simian line, frequently occurs on the palm, and the distal flexion crease on the fifth finger is often absent (Holt 1968, Schaumann and Alter 1976).

One of the most characteristic features of the dermatoglyphics in Down's syndrome is a marked increase in the frequency of ulnar loops on the finger tips; these tend to be vertically oriented and L-shaped. Frequently, ulnar loops may be found on all ten fingers. When radial loops are

present, they tend to occur on the fourth or fifth finger rather than on the index finger, where they are most frequently found in normal individuals. Other characteristics include centrally placed triradii on palms, transversely aligned ridges on distal palms, third interdigital patterns, a high frequency of hypothenar patterns, and a low incidence of patterns in the thenar/I area. The total finger ridge count in Down's individuals is lower and its variability smaller than in the normal population. This tendency toward decreased variability in ridge counts is also common for other dermatoglyphic traits in Down's syndrome (Holt 1968, Schaumann and Alter 1976, Loesch 1975, Berg 1968).

Although mean values of a-b ridge count on the palm do not appear to differ significantly from controls, Penrose and Loesch (1967) have found ridge width in that area to be significantly narrower than in controls. They suggested that the narrow ridges reflect the relatively short statures of Down's individuals, which are about equal to the normal statures of 14 year old normal males and 11 year old normal females, respectively. Mean ridge width in mongols appeared to be similar to that in control children of comparable stature.

Trisomy 18. Individuals with trisomy 18 show developmental and mental retardation, with a characteristically long head, low-set, malformed ears, and micrognathia. Flexion deformities of the hands are characteristic, and fingers

generally lack distal flexion creases. A single transverse palmar crease is frequently observed in individuals with trisomy 18. The most characteristic dermatoglyphic feature in full trisomy 18 is a strikingly high frequency of arches on the fingertips; fewer than six arches is very unusual, although it is sometimes observed in mosaic, translocation, or partial trisomy 18. Radial loops tend to occur mainly on the thumbs, less often on the third, fourth and fifth fingers, and rarely on the second digit. Distal axial triradii also occur frequently in individuals with trisomy 18 (Holt 1968, Schaumann and Alter 1976, Penrose 1969).

Trisomy 13. Characteristic features of trisomy 13 include mental retardation, microcephaly, cleft lip and cleft palate, deformities of the eyes and ears, and polydactyly (extra digits). An unusual frequency of fingertip pattern types has been found. Arches and radial loops are considerably increased in incidence, while ulnar loops and whorls are decreased. Only 28 percent of radial loops are found on the second digit, with the remainder almost equally divided among the remaining digits. The axial triradius is usually displaced distally to the center of the palm, resulting in very wide atd angles. This triradius is even higher on the palm than it is in mongolism and trisomy 18. Thenar patterns are quite frequent in trisomy 13, and a single transverse flexion crease is often observed on the palms (Holt 1968, Schaumann and Alter 1976).

Sex Chromosome Aneuploidies

Abnormalities in the number of sex chromosomes do not seem to have as great an influence on dermatoglyphic characters as do autosomal aberrations. However, there are some dermatoglyphic peculiarities associated with sex chromosome defects.

Turner's syndrome. Turner's syndrome results from full or partial monosomy of an X chromosome, with or without mosaicism. There are usually 45 chromosomes in each cell, with only one X and no Y. Individuals with Turner's syndrome are phenotypically females of short stature, with symptoms of ovarian dysgenesis and infantile external genitalia. Webbing of the neck is characteristic and the condition often produces slight deformities of the limbs and extremities. On the palm the skin is frequently very thin and wrinkled, and volar pads tend to be prominent (Holt 1968, Schaumann and Alter 1976).

On the fingers there tends to be a reduction of arch and radial loop patterns and an increase in the number of ulnar loops. Total finger ridge count and a-b ridge count have been found to be higher in individuals with Turner's syndrome than in controls. On the palms the axial triradius is displaced distally, although not as much as in Down's syndrome. Associated with this distal axial triradius is a large atd angle and an increase in hypothenar patterns (Holt 1968, Schaumann and Alter 1976).

Klinefelter's syndrome. The term Klinefelter's syndrome is applied to males with more than one X chromosome in each cell. Individuals with Klinefelter's syndrome are phenotypically males with underdeveloped genitalia, sparse body hair, and limbs which are longer than average. A majority of individuals with Klinefelter's syndrome are mentally defective, and the condition accounts for some one percent of male patients in mental institutions. However, patients with apparently normal intelligence and normal development, although sterile, have been described (Sutton 1975).

Dermatoglyphic characteristics in 47,XXY individuals are not very different from normal males, the most notable feature being a reduced total finger ridge count. Patterns tend to be smaller, with lower ridge counts. On the palms, a tendency for increased width of the ridges has been noted. An increase in the number of sex chromosomes (XXYY, XXXY, XXXYY, XXXXY) is generally associated with a proportional reduction in total finger ridge count and an increase in width of ridges in the a-b area. The single transverse flexion crease is frequently found in the various types of Klinefelter's syndrome (Holt 1968, Penrose and Loesch 1967, 1969, Schaumann and Alter 1976, Shiono et al. 1975).

Polysomies of the X Chromosome

There does not seem to be a distinctive phenotype among 47,XXX females, although various congenital anomalies have been observed. Frequently an increase in mental

impairment and sexual disturbances (menstrual disorders, amenorrhea, sterility) occur. Tetrasomic (XXXX) or pentasomic (XXXXX) females are usually affected more severely, with mental retardation and various congenital abnormalities. Dermatoglyphic features include a progressively lower mean total finger ridge count correlated with an increasing number of sex chromosomes (Schaumann and Alter 1976). In addition, Saldana-Garcia (1975) found an excess of radial loops and arches on the fingers of XXX females and a tendency for ridge width to increase with the number of sex chromosomes.

Cleft Lip and Palate

A number of studies have been done to investigate the incidence of unusual dermatoglyphics associated with cleft lip and/or palate. No significant differences were found between patients and controls regarding patterns on the fingertips, third interdigital area or hallucal patterns of 71 patients examined by Silver (1966). DeBie *et al*. (1977) likewise found no significant differences between 143 cleft patients and controls with respect to patterns and ridge counts on fingers and palms. However, Adams and Niswander (1967) found an increase in fluctuating asymmetry of the palmar *atd* angles in individuals with familial CL(P), a finding which was confirmed by Woolf and Gianas (1976); no difference in *atd* asymmetry was found between cases with sporadic CL(P) or isolated CP and controls. Propositi with familial CL(P), as well as their normal sibs and parents,

have also been found to show greater asymmetry in a-b ridge counts and pattern types on the fingers, while propositi without a family history and their normal sibs and parents were similar to controls (Woolf and Gianas 1977).

IV. EFFECTS OF PARENTAL AGE AND BIRTH ORDER ON DERMAL RIDGES

Very little research has been done on the relationship between parental age or birth order and dermatoglyphic variation. A study of pattern types in 666 Koreans by Birdsong and Rashad (1972) suggested that subjects of birth order number six have a high frequency of true whorls and a low frequency of ulnar loops. They found no consistent trend for birth orders one through five. However, their results were not confirmed by a similar study of German families by Brehme and Wittmann (1975), who were unable to show an effect of birth order or maternal age on the number of whorls in the offspring.

Dermatoglyphic asymmetry has also been investigated with respect to the effect of maternal aging. Parsons (1973) studied bilateral asymmetry of finger ridge count and found a maternal age effect such that asymmetry tended to be high in offspring of older mothers. His data also indicated an increase in asymmetry with parity, but the sample was too small for conclusive results.

A similar study of ridge count asymmetry was done by

Parham and Scott (n.d.) in which asymmetry on the index finger was examined. This digit exhibits the highest degree of asymmetry between corresponding fingers of both hands. Preliminary analysis of their data suggested that asymmetry is highest in offspring of younger and older mothers. Low asymmetry values were observed in offspring of mothers aged 31-35 years, which may reflect an optimal maternal age range for developmental stability of the fetus. Mean ridge counts on the index finger showed no indication of effects from either maternal age or birth order in their study.

V. DISCUSSION

It has been shown that aging in parents produces variation in the offspring and that it also affects gametic development as well as fetal growth. Most of the effects of parental aging have been studied in relation to abnormal states in their offspring, and a number of these pathological conditions produce peculiarities in the dermatoglyphic configurations of affected individuals. An increase in maternal age also appears to produce increasing asymmetry in finger ridge counts of normal individuals. The large majority of studies involving dermatoglyphics and developmental processes have been aimed toward clinical diagnosis, but unfortunately, most have lacked a theoretical orientation. By what processes could aging in parents affect the expression of dermatoglyphic traits? Do these processes produce

identifiable dermatoglyphic characteristics in the offspring of aged parents? In answer to these questions, two possibilities will be considered: (1) the effect of aging on fetal growth, and (2) the effect of aging on developmental stability of the offspring.

Dermatoglyphics and Intrauterine Growth

Birth weight may be regarded as one indicator of the rate of fetal growth. There exists a high correlation between intrauterine growth retardation and low birth weight (Warkany *et al.* 1961). Since older mothers tend to have offspring with low birth weights (Karn and Penrose 1951), it is likely that the rate of prenatal growth in their offspring is slower than that in offspring of younger mothers. Supporting this idea is the observation of slower rates of development and cleavage in eggs of aged mothers among experimental animals (Blandau 1954, Adams 1973).

Low birth weights are characteristic of individuals with sex chromosome aneuploidies, there being a general decrease in birth weight as the number of sex chromosomes increases (Barlow 1973). These low birth weights, along with retarded mental development, are cited by Barlow as examples of a reduced rate of cell division, which he proposes is partially regulated by the amount of heterochromatin in the cells. Heterochromatin is the darkly staining region of chromosomes which replicates late in the cell cycle (Back 1976). According to Barlow (1973), in the sex

chromosome aneuploidies the extra chromosomes are heterochromatic; therefore, they reduce the rate of fetal growth.

Webb (1977) found sexual differences in tooth measurements, dermal ridge counts, and dermatoglyphic asymmetry which support the idea that heterochromatin affects growth rate. The Y chromosome in males and the inactive X chromosome in females are heterochromatic. If heterochromatin retards growth rate, then males would be expected to have faster growth rates than females, since the Y chromosome is smaller than the X chromosome. In a sample of American Whites, Webb demonstrated that males show faster development of tooth crowns, larger tooth sizes, higher ridge counts, and generally higher dental and dermatoglyphic asymmetry values than females. These results accord well with the theory that heterochromatin affects growth rates.

From the evidence presented by Barlow (1973) and Webb (1977), it appears that the magnitude of ridge counts may be affected by the rate of fetal growth, with accelerated growth rates producing high ridge counts and slow growth rates producing lower ridge counts. It is possible that growth rate also affects the width of dermal ridges. An increase in the sex chromosome number produces an increase in width of ridges in the <u>a-b</u> area, as well as a reduction in total finger ridge count (Penrose and Loesch 1967, 1969; Penrose 1967). Since individuals with sex chromosome aneuploidies appear to have a reduced rate of cell division

(Barlow 1973), this retarded growth rate may be partially responsible for the breadth of dermal ridges. If this is the case, then a reduced growth rate would produce wider ridges, and vice versa. Such a suggestion has been proposed by Jantz and Parham (1978).

The effect of parental age on growth rate of human offspring is not known at present. However, a slower rate of cleavage among fertilized eggs has been observed in older mice and hamsters (Adams 1973), and retardation in the rate of development in implanted ova is a principal effect of aging in guinea pigs (Blandau 1954). Older human mothers tend to have offspring with slightly lower birth weights (Karn and Penrose 1951); thus, it is likely that the fetal growth rate in older mothers is somewhat slower than that in young mothers. It could be expected, therefore, that the offspring of older mothers would have wider ridges and lower ridge counts than those of young mothers.

A higher percentage of low birth weight infants occurs in first and later born offspring, and birth weight tends to increase with birth order in the intermediate birth order categories. If fetal growth rate (as reflected by birth weight) affects the number and width of dermal ridges, then one could expect to find lower ridge counts and wider ridges in individuals of very low and high birth order, and higher ridge counts and narrower ridges in intermediate birth orders.

It should be noted at this point that in dermatoglyphic development we are concerned with prenatal growth. There is evidence that some of the relationships present at birth are reversed postnatally. For example, in contrast to the direct relationship between stature and parity at birth, there is an inverse relationship between stature and birth order during the period from one year after birth to 14 years. Within these age limits, higher means are reported on first born rather than on children of later birth orders (Meredith 1950). In his study on rotifers, Lansing (1954, 1959) observed that accelerated aging was accompanied by retarded maximal growth, whereas retarded aging was accompanied by greater maximal growth. In the sex chromosome aneuploidies, birth weight decreases with additional chromosomes, but adult height tends to increase (although not consistently) as the number of chromosomes increase (Penrose and Loesch 1967). Also, a study of tooth size in 47,XYY males by Alvesalo _et al._ (1975) showed that the teeth of XYY males are larger but reach their maturation later than the teeth of normal XY males; thus, although the mitotic rate of their cell lines might be slower than that of XY, the larger tooth sizes of the XYY males may result from a relatively longer active mitotic period. These studies indicate that factors which affect prenatal growth and development are not necessarily the same as those which control postnatal growth rates. Since dermatoglyphic characters are determined

prenatally, postnatal growth factors can have no effect on variation in the number of dermal ridges, although they do produce some variation in size as the ridges keep pace with growth of the hands and feet.

Dermatoglyphics and Developmental Stability

A considerable amount of research has been concerned with developmental stability, or the ability of the organism to resist environmental disturbances during development. Canalisation refers to the ability of an organism to withstand, or be buffered against, such environmental upsets in the developmental process (Waddington 1957). One form of variation which has been used to measure developmental stability is fluctuating asymmetry, which refers to the non-adaptive deviations from perfect bilateral symmetry in homologous bilateral structures such as ears, eyes, arms, fingers, etc. (Soulé 1967). The level of asymmetry has been used to indicate the effectiveness of the control system in buffering against accidents of development.

A character frequently studied in regard to asymmetry is the sterno-pleural chaeta (bristle) number in *Drosophila*. The degree of fluctuating asymmetry in chaeta number can be increased through artificial directional selection and inbreeding. Thoday (1958) found that ten generations of selection for high or low sterno-pleural chaeta number produced a deterioration of developmental homeostasis as measured by chaeta number. He suggested that the increasing asymmetry

was probably due to a deterioration of the balanced gene complexes linked to those affecting bristles. Selection regimes have also produced alterations in asymmetry of secondary vibrissae (whiskers) and number of toes on the hind feet in mice (Kindred 1967).

In humans, dermatoglyphics provide a useful measure of fluctuating asymmetry in the individual. Since dermal ridges are formed early in embryonic development, they can reflect developmental processes of early prenatal growth. Dermatoglyphic patterns have no known functional advantages, thus it is unlikely that natural selection would act directly to reduce asymmetry. Dermatoglyphic asymmetry can therefore be considered to reflect the extent to which the developing organism is subject to developmental disturbances (Jantz n.d.).

A familial study on asymmetry of finger ridge counts revealed only a small hereditary component (Singh 1970). However, Jantz (1975) found patterning of fluctuating asymmetry along population lines, suggesting a genetic rather than environmental basis for such variation. He suggested that the degree of developmental stability in different populations may itself be under genetic control. Soulé (1967) has also postulated that there is a population asymmetry parameter which characterizes asymmetries for populations, but not necessarily within individuals. In other words, a population having a high average asymmetry for one trait

would tend to have high levels of asymmetry for other traits. According to Soulé, this correlation in asymmetry levels for traits within a population does not hold true in the individual organism; a high level of asymmetry in tooth dimensions would not necessarily imply asymmetry in other structures within an individual.

However, other investigators have found evidence that asymmetry does reflect an inability of the individual genotype to buffer against environmental insults. Garn et al. (1966) found an increase in asymmetry of the distal tooth in each class as compared with the proximal tooth; individuals with third molar agenesis were found to be more asymmetrical for all remaining teeth, suggesting a generalized phenomenon.

Dermatoglyphic pattern type on fingers and a-b ridge count have shown increased asymmetry in propositi with familial CL(P) and in their normal parents and sibs (Woolf and Gianas 1977), which lends support to the concept that asymmetry can be a generalized phenomenon within an individual. Adams and Niswander (1967) noted an increase in asymmetry of the atd angle and molar teeth in individuals with familial CL(P) as compared with controls, although this increased level of asymmetry was not observed in cases of sporadic CL(P) or isolated CP, a finding confirmed by Woolf and Gianas (1976). Adams and Niswander concluded that the increased asymmetry reflected a lack of buffering against

developmental noise in affected individuals.

Since parental age and birth order effects have been shown in a number of congenital disorders, including CL(P), it is possible that offspring within high risk categories are less well buffered against upsets during development, i.e., they are less well canalised. However, it is also possible that the parental age and birth order effects result not from the degree of canalisation in the offspring, but from the increased levels of stress presented by the reproductive environment at various parental ages and with different states of parity in the mother. Either a lack of canalisation or an increase in environmental stress associated with parental age and birth order could be expected to produce increased levels of asymmetry in offspring within high risk categories. A study of summed finger ridge count asymmetry by Parsons (1973) was suggestive of a maternal age effect, showing greater asymmetry at high ages. However, little is known about the effects of parental age and birth order on individual digits or areas of the palm.

CHAPTER III

OBJECTIVES

The main objective of this study is to investigate the effects of parental age and birth order on the dermatoglyphics of phenotypically normal individuals. Three types of dermatoglyphic traits will be examined: (1) ridge counts on fingers and palms; (2) ridge width in the a-b area of the palm; and (3) asymmetry of ridge counts on fingers and palms.

Parental age and birth order effects known in humans tend to be either linear or parabolic in their distribution. For example, as maternal age increases, there appears to be an increase in the frequency of spontaneous abortions, twin deliveries, hydrocephaly, and Down's syndrome in offspring. Parabolic or U-shaped distributions in relation to maternal age are found in the frequency of stillbirths, low birth weight infants, chromosomal errors, anencephaly, CL(P) in conjunction with multiple malformations, and lower survival rates of offspring; these traits have higher frequencies at low and high maternal ages. Thus, an intermediate maternal age may be optimal, since it is associated with the highest reproductive ability and the fittest offspring, as measured by maximum developmental stability and viability (Parsons 1964, 1973). If maternal age affects dermatoglyphic

variation, then changes in the frequencies of dermatoglyphic traits could be expected to show linear or parabolic trends as maternal age increases.

Based on evidence from sex chromosome aneuploidies, it was suggested in the last chapter that the rate of fetal growth affects the number and width of ridges, with a slow rate of fetal growth associated with reduced total ridge counts and increased ridge breadth in the a-b area. Little information is available regarding differences in fetal growth rates in parents of various ages. However, low birth weight may be interpreted as indicative of slow fetal growth rates. Birth weight shows a small but significant negative correlation with maternal age (Karn and Penrose 1951). Thus, if growth rates affect dermatoglyphic variation, one would expect a decrease in ridge counts and an increase in ridge breadth to occur as maternal age increases. Birth weight tends to increase with birth order, although a high frequency of low birth weight infants has also been found for late pregnancies (Karn and Penrose 1951, Chakraborty *et al*. 1975). Thus, a linear or parabolic trend in dermatoglyphic variation could be expected in relation to birth order. A linear relationship could reflect a tendency for ridge counts to increase and ridge width to decrease as birth order increases; a parabolic distribution would show the highest ridge counts and most narrow ridges occurring in intermediate birth orders.

There has been a suggestion (Selvin and Garfinkle 1972) that low and high paternal ages are associated with a slightly elevated proportion of low birth weight infants. If this is the case, then lower ridge counts and wider ridges would be expected in offspring of very young and older fathers, while higher ridge counts and narrow ridges would be expected in offspring of intermediate aged fathers.

The effect of maternal and paternal age on birth weight appears to be much less pronounced than that for birth order. Thus, effects of parental age on ridge count or ridge width might be expected to be less pronounced than that of birth order. Birth order has been repeatedly shown to affect birth weight; thus, if fetal growth rate affects the number or width of ridges, it is most likely to be observed in relation to birth order.

Another approach to examining parental age and birth order effects on dermatoglyphic variation deals with fluctuating asymmetry of dermal ridges. Dermatoglyphic asymmetry may be assumed to reflect environmental stress on the developing organism and the extent to which the fetus is buffered against disturbances during development.

Variation in the proportion of congenital defects and chromosome abnormalities indicates that parental age and birth order have some effect on the ability of the offspring to resist disturbances during development. Intermediate maternal age may be optimal, as indicated by a lower frequency

of defective offspring; however, low maternal age also appears advantageous, while elevated maternal age produces increased risks for offspring. If dermatoglyphic asymmetry is affected by maternal age, greater asymmetry would be expected to occur in high risk age groups. One could expect either a linear trend of increasing asymmetry with advancing maternal age, or a parabolic relationship, with lowest asymmetry found at intermediate maternal ages.

Paternal age also affects the viability of offspring, with increased frequency of defects and stillbirths occurring at elevated paternal ages. There also appears to be a higher proportion of low birth weight infants born to very young and older fathers. Thus, both linear and parabolic relationships might be expected between dermatoglyphic asymmetry occurring as paternal age increases, or with elevated levels of asymmetry in offspring of very young and older fathers.

Birth order may also be expected to produce differences in dermatoglyphic asymmetry since, for example, an increasing frequency of spontaneous abortions has been observed with increasing birth order (Javert 1957), and the proportion of low birth weight (high risk) infants is greatest for first and late pregnancies (Chakraborty et al. 1975). Thus, birth order could be expected to reflect either a linear increase in asymmetry with advancing birth order, or a U-shaped distribution with the greatest magnitude of

asymmetry occurring in low and high birth orders.

A second objective of this research is to provide a quantitative description of a sample of Caucasian Americans. Much of the past research done in dermatoglyphics has been based on qualitative, rather than quantitative, analysis. It is hoped that the present study will make a significant contribution to the body of quantitative dermatoglyphic data which is available for future research.

CHAPTER IV

MATERIALS AND METHODS

I. SOURCE OF DATA

The present study was based on finger and palm prints of 460 Caucasian students enrolled in introductory physical anthropology classes at The University of Tennessee, Knoxville, during 1976-77. Rolled prints were obtained using printer's ink. At the same time the prints were made, each student filled out a questionnaire containing information on the age of parents when the student was born and the student's order of birth within his family. Parent's age was recorded in categories of five year intervals. Since the questionnaire was self-administered it is possible that some of the information obtained was inaccurate. However, there should not be enough errors to significantly affect the results of this study. The sample was limited to American students whose parents were born within the continental United States. Some of the ridge count data was obtained through the courtesy of R. S. Webb (1977), who used part of the sample in his research.

II. DERMATOGLYPHIC VARIABLES

Dermal ridges course across the fingers and palms in approximately parallel lines, conforming to the curvature of

various areas. When three parallel ridge systems come together, a deltoid-shaped structure, or triradius, is formed. Most individuals have triradii located at the base of digits two, three, four and five (Figure 2). These digital triradii are designated _a_, _b_, _c_, and _d_, and they are located under the index, middle, ring and little finger, respectively. Another triradius is usually found at the base of the palm and is designated as the axial triradius, _t_. Occasionally, two or three axial triradii may be present (Holt 1968).

In the simplest classification of ridges on the fingers and palms, patterns are designated as arches, loops or whorls, depending on the number of triradii present (Galton 1892). The simplest pattern, the arch, has no triradius and is composed of gently curving ridges. A loop has one triradius, and a whorl has two triradii. Loops on the fingers are further classified by the direction they face. A radial loop opens to the radial side of the hand and an ulnar loop to the ulnar side (Holt 1968).

Quantitative measurements of dermatoglyphic features were obtained by counting the number of ridges between two points on the fingers and palms. The method of counting ridges on the fingers is shown in Figure 3. A whorl has two ridge counts, taken from the core of the pattern to each of its two triradii. In many recent studies only the higher count has been used so that an individual may be represented by ten ridge counts, one for each digit. In this system, a

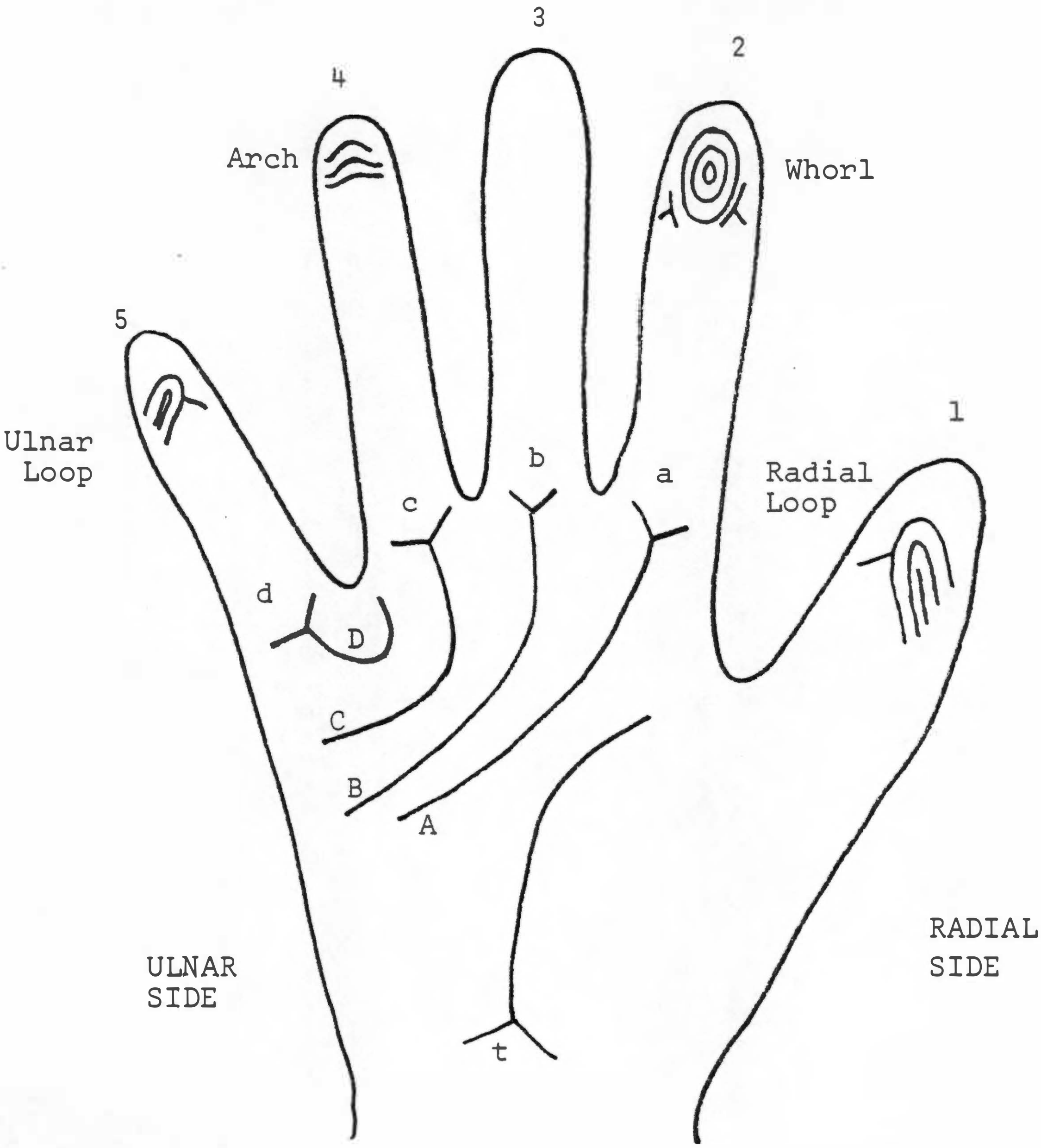


Figure 2. Dermatoglyphic configurations of fingers and palms.

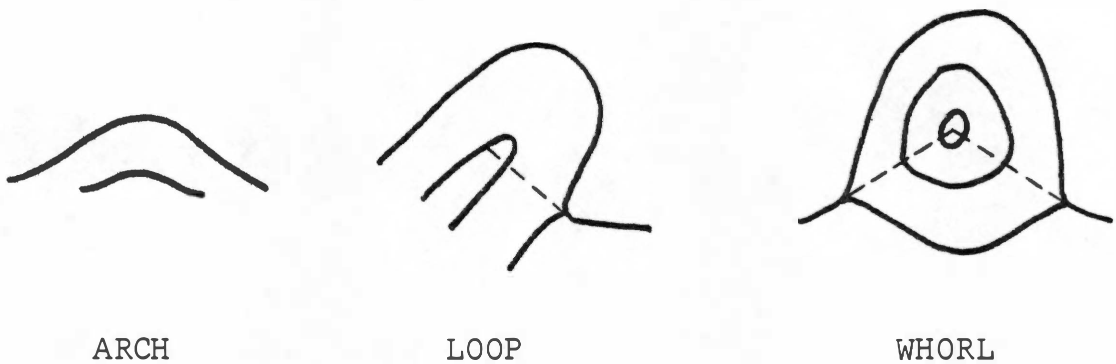


Figure 3. Ridge counts for basic pattern types.

loop has one count and an arch has a count of zero (Holt 1968). An alternative method uses two counts, radial and ulnar, for each digit. The ulnar count of an ulnar loop is scored zero, and similarly for a radial loop. In the case of an arch, both counts are scored zero. In this study all 20 counts were recorded.

Quantitative measures of palmar traits included ridge counts between the interdigital triradii (a-b, b-c, and c-d) and counts for patterns in the interdigital areas. A measure of ridge breadth (in millimeters) in the a-b interval was also obtained. The interdigital ridge counts are obtained by counting the number of ridges which lie on a straight line between two adjacent interdigital triradii, excluding the triradii themselves, as shown in Figure 4. A problem arises when one of the triradii, usually c, is absent. Sometimes it is possible to identify a discontinuity in the area where the triradius should be, and this may be considered as a rudimentary triradius. In cases where this is not possible, an approximate location of the triradius may be determined 11 ridges below the flexion crease of the finger, which is the average location of the c triradius (Baitsch and Schwarzfischer 1959). Thus complete data sets may be obtained for each individual (Jantz n.d.).

In the interdigital areas of the palm, patterns may be found which are more or less analagous to those on the digits. A method for counting the ridges of these patterns

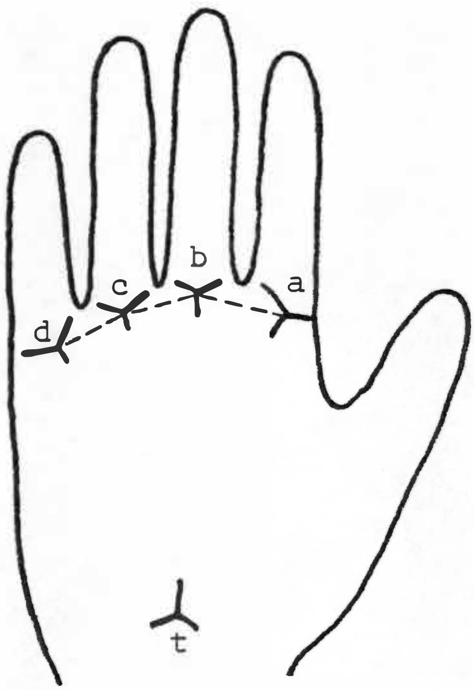


Figure 4. Ridge counts between interdigital triradii.

has been developed by Jantz (n.d.). When four triradii are present at the base of the fingers, a loop is always formed by the recurvature of main line D, C, or less frequently, B. Ridges in these patterns are counted by standard proceedures, i.e., by counting the number of ridges between the core of the pattern and its associated interdigital triradius, as may be seen in Figure 5. Patterns formed by the D main line have a radial orientation, patterns by the B line have an ulnar orientation, and those formed by the C line may have either a radial or an ulnar orientation. Patterns may also occur as the result of recurvature of the A line or presence of accessory triradii in an interdigital area. Since the

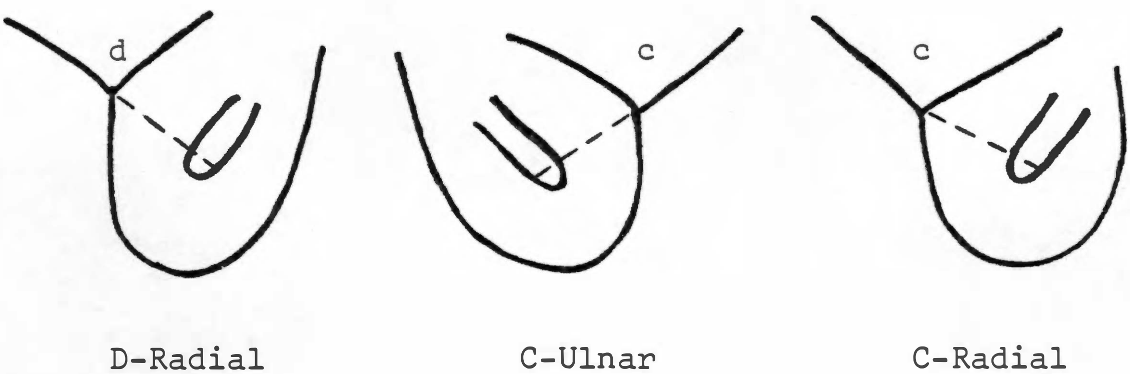


Figure 5. The d and c interdigital triradii and patterns resulting from recurvature of associated main lines on the left hand (adapted from Jantz, n.d.).

majority of patterns are formed by recurvature of the C and D lines, Jantz recognizes three primary variables for the hand: "(1) radial counts from the d triradius to the center of an associated pattern; (2) ulnar counts from the c triradius to the center of the associated pattern; and (3) radial counts from the c triradius to the center of the associated pattern" (Jantz n.d.:27). Patterns in the second interdigital area formed by the A and (rarely) B lines may be grouped together as a fourth variable, and patterns formed by an accessory triradius in the fourth interdigital area constitute a fifth variable. In the present study, these five ridge counts were recorded.

Another variable considered in this study is ridge width. This was estimated according to the method of Penrose and Loesch (1967), in which ridge width, W, is obtained by adding together the a-b distances, D^l and D^r, on the left and right hands respectively, and dividing the sum by the ridge count numbers, C^l and C^r, with two added, since in ridge counting the triradii themselves are omitted:

$$W = \frac{D^l + D^r}{C^l + C^r + 2}$$

When accessory a triradii were present, the count was made to the more radial triradius. The number of ridges is independent of age; however, as the body grows larger, the ridges grow wider. Thus, comparisons of ridge breadth should be made on subjects of comparable age, as is done in the

present study.

In order to test the effect of parental age and parity on developmental stability, the data were analyzed with respect to bimanual asymmetry of various dermatoglyphic features. Fluctuating asymmetry for any dermatoglyphic variable in an individual was expressed as the absolute difference, d, between values for right (R) and left (L) hands:

$$d = |R - L| \quad .$$

This value will include the directional component, if present.

III. STATISTICAL PROCEDURES

All statistical procedures were performed using the Statistical Package for the Social Sciences (SPSS) (Nie *et al.* 1975) on the IBM/360 computer at The University of Tennessee, Knoxville. The data were analyzed in six phases. The first phase was the computation of summary statistics (means, standard deviations) for each variable.

The second phase involved an examination of the interaction of finger and palm ridge counts. Various researchers have shown that correlations exist between dermal traits on the hands of an individual. For example, Bonnevie (1924), Holt (1951), and Mavalwala (1962) found that ridge counts on homologous fingers and adjacent fingers are more highly correlated than those on fingers further apart. Correlations have also been noted for various palmar traits (Mukherjee

1966, Loesch 1971, Máté 1975). Thus, much of the variation in dermatoglyphic traits may be explained in fewer than 20 finger ridge counts or 16 palm ridge counts.

Factor analysis is a statistical procedure which reduces a set of correlated variables to a new set of composite variables which are uncorrelated, and it has proven to be a useful tool in understanding the interaction of dermatoglyphic traits (Knussman 1967, 1969, Nance et al. 1974, Roberts and Coope 1975, Chopra 1971, Jantz and Owsley 1977, Oliveira 1975). Factor analysis was used in the present study to ascertain the structure of the dermatoglyphic traits and to reduce the set of correlated dermatoglyphic variables to a new set of uncorrelated variables. Factor analyses were carried out separately for finger ridge counts and for palm ridge counts within each sex. Unity was retained in the diagonal of the correlation matrix. A varimax rotation of factors was performed using the FACTOR subroutine of SPSS. Scores for 12 rotated factors from fingers and 11 rotated factors from palms were used in subsequent analyses in lieu of the original ridge count data. By retaining 12 finger and 11 palm factors in the rotated solution, approximately 90 percent of the total variance in the data was accounted for, while the number of dermatoglyphic variables was reduced by almost one half.

The third phase involved factor analysis of parental age and birth order variables. As mentioned in the second

chapter, paternal age, maternal age and birth order are correlated with each other. In order to remove the intercorrelations between them, a principal component factor analysis was performed on the three variables using the FACTOR subroutine of SPSS with unity retained in the diagonal of the correlation matrix. Three original factors were rotated, thereby producing three new uncorrelated variables which correspond well with the original variables (paternal age, maternal age, and birth order).

In the fourth phase, dermatoglyphic factors were examined by regression analysis to determine the presence of relationships with the parental age and birth order factors. "In simple regression analysis, values of the dependent variable are predicted from a linear function of the form,

$$Y' = A + B_1X,$$

where $\underline{Y'}$ is the estimated value of the dependent variable $\underline{Y}$, $\underline{B}$ is a constant by which all values of the independent variable $\underline{X}$ are multiplied, and $\underline{A}$ is a constant which is added to each case." (Nie et al. 1975:323). Dermatoglyphic factors were tested for a parabolic relationship with parental age and birth order factors by adding the squared $\underline{X}$ term to the regression equation, i.e.,

$$Y' = A + B_1(X) + B_2(X)^2 \quad .$$

This test was performed using the stepwise REGRESSION

procedure of SPSS. From these tests, it could be determined whether ridge counts increase, decrease, or form a parabolic shaped curve as parental age and birth order increase.

The fifth phase of analysis involved evaluation of the effects of parental age and birth order on ridge width in the second interdigital area. Relationships were examined using the linear and quadratic regression procedures just discussed.

The sixth phase of analysis was directed at the relationships between dermatoglyphic asymmetry, parental age, and birth order. Statistical procedures were similar to those used in evaluating the nature of ridge count variability, with the exception that raw asymmetry data were used instead of dermatoglyphic factor scores. Factor analysis was unnecessary, since examination of a correlation matrix based on asymmetry scores showed very low correlations between the variables. Linear and quadratic trends were tested in the manner previously discussed for ridge counts, i.e., using the stepwise REGRESSION procedure of SPSS.

CHAPTER V

DESCRIPTION OF THE SAMPLE POPULATION

One of the objectives of this study is to provide a quantitative description of a sample of Caucasian Americans. In the following discussion, summary statistics (means, standard deviations) for the sample are presented, and the structure of dermatoglyphic variation is examined as it is revealed by factor analyses of finger and palm ridge counts. In addition, results of the factor analysis of parental age and birth order are presented.

I. SUMMARY STATISTICS

Summary statistics for finger and palm ridge counts are presented in Table 1. They are in agreement with the findings of previous studies, in that males generally have higher finger ridge counts than females. Males have higher mean counts in 80 percent of the digital ridge counts (16 of 20), while females show higher mean values for radial counts on right digits two and three, and ulnar counts on left digits one and three. On the palms, females have higher mean counts than males on 75 percent (12 of 16) of the variables; male counts are higher for C-radial (CR) and A patterns on the right hand and for D-radial (DR) and D-accessory (DACC) patterns on the left hand. All of the interdigital ridge counts appear to be greater in females. These results are in

Table 1. Means and standard deviations for digital and palmar ridge counts (in ridges).

Variable	Males X̄	Males S.D.	Females X̄	Females S.D.	t
Digital					
Radial					
5R	14.16	5.73	12.75	5.75	2.63**
5L	13.71	5.36	12.38	5.29	2.67**
4R	15.54	6.83	15.11	6.36	.70
4L	15.89	6.33	14.55	6.72	2.20*
3R	10.74	6.00	10.95	5.72	.38
3L	11.06	6.27	10.58	6.50	.80
2R	7.60	7.05	8.17	6.79	.88
2L	7.25	6.89	7.12	6.60	.20
1R	18.85	6.15	17.22	6.56	2.75**
1L	16.57	5.85	14.56	6.16	3.59***
Ulnar					
5R	1.97	5.01	1.30	3.66	1.62
5L	1.15	3.75	1.46	4.02	.86
4R	5.89	7.53	5.11	7.09	1.14
4L	4.03	6.95	3.91	6.51	.19
3R	2.19	5.80	1.73	5.08	.88
3L	1.69	4.88	2.19	5.43	1.03
2R	6.60	8.21	6.27	8.21	.43
2L	6.12	7.52	5.62	7.71	.70
1R	5.82	7.86	5.46	7.44	.50
1L	3.21	6.64	3.98	6.89	1.22
TFRC	137.57	46.01	129.39	48.14	1.86
ARC	170.04	75.19	160.42	78.64	1.34
Palmar					
Rc-d	37.06	7.39	37.98	7.26	1.34
Lc-d	36.23	8.02	36.60	8.53	.47
Rb-c	27.82	6.05	28.82	5.72	1.81
Lb-c	27.39	5.80	28.25	5.88	1.58
Ra-b	40.86	5.44	41.48	5.98	1.16
La-b	41.69	5.92	42.40	5.51	1.32
RD-rad	1.68	5.16	2.19	5.63	1.01
LD-rad	3.08	6.38	2.91	5.81	.30
RC-uln	2.74	5.39	3.44	6.29	1.29
LC-uln	2.39	4.34	2.75	4.83	.84
RC-rad	4.63	5.40	4.45	5.16	.36
LC-rad	1.81	3.31	1.98	3.54	.53
RD-acc	.31	1.68	.43	2.17	.67
LD-acc	.57	2.10	.46	1.97	.48
RA	.20	1.06	.12	.76	.92
LA	.07	.56	.10	.74	.49

* $p < .05$ ** $p < .01$ *** $p < .001$

general accord with those of Webb (1977). However, sex differences are statistically significant only for radial counts on the thumb and fifth finger of both hands and on the fourth finger of left hands.

Summary statistics for asymmetry values are presented in Table 2. In the overall sample, males appear to be generally more asymmetrical than females. Seven of the ten asymmetry values for finger ridge counts (70 percent) are higher in males than in females, and six of eight values on the palms (75 percent) are higher in males. These differences do not reach statistical significance, however. The highest asymmetry values in males occur on digits one and two, while in females, the highest levels of asymmetry are found on digits one, two and four. The fifth finger in both sexes makes the least contribution to asymmetry. For each individual digit, the radial count usually has a higher mean asymmetry value than the ulnar count, which would be expected from the higher frequency of ulnar loop patterns (which yield a radial count) than either radial loops or whorls, thereby presenting more opportunities for asymmetry in the radial count to occur.

On the palms there is some variation between males and females with respect to relative magnitude of asymmetry. In males, asymmetry values for interdigital ridge counts are highest for c-d counts and lowest for b-c counts. In females, the relative magnitude of asymmetry in the

Table 2. Means and standard deviations for asymmetry (in ridges) and a-b width (in mm.).

	Males		Females		
Variable	$\overline{X}$	S.D.	$\overline{X}$	S.D.	t
5-radial	2.54	2.89	2.73	2.27	.78
5-ulnar	1.63	4.44	1.38	3.48	.66
4-radial	3.17	3.21	3.65	3.69	1.49
4-ulnar	3.47	5.40	3.33	5.31	.28
3-radial	3.45	3.08	3.20	3.17	.86
3-ulnar	2.10	5.20	2.31	5.20	.42
2-radial	4.44	4.48	4.30	4.85	.32
2-ulnar	4.28	5.38	4.26	5.77	.02
1-radial	4.13	3.54	3.92	3.23	.50
1-ulnar	4.55	6.63	3.61	5.52	1.63
Total Radial	17.74	8.48	17.80	8.10	.08
Total Ulnar	16.04	15.00	14.89	14.21	.35
Total Rad-Uln	33.77	18.73	32.69	17.01	.24
c-d	4.11	3.68	4.38	4.48	.51
b-c	2.96	2.57	3.44	3.25	1.77
a-b	3.31	2.93	3.25	3.75	.19
D-radial	3.11	6.01	2.69	5.19	.80
C-ulnar	3.83	5.42	3.65	5.18	.36
C-radial	3.74	4.30	3.50	4.36	.42
D-accessory	.80	2.54	.66	2.54	.48
A	.50	1.22	.19	.98	2.69**
a-b width	.58	.05	.52	.05	12.83***

** $p<.01$ *** $p<.001$

interdigital areas follows an increasing radio-ulnar gradient: a-b is less than b-c, which is less than c-d. Asymmetry of pattern ridge counts, however, follows the same trend in both sexes. DACC and A patterns have the lowest asymmetry values, which would be expected from their low frequency of occurrence on the palm. Of the remaining pattern types, DR patterns show the lowest asymmetry values, and CU has the highest, with CR asymmetry intermediate in value. The variation between males and females does not reach statistical significance except for asymmetry of A patterns.

Means and standard deviations for ridge width are also presented in Table 2. Ridge width is larger in males, and the difference in ridge width between the sexes is highly significant. Finally, Table 3 presents the distribution of subjects in the various parental age and birth order categories.

II. DERMATOGLYPHIC FACTORS

The dermatoglyphic data were submitted to factor analysis, fingers and palms separately. The first 12 finger factors accounted for approximately 90 percent of the variance in both males and females, and these were subjected to varimax rotation. Eigenvalues, cumulative percent of variance, and rotated factor loadings from the analysis of digital data may be found in Tables 4 to 6.

The first eigenvalue is higher in females (8.04 in

Table 3. Number of subjects in parental age and birth order categories.

Variable	Males N	Males Percent	Females N	Females Percent
Paternal age:				
20	6	3	9	4
21-25	50	23	63	26
26-30	72	34	80	32
31-35	49	23	60	24
36-40	19	9	22	9
41-45	12	6	8	3
45	5	2	5	2
Maternal age:				
20	23	11	30	12
21-25	73	34	81	33
26-30	69	32	74	30
31-35	31	15	47	19
36-40	13	6	11	4
41-45	4	2	2	1
45	-	-	2	-
Birth Order:				
1	76	35	91	37
2	76	35	69	28
3	35	16	51	21
4	14	7	20	8
5	8	4	8	3
6	1	1	6	2
7	2	1	-	-
8	-	-	2	1
9	-	-	-	-
10	1	1	-	-

Table 4. Eigenvalues and cumulative percent of variance from factor analysis of finger ridge counts.

Factor	Males		Females	
	Eigen-Value	Cum. Pct.	Eigen-Value	Cum. Pct.
1	7.22	36.1	8.04	40.2
2	1.72	44.7	1.89	49.7
3	1.66	53.0	1.43	56.8
4	1.29	59.5	1.34	63.5
5	1.23	65.6	1.03	68.6
6	1.00	70.6	.94	73.4
7	.90	75.1	.71	76.9
8	.67	78.5	.63	80.1
9	.63	81.6	.55	82.8
10	.60	84.6	.50	85.3
11	.53	87.3	.44	87.6
12	.44	89.5	.42	89.7
13	.39	91.4	.36	91.4
14	.34	93.1	.32	93.1
15	.33	94.8	.30	94.6
16	.28	96.2	.29	96.0
17	.23	97.3	.24	97.2
18	.19	98.3	.21	98.2
19	.19	99.2	.19	99.2
20	.15	100.0	.17	100.0

Table 5. Rotated factor loadings for fingers (males).

	FACTOR 1 (14.58)	FACTOR 2 (8.17)	FACTOR 3 (6.57)	FACTOR 4 (8.87)	FACTOR 5 (7.70)	FACTOR 6 (8.90)	FACTOR 7 (8.94)	FACTOR 8 (5.49)	FACTOR 9 (5.90)	FACTOR 10 (5.47)
L5R	0.87353	0.13642	0.02735	0.17209	0.07782	0.14667	0.10577	0.09469	0.09885	0.00010
L5U	0.08670	0.06358	-0.02751	0.08221	0.10241	0.15136	0.06250	0.91669	0.23170	0.01717
L4R	0.67051	0.18026	0.07456	0.16942	0.17626	0.27531	0.33384	0.04181	-0.09719	0.23123
L4U	0.18574	0.09106	0.08232	0.08424	0.10687	0.79330	0.10267	0.22114	0.03142	0.13431
L3R	0.38617	0.18185	0.06024	0.21045	0.24857	0.17874	0.71881	-0.10179	0.02245	0.06692
L3U	0.05950	0.22962	0.03902	0.01946	0.10524	0.23847	0.10981	0.06294	-0.03157	0.20555
L2R	0.13616	0.10103	-0.00328	0.17612	0.78745	0.19658	0.20903	-0.02062	0.09936	0.18247
L2U	0.16238	0.82987	0.23422	0.13267	0.02081	0.17090	0.13449	0.05334	0.10272	0.11783
L1R	0.17533	0.11396	0.10824	0.86958	0.14908	0.04469	0.11468	-0.04223	0.18909	0.01390
L1U	0.07141	0.08858	0.93210	0.04543	0.08999	0.00076	0.07731	-0.01690	0.08856	0.05136
R5R	0.81519	0.13697	0.14833	0.09997	0.11178	0.02088	0.13255	-0.02075	0.35570	-0.02358
R5U	0.14391	0.05952	0.06868	0.02053	0.12721	0.17528	0.07003	0.27473	0.86208	0.04909
R4R	0.66376	0.08143	0.04732	0.09946	0.13260	0.26957	0.36545	0.12198	-0.27372	0.28727
R4U	0.20746	0.15704	-0.02956	0.06696	0.16634	0.80870	0.21179	0.00683	0.18875	0.11316
R3R	0.20860	0.11330	0.07125	0.13673	0.18424	0.15232	0.85038	0.15234	0.09118	0.02833
R3U	0.12798	0.22808	0.07248	0.08403	0.07495	0.19575	0.06440	0.01625	0.05273	0.08448
R2R	0.20787	0.00456	0.12297	0.16667	0.78673	0.12354	0.17068	0.19962	0.09071	-0.04635
R2U	0.23650	0.79186	-0.04398	0.04653	0.08196	0.09227	0.14266	0.04450	-0.01602	0.10296
R1R	0.15133	0.03529	0.00707	0.85690	0.10616	0.08967	0.15048	0.15005	-0.15757	0.08701
R1U	0.27812	0.13520	0.54986	0.19563	-0.07662	0.14329	0.01570	-0.01481	-0.12439	0.04085

	FACTOR 11 (4.99)	FACTOR 12 (3.89)
L5R	0.09446	0.06144
L5U	0.05958	-0.00853
L4R	-0.13110	0.10956
L4U	0.25583	-0.03510
L3R	0.04937	-0.03381
L3U	0.87798	0.01219
L2R	0.07170	0.27105
L2U	0.15308	-0.17468
L1R	0.01844	-0.05037
L1U	0.03149	0.04297
R5R	0.10367	0.02997
R5U	-0.03626	-0.05874
R4R	-0.03819	0.03287
R4U	0.05160	0.11903
R3R	0.10880	0.03255
R3U	0.21312	0.03314
R2R	0.00012	-0.31201
R2U	0.13654	0.35039
R1R	0.01153	0.14924
R1U	0.01056	0.62154

The percent of variance explained by each factor is given in parentheses.

Table 6. Rotated factor loadings for fingers (females).

	FACTOR 1 (10.48)	FACTOR 2 (7.96)	FACTOR 3 (8.49)	FACTOR 4 (6.62)	FACTOR 5 (9.82)	FACTOR 6 (6.26)	FACTOR 7 (5.50)	FACTOR 8 (12.78)	FACTOR 9 (5.26)	FACTOR 10 (4.98)
L5R	0.84956	0.15196	0.10987	0.17102	0.17504	0.07056	0.01636	0.27495	0.07188	0.03644
L5U	0.12052	0.01445	0.04054	0.90390	0.00092	0.05471	0.12945	0.02881	0.01622	0.74158
L4R	0.45284	0.17702	0.13719	0.00015	0.12714	-0.00161	0.05568	0.70360	0.04598	0.09194
L4U	0.11323	0.10836	0.16528	0.48973	0.00201	0.18175	0.09037	0.26477	0.20911	0.08225
L3R	0.24427	0.23851	0.02497	0.04144	0.23594	0.25857	0.13979	0.65102	0.10409	0.11232
L3U	0.07019	0.17610	0.05957	0.14853	0.02003	0.07159	0.92936	0.12617	0.16041	0.06896
L2R	0.17157	0.02763	0.17691	0.08239	0.15716	0.29195	0.04655	0.32287	0.13039	0.05567
L2U	0.13674	0.68488	0.24709	0.03317	0.09276	0.28957	0.26380	0.18744	0.24191	0.06582
L1R	0.22773	0.09968	0.13364	0.02532	0.87710	0.06963	0.04386	0.12734	0.05834	-0.01241
L1U	0.03310	0.21648	0.82379	0.22640	0.15622	0.21255	0.09678	0.11234	0.10376	-0.04820
R5R	0.77391	0.22982	0.12068	0.03212	0.24387	0.14511	0.08954	0.28004	0.07334	0.12548
R5U	0.10295	0.00486	0.14195	0.34130	0.05248	0.10936	0.08047	0.09914	0.11519	0.84696
R4R	0.41357	-0.02496	0.15509	0.05115	0.10980	0.03383	0.18316	0.67872	0.12659	-0.10967
R4U	0.19747	0.33995	0.09460	0.04729	0.06681	0.09474	0.10212	0.25014	0.10340	0.24458
R3R	0.07749	0.25401	0.03947	0.11537	0.27687	0.34193	-0.00183	0.72474	0.03414	0.13526
R3U	0.10998	0.22442	0.12698	0.05440	0.09677	0.01327	0.17831	0.11166	0.89628	0.10567
R2R	0.13298	-0.00084	0.14570	0.09070	0.11413	0.05576	0.07801	0.22622	0.00645	0.09449
R2U	0.26429	0.79503	0.11722	0.02288	0.10640	-0.15189	0.09027	0.20966	0.13771	-0.04137
R1R	0.11196	0.05121	0.13610	-0.01606	0.89333	0.06740	-0.00831	0.23753	0.04736	0.06602
R1U	0.19425	0.04139	0.84150	-0.10709	0.15054	-0.02049	-0.01705	0.06862	0.05442	0.20852

	FACTOR 11 (6.68)	FACTOR 12 (4.83)
L5R	0.05468	0.07700
L5U	0.10120	0.05769
L4R	0.22097	0.05906
L4U	0.63390	0.00980
L3R	0.13692	0.29476
L3U	0.39369	0.04352
L2R	0.10464	0.78041
L2U	0.13214	-0.19926
L1R	0.08784	0.11904
L1U	-0.01459	-0.00651
R5R	0.16585	0.11624
R5U	0.18956	0.04948
R4R	0.29690	0.00427
R4U	0.73110	0.13228
R3R	0.02291	0.23769
R3U	0.14934	0.10455
R2R	0.12949	0.21447
R2U	0.71967	0.16756
R1R	-0.02265	0.01975
R1U	0.18145	0.16663

The percent of variance explained by each factor is given in parentheses.

females versus 7.22 in males), which may be interpreted to mean that intercorrelations among the variables are higher in females. This finding is consistent with the significantly higher correlations between ridge counts observed by Jantz (1977) in female American Whites. This result was also obtained by Jantz and Owsley (1977) for Whites and Yoruba and by Roberts and Coope (1975), although the latter do not comment on it.

When 12 factors are rotated, each factor usually includes a heavy loading on only one variable or on one pair of the same variable on left and right hands. Seven factors in males and six in females reflect the combined contributions of both hands in their most heavily loaded variable, and these factors make the greatest contributions to overall variance in the data. The remaining factors appear to differentiate differences between hands, loading heavily on a variable of either the right or the left hand. Interpretation of the factors, therefore, is very straightforward.

The first factor derived from male finger data reflects the radial counts on digits four and five of both hands. The second factor is weighted on ulnar counts for the second digits. Factor three represents ulnar ridge counts on the two thumbs, and factor four is a radial count factor for the thumbs. Factor five is heavily loaded on radial counts of both second digits, and the sixth factor represents ulnar

counts on the two fourth digits. Factor seven is mainly a radial count factor for the third digits, but radial counts on digit four are also emphasized. These first seven factors include an emphasis on all of the 20 finger ridge count variables with the exception of ulnar counts on digits three and five; these latter variables are represented on individual hands by later factors.

Each of the last five finger factors in males emphasizes an ulnar count on one digit. Factors eight and nine load on the fifth digit, left and right hand respectively. Factors ten and 11 load on digit three, right and left respectively, and the final factor represents the ulnar count on the right thumb.

In the analysis of dermatoglyphic data for fingers in females, four of the first five factors are comparable to the first four factors derived from the male sample: the first factor in females represents radial ridge counts on digits four and five; the second is a digit two ulnar count factor; the third is a thumb ulnar count factor; and the fifth represents radial counts on the thumb. These factors account for the contributions of digits on both hands, i.e., heavy loadings are found in both hands for the variable represented by the factor. Two other factors show the bilateral effect of a variable: factors eight and 11. The eighth finger factor in females is strongly weighted on radial counts for the third and fourth fingers. It is

surprising that the fourth finger is involved here, since it also appears in conjunction with digit five on the first factor. Factor 11 represents ulnar counts on the fourth finger of both hands.

The remaining factors reflect the contribution of a single variable on either the right or left hand. Unlike the males, which reflected only ulnar counts on the unilateral factors, both radial and ulnar counts are emphasized in the females. Factors six and 12 emphasize radial counts on digits two, right and left respectively. The fourth and tenth factors represent the ulnar count on digit five, left and right respectively, and factors seven and nine reflect the contribution of the ulnar count on the third finger, left and right respectively.

A number of interesting observations emerge from the factor analysis of finger ridge counts. Each raw variable is represented by a heavy loading on one factor, with the exception of radial counts on digits four of left and right hands in females, which are heavily loaded on two factors instead of only one. It is at once apparent that the factors are quite similar in the male and female analyses, the main difference being the percent of variance accounted for by comparable factors. The other major difference is that radial counts on the second digit are broken up into different factors for right and left hands in females, while they are combined into one factor in males. The percent of variance

accounted for by digit two factors indicates that in females, radial counts on digit two of the right hand (factor six) makes a greater contribution to dermatoglyphic variation (6.26 percent) than those on the left hand (factor 12) (4.83 percent), while in males both are of more equal importance. Radial counts on the fourth and fifth digits appear to be interrelated, and together they account for a considerable proportion of variance in both males (14.58 percent) and females (19.48 percent).

Because of the large number of factors used in the rotated solution, the factors obtained in this study do not conform closely to those of other studies which have used factor analysis of dermatoglyphic traits (Jantz and Owsley 1977, Nance et al. 1974, Chopra 1971, Roberts and Coope 1975, Knussman 1967, 1969, Oliveira 1975). These studies usually considered only those factors with eigenvalues equal to or greater than unity, which generally number about five or six factors. When fewer factors are considered, variables tend to be grouped, whereas in this study most factors represent ungrouped variables, or the grouping simply consists of combining the same variable from right and left hands. (A reasonable question arises as to which method, if either, more closely approximates biological reality. However, the purpose for using factor analysis in this study was to decorrelate and reduce the number of variables while retaining as much information as possible. By using a larger

number of factors, 90 percent of the variance has been retained, yet the number of variables has been reduced by almost half.)

In several analyses of digital ridge counts utilizing fewer factors, a pattern emerges in which digits two and three are grouped as one unit, digits four and five as a second unit, and the thumb as a third unit (Knussman 1967, 1969, Jantz and Owsley 1977, Roberts and Coope 1975). Digit four is sometimes grouped with digit five (Jantz and Owsley 1977), while at other times it is associated with the second and third digit (Roberts and Coope 1975, Nance et al. 1974). In an analysis of 20 ridge counts, Jantz and Owsley (1977) found that the radial and ulnar counts for a group of digits were weighted on different factors, e.g., they found a 5-4-radial count factor and a 5-4-ulnar count factor in a sample of American Whites. Their study also showed that the groupings of digits were similar in American White, American Black, and African Black samples, although some evidence of sex and race variation was observed.

In the present study, which utilized at least twice as many factors in the rotated solution, the grouping of radial counts on digits four and five still appears as an important unit in both male and female samples. This indicates that a high correlation exists between the radial counts on digits four and five. The appearance of these two digits on a single factor even when a large number of factors

are retained lends support to interpretation of the fourth and fifth digits as a functional or biological unit.

In females, radial counts on digits three and four are also grouped together; in fact, the 3-4-radial count factor accounts for the largest proportion of variance in finger ridge counts of the female sample (12.78 percent). Perhaps what is significant about the grouping of digits in this and other studies is that adjacent fingers tend to vary together to a greater extent than do non-adjacent fingers, and that radial sides of adjacent digits are more highly correlated than are the radial and ulnar sides of a single digit.

In regard to the latter observation, it should be noted that in the present study, each factor reflected either radial or ulnar counts, but not both. Studies utilizing 20 ridge counts have revealed factors which appear to differentiate between radial and ulnar sides of the fingers (Roberts and Coope 1975, Jantz and Owsley 1977), and Oliveira (1975) observed radial-ulnar contrasts in her principal components analysis of pattern types. The radial-ulnar contrasts observed in these studies indicate that differences exist in the development of radial and ulnar sides of individual fingers. Babler (1977) has recently observed a radial-ulnar gradient in the maturation of dermal ridges on the hands of human abortuses, with the thumb being most advanced and the fifth digit being least matured. It is

possible that a maturation gradient also exists on individual digits. Since the formation of dermatoglyphic patterns is related to the timing of ridge proliferation and subsidence of fetal pads on the finger tips, variation in ridge maturation or in timing of ridge differentiation between the radial and ulnar sides of digits could produce differences in dermatoglyphic patterning which would be reflected in the separation of radial and ulnar counts on different factors.

On the palms, retention of 11 factors preserved approximately 91 percent of the variance in males and in females, as may be seen in Table 7. Intercorrelations among palmar variables are approximately the same in both sexes, as can be seen in the percent of variance accounted for by the first eigenvalue (20.3 percent in males, 20.4 percent in females). Rotated factor matrices for males and females are presented in Tables 8 and 9.

The palm factors in both sexes fall into three main categories: (1) those which identify individual interdigital ridge counts; (2) those which identify individual pattern ridge counts; and (3) those which draw contrasts between patterns in the third and fourth interdigital areas.

In both sexes, each (bilateral) interdigital ridge count is represented by a single factor. The _c-d_ count from both hands is reflected on factor one in males and factor five in females. The _b-c_ count loads heavily on factor five in males and factor three in females, and the _a-b_ count is

Table 7, Eigenvalues and cumulative percent of variance from factor analysis of palm ridge counts.

	Males		Females	
Factor	Eigen-Value	Cum Pct.	Eigen-Value	Cum Pct.
1	3.25	20.3	3.27	20.4
2	2.22	34.2	2.11	33.6
3	1.71	44.8	1.84	45.1
4	1.41	53.6	1.29	53.2
5	1.19	61.1	1.23	60.9
6	1.09	67.9	1.08	67.7
7	1.01	74.2	.88	73.2
8	.88	79.7	.86	78.5
9	.84	84.9	.77	83.3
10	.54	88.3	.69	87.6
11	.51	91.5	.53	91.0
12	.40	93.9	.41	93.5
13	.29	95.8	.36	95.8
14	.27	97.5	.27	97.5
15	.25	99.0	.24	99.0
16	.16	100.0	.17	100.0

Table 8. Rotated factor loadings for palms (males).

	FACTOR 1 (11.07)	FACTOR 2 (9.54)	FACTOR 3 (11.01)	FACTOR 4 (8.56)	FACTOR 5 (11.77)	FACTOR 6 (7.29)	FACTOR 7 (6.50)	FACTOR 8 (6.33)	FACTOR 9 (6.35)	FACTOR 10 (6.71)
LCD	0.96338	-0.04331	0.27636	0.03076	0.23462	0.02072	0.09600	0.04084	0.03243	0.07623
LBC	0.12160	-0.02764	0.17760	-0.06770	0.90359	0.08283	-0.00948	0.03445	0.03621	0.03076
LAB	0.17270	-0.01161	0.88725	-0.02148	0.15500	-0.06600	0.07206	0.06029	0.01067	0.04817
RCD	0.93882	-0.03724	0.10597	0.00852	0.06105	-0.00307	0.07160	0.05719	0.05691	-0.04146
RBC	0.14680	0.01421	0.14080	0.07886	0.91261	0.04829	0.06099	0.06087	0.02446	0.09910
RAB	0.13567	-0.05728	0.89192	-0.15517	0.16054	-0.00252	-0.01725	-0.00354	0.02439	-0.01652
LDR	0.01684	-0.03504	0.07117	-0.14537	0.12336	0.21081	-0.19888	-0.07227	-0.13110	0.88793
LCU	0.10474	-0.04209	0.00139	-0.04169	0.05506	-0.02551	0.93116	-0.05440	-0.18587	-0.17916
LCR	0.10123	0.12735	0.03370	0.23275	0.07421	0.00150	-0.22617	0.05574	0.88041	-0.14192
LDACC	0.08498	0.09269	0.04761	-0.00463	0.08315	0.04313	-0.05058	0.97883	0.05056	-0.05567
LA	-0.07646	0.81795	0.08048	0.04282	-0.12036	0.01032	0.16023	0.15205	0.32034	0.15131
RDR	0.03462	-0.02504	-0.04921	-0.08180	0.15225	0.91570	-0.01550	0.05478	0.00014	0.20497
RCU	0.11695	-0.03345	0.14061	-0.68086	0.21394	-0.45902	0.08262	0.05754	-0.01338	0.35245
RCR	0.07876	0.07136	-0.12313	0.88412	0.05707	-0.23429	-0.00901	0.02191	0.23811	-0.02501
RDACC	-0.01592	0.07937	-0.01648	0.07769	0.03823	-0.02500	-0.01642	0.01241	0.08184	0.06818
RA	-0.01893	0.90290	-0.13836	0.04796	0.08354	-0.03256	-0.17968	-0.00938	-0.11865	-0.12803

	FACTOR 11 (6.32)
LCD	-0.05050
LBC	0.03760
LAB	-0.00933
RCD	0.02468
RBC	0.00771
RAB	-0.01015
LDR	0.09061
LCU	-0.01614
LCR	0.10061
LDACC	0.01235
LA	0.05406
RDR	-0.03826
RCU	-0.09153
RCR	0.05562
RDACC	0.98411
RA	0.06011

The percent of variance explained by each factor is given in parentheses.

Table 9. Rotated factor loadings for palms (females).

	FACTOR 1 (11.11)	FACTOR 2 (9.61)	FACTOR 3 (11.25)	FACTOR 4 (7.46)	FACTOR 5 (11.18)	FACTOR 6 (6.44)	FACTOR 7 (6.29)	FACTOR 8 (6.36)	FACTOR 9 (7.50)	FACTOR 10 (7.51)	FACTOR 11 (6.27)
LCD	0.12989	-0.00978	0.22140	-0.00417	0.88318	-0.11261	-0.08573	0.02340	-0.02016	0.07261	-0.04926
LBC	0.17442	0.12477	0.82927	0.11035	0.17020	-0.10590	-0.03574	-0.00747	0.17111	0.03610	0.00994
LAB	0.90076	0.01380	0.14449	0.07978	0.15707	0.01526	-0.11343	0.00452	-0.07432	0.04516	-0.01818
RCD	0.24453	-0.07346	0.08039	0.01368	0.88971	0.08093	0.00126	-0.00721	-0.03037	0.00829	0.02140
RBC	0.11415	0.00304	0.90689	0.07175	0.12903	0.00146	-0.03044	0.06586	-0.06262	0.05073	0.00336
RAB	0.88479	0.11523	0.13516	-0.04095	0.20815	-0.04369	-0.07005	0.00617	0.04850	0.01865	-0.09527
LDR	0.03803	0.11958	0.24968	0.31008	0.06015	0.11006	-0.03964	-0.10720	0.77968	-0.25533	-0.01823
LCU	0.10280	0.29976	0.15767	-0.06157	0.19019	0.07138	-0.03521	-0.10715	-0.70214	-0.42106	-0.01637
LCR	0.07290	-0.14639	0.09670	-0.02506	0.09004	0.04518	-0.01445	0.10015	-0.01386	0.93993	0.02700
LDACC	0.00950	0.00897	0.05374	0.03135	0.01362	0.10975	0.01181	0.98043	-0.01495	0.10575	0.06413
LA	-0.15421	-0.02777	-0.05226	-0.02047	-0.00014	0.02377	0.98220	0.01193	-0.00810	-0.00940	0.04695
RDR	0.03024	-0.04124	0.17427	0.92400	0.01778	-0.02138	-0.02261	0.04030	0.22081	-0.00688	-0.02596
RCU	0.06246	0.07389	0.21073	-0.27881	0.06216	-0.01481	-0.03445	0.02611	-0.05454	-0.05065	-0.03276
RCR	-0.08853	-0.77592	0.10739	-0.36435	0.22268	0.10768	-0.00602	0.01956	0.00786	0.21898	0.06232
RDACC	-0.02098	-0.07089	-0.07982	-0.02094	-0.02475	0.97657	0.02363	0.10877	0.03206	0.03516	0.01402
RA	-0.09098	-0.06315	0.01131	-0.02651	-0.02158	0.01392	0.04625	0.06303	-0.00352	0.02743	0.98890

The percent of variance explained by each factor is given in parentheses.

represented by factor three in males and factor one in females. Interdigital ridge count factors account for the largest proportion of variance in the palmar data in both sexes. Of the three factors, the b-c factor makes the largest contribution to total variance (11.77 percent in males, 11.25 percent in females), and the a-b factor contributes least (11.01 percent in males, 11.11 percent in females); the c-d factor contributes 11.07 percent to overall variance in males and 11.18 percent in females.

Using familial data, Pons (1964) presented evidence for genetic determination of a-b ridge count and suggested that it is controlled by a polymeric system with genes of additive effect. Results of a study by Pateria (1974) using familial correlations lend support to the concept of an additive genetic model for interdigital ridge counts, especially for the b-c or third interdigital area. The b-c ridge count has been found to be relatively uncorrelated with the a-b and c-d ridge counts, while a-b and c-d counts show significant positive correlations with each other (Knussman 1967, 1969, Maté 1975). The third interdigital ridge count has been neglected in many studies, partly because the c triradius is often absent. However, the b-c factor makes the most important contribution to variance in the present study, and this area of the palm shows considerable independence and variability in both normals and abnormals; thus, it merits greater consideration in future research on palm dermatoglyphics.

The remaining palm factors emphasize ridge counts in pattern areas. D-accessory patterns are broken down into contributions from the right hand (factor 11 in males, factor six in females) and the left hand (factor eight in both males and females), as are A-type patterns in females (factor seven for left hand and factor 11 for right hand). However, A-type patterns are combined into a single bilateral component (factor two) in males.

The remaining palmar actors relate to patterns in the third and fourth interdigital areas. For both sexes there exists one factor which contrasts C-ulnar (CU) versus C-radial (CR) ridge counts on the right hand; in males this is the fourth factor, and in females it is the second. Also, for both sexes there is a factor which draws a contrast between D-radial (DR) versus CU and CR counts (factor six in males and factor four in females). Thus, it would appear that on the right hands of males and females, patterns in the fourth interdigital area formed by recurvature of the D-line are distinct from those of the C-line. This would seem to justify the separate classification of CU and DR patterns, which in most other studies have been grouped along with D-accessory patterns under a single category of fourth interdigital patterns.

However, this grouping does not persist within the left hand. In males, counts for each pattern type are strongly weighted on different factors: CU is emphasized on factor

seven, CR on factor nine, and DR on factor ten. In females, CR counts are reflected by factor ten. Factor nine in females draws a contrast between DR and CU counts, suggesting that grouping these variables together is an acceptable procedure. Therefore, the distinction between fourth interdigital patterns formed by C-lines versus those formed by D-lines remains uncertain, since pattern groupings are inconsistent between hands and between sexes.

As in the data for fingers, there is a great similarity in factors derived from the dermatoglyphic data for female and male palms. The major differences between the sexes lie in the importance of each variable's contribution to the overall variance within the data and in the interaction of pattern ridge counts on the palms. It is interesting that ridge counts for an interdigital area and patterns within that area do not appear on the same factor; for example, b-c and CR counts do not load heavily on the same factor. This would suggest that different mechanisms may be responsible for controlling the number of interdigital ridges and the size of interdigital patterns.

Using a different method of counting ridges of palmar patterns, Glanville (1965) studied familial and twin correlations for summed pattern ridge counts on left and right hands in a sample of Americans of European descent. Variation in this summary trait appeared to be determined by additive genes, but an appreciable amount of variation of non-genetic

origin was also observed. Racial differences in the magnitude of palmar patterns has been noted by Glanville and Poelking (1964), who demonstrated that in American Black males, loops in the third and fourth interdigital areas on both hands tend to be smaller than in American White males of European descent. The relative proportion of patterns in these areas also differed markedly between the two groups. Such racial variation could have a genetic basis. Further study is needed to clarify the relative contributions of heredity and environment in determining variation of pattern size on the palms.

III. PARENTAL AGE AND BIRTH ORDER FACTORS

As previously discussed, parental age and birth order are correlated. In the present study, the correlation between maternal and paternal ages was 0.8, between maternal age and birth order was 0.5, and between paternal age and birth order was 0.5. In order to remove the effect of these intercorrelations, paternal age, maternal age, and birth order data (for both sexes combined) were submitted to factor analysis; the three original factors were subjected to varimax rotation. Eigenvalues and the rotated factor matrix are presented in Tables 10 and 11.

By using a full component rotated solution, three new variables were obtained which are uncorrelated and to a great extent are representative of the three original

Table 10. Eigenvalues and cumulative percent of variance from factor analysis of parental age and birth order data.

Factor	Eigenvalue	Cum. Pct.
1	2.24	74.8
2	.58	94.2
3	.17	100.0

Table 11. Rotated factor loadings for parental age and birth order data.

	Factor 1* (34.81)	Factor 2 (34.75)	Factor 3 (30.44)
Paternal age	.23	.88	.41
Maternal age	.28	.47	.84
Birth order	.96	.20	.22

*Percent of variance explained by each factor is given in parentheses.

variables. Factor one is a birth order factor, factor two is a paternal age factor, and factor three is a maternal age factor. The birth order factor makes the largest contribution to overall variance (34.81 percent). Parental ages contribute very little to this factor, making it a variable which is highly representative of birth order. The paternal age factor accounts for 34.75 percent of the total variance, which is almost equal to the proportion of variance contributed by the birth order factor. Maternal age is represented on this factor also, but to a much lesser degree than paternal age. Thus, this factor may be considered to represent paternal age, although some effect of maternal age is included. The maternal age factor makes the least contribution to total variance (30.44 percent); although paternal age also contributes to this factor, its effect is small in comparison to that of maternal age; thus, this factor may be considered to represent maternal age. Scores for these three factors were used in subsequent analyses in lieu of the original parental age and birth order data.

CHAPTER VI

PARENTAL AGE AND BIRTH ORDER EFFECTS ON RIDGE COUNTS

This study revealed a number of significant effects of parental age and birth order on finger and palm ridge counts. In the following sections, effects will be discussed first for maternal age, then for paternal age, and finally for birth order.

When parental age and birth order were factor analyzed, approximately 60 unique factor scores were produced for each factor. Although these scores no longer correspond one-to-one with the original parental age and birth order categories, low scores may be interpreted to represent low parental ages or low birth order, and high scores represent high parental ages and high birth order. Tables 28 to 67 of the Appendix present summary statistics for each variable which is discussed in this and the following chapters.

Parental age and birth order factor scores were not grouped for the regression analyses. However, in order to simplify graphic representations of the results, mean factor scores are arbitrarily divided into groups with intervals of 1.0. Regression lines are graphed using the midpoint of each group of factor scores.

I. MATERNAL AGE EFFECTS

Results of linear and quadratic regressions of the maternal age factor on dermatoglyphic factors are presented in Tables 12 and 13. On fingers, maternal age effects involve digits four and five. In both males and females, ulnar counts on digit five (finger factors nine and ten respectively) tend to increase as maternal age increases, as shown in Figures 6 and 7. Ulnar counts are derived from radial loops or whorl patterns; thus, an increase in ulnar counts suggests that the size or frequency of radial loops or whorls on digit five increases as maternal age advances.

In males, a maternal age effect is also observed for finger factor one, which represents radial counts on digits four and five. Regressions reveal both linear and quadratic relationships between these variables, as seen in Figure 8. The linear regression approaches statistical significance ($p<.06$), while the quadratic regression is highly significant ($p<.01$). It appears that in male offspring, low radial counts on digits four and five are found at low maternal ages; these tend to increase as maternal age increases up to the highest maternal age categories, at which point radial counts tend to decrease. Since radial counts are derived from ulnar loops or whorl patterns, maternal age appears

Table 12. Results of linear and quadratic regressions of maternal age factor on finger and palm factors (males).

Variable	d.f.	F1 (5-4 Radial) S.S.	F1 (5-4 Radial) M.S.	F1 (5-4 Radial) F	F9 (R5-Ulnar) S.S.	F9 (R5-Ulnar) M.S.	F9 (R5-Ulnar) F
Due to linear	1	3.78	3.78	3.83+	5.10	5.10	5.20*
Residual	211	208.22	.99		206.91	.98	
Due to quadratic	2	10.63	5.31	5.54**	6.10	3.05	3.11*
Residual	210	201.38	.96		205.91	.98	
Reduction in S.S. due to quadratic	1	6.84	6.84	7.14**	1.00	1.00	1.02

	P7 (LC-Ulnar) S.S.	P7 (LC-Ulnar) M.S.	P7 (LC-Ulnar) F
Due to linear	.81	.81	.81
Residual	211.20	1.00	
Due to quadratic	7.24	3.62	3.71*
Residual	204.76	.98	
Reduction in S.S. due to quadratic	6.44	6.44	6.57*

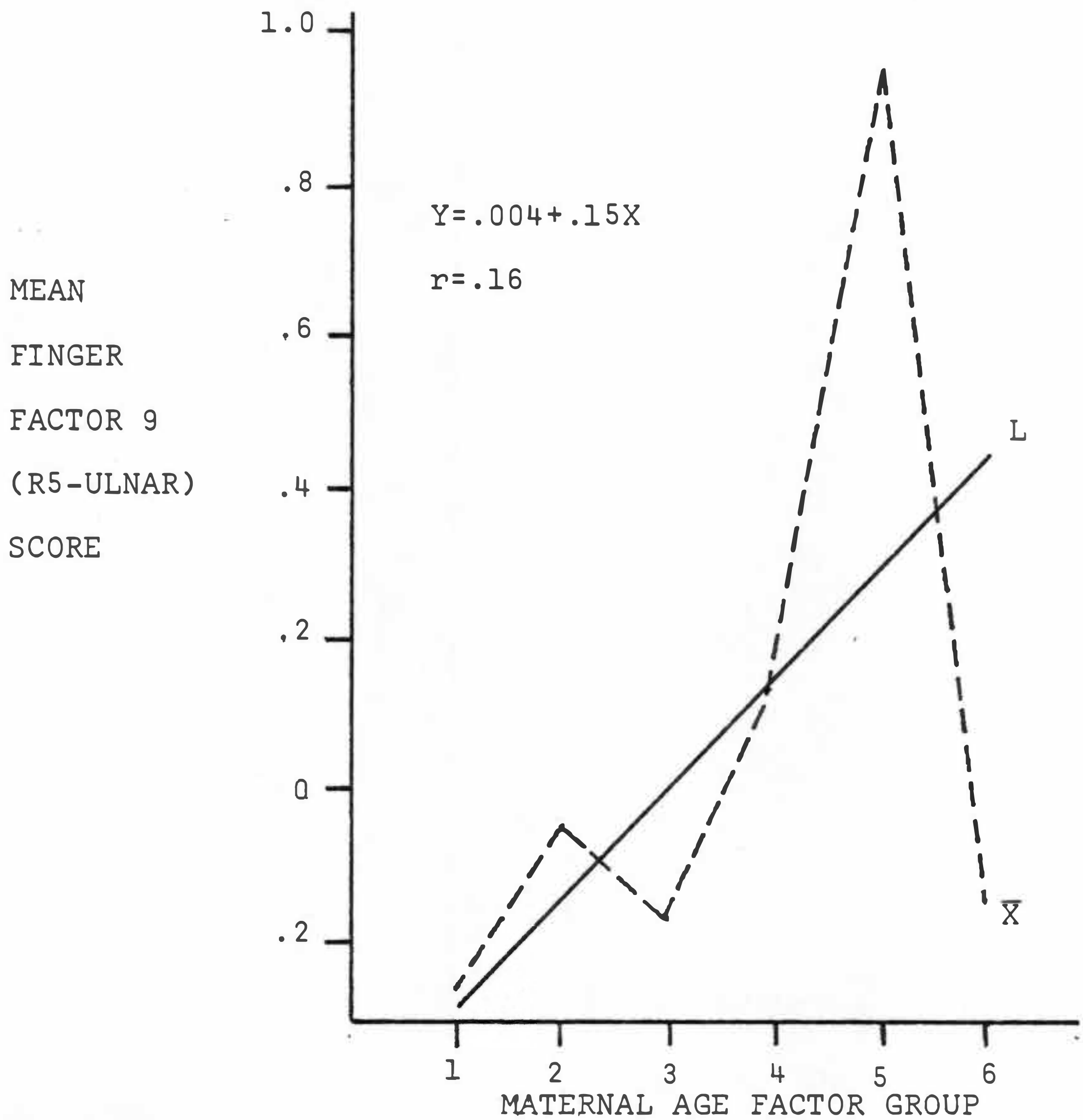
* $p<.05$ ** $p<.01$ + $p<.06$

S.S.=Sum of Squares   M.S.=Mean Square

Table 13. Results of linear and quadratic regressions of maternal age factor on finger and palm factors (females).

		F10 (R5-Ulnar)			P1 (a-b)		
	d.f.	S.S.	M.S.	F	S.S.	M.S.	F
Due to linear	1	5.02	5.02	5.10*	.23	.23	.23
Residual	245	240.99	.98		245.77	1.00	
Due to quadratic	2	5.98	2.99	3.04*	4.49	2.25	2.27
Residual	244	240.02	.98		241.51	.99	
Reduction in S.S. due to quadratic	1	.97	.97		4.27	4.27	4.31*

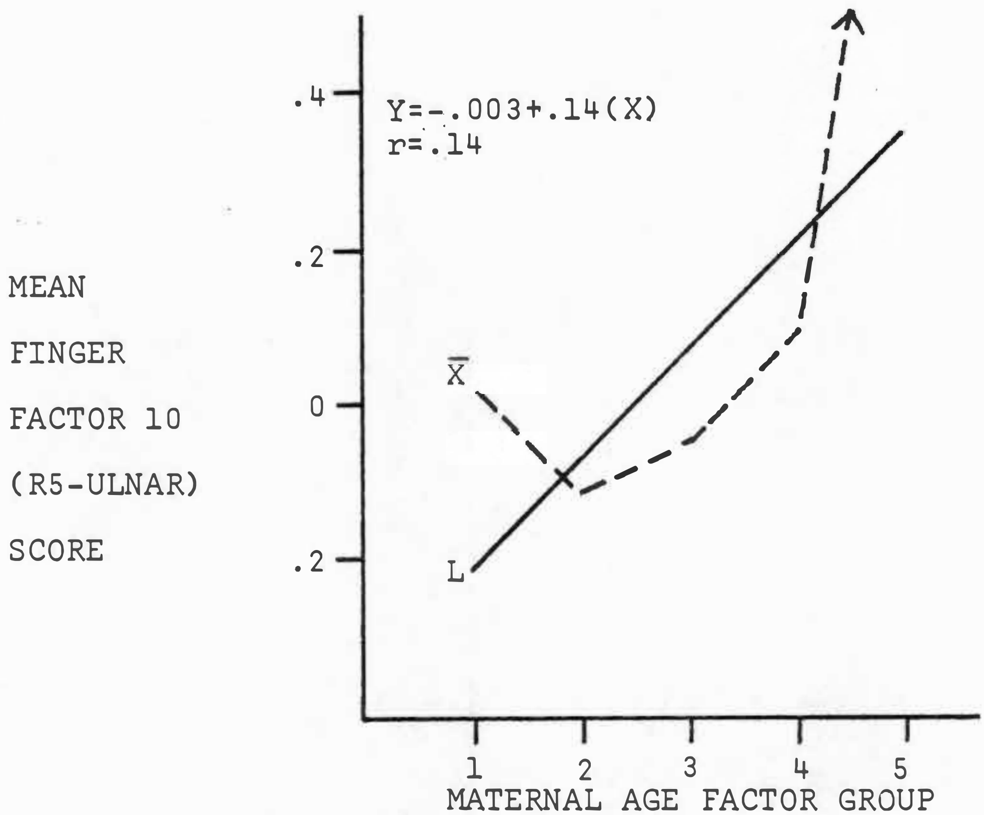
* $p<.05$ S.S.=Sum of Squares M.S.=Mean Square



Maternal Age Factor Groups

Code	Value	N
1	< -1.5	10
2	-1.5 to - .5	60
3	- .5 to .5	80
4	.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

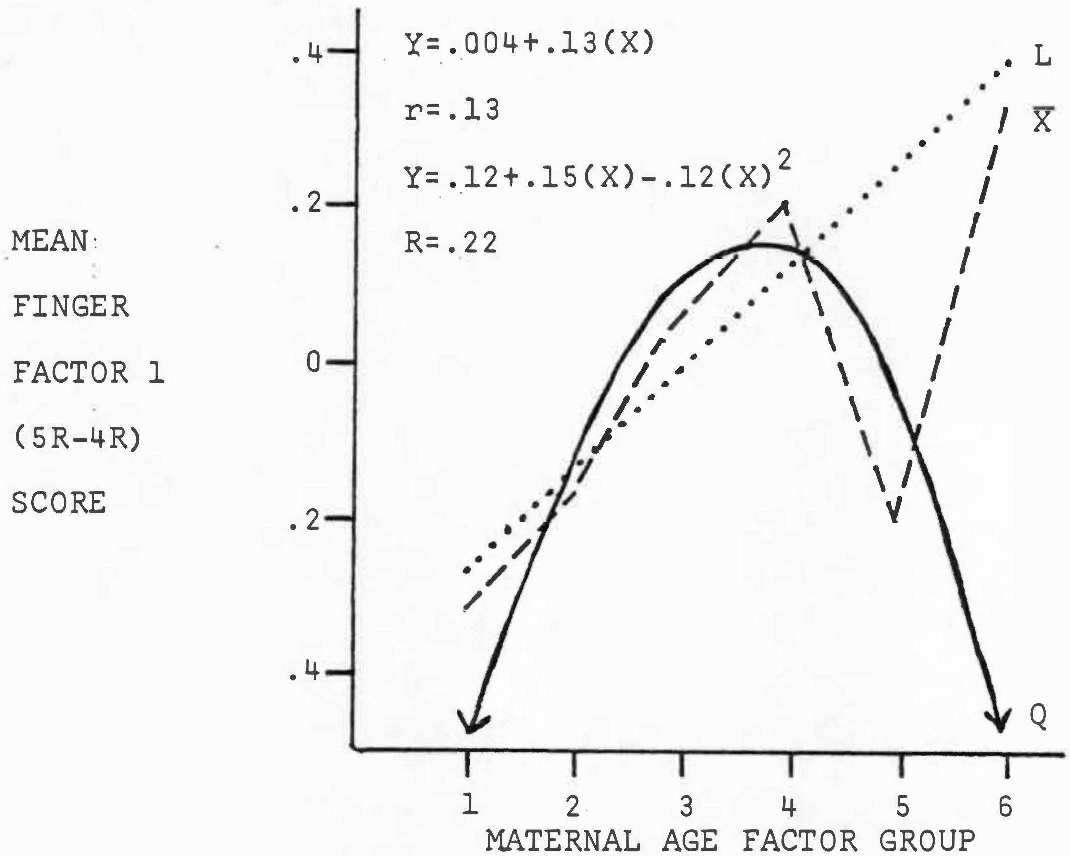
Figure 6. Means ($\bar{X}$) and linear regression (L) of maternal age factor on finger factor 9 (Right 5-Ulnar) in males.



Maternal Age Factor Groups

Code	Value	N
1	< -1.0	33
2	-1.0 to -0.0	88
3	0.0 to 1.0	94
4	1.0 to 2.0	21
5	> 2.0	11

Figure 7. Means ($\overline{X}$) and linear regression (L) of maternal age factor on finger factor 10 (Right 5-Ulnar) in females.



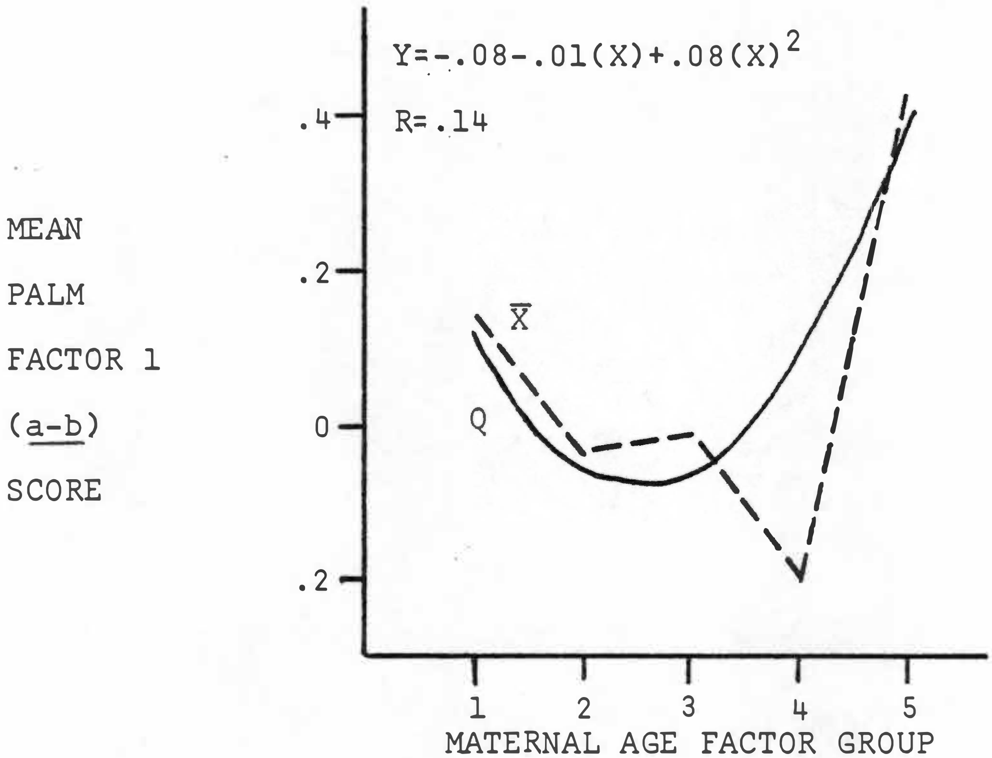
Maternal Age Factor Groups		
Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

Figure 8. Means ($\overline{X}$), linear (L) and quadratic (Q) regressions of maternal age factor on finger factor 1 (5-Radial, 4-Radial) in males.

to affect the size or frequency of these pattern types on digits four and five in males, with highest values occurring in offspring of intermediate aged mothers. Since the frequency of radial loops on fingers four and five of Caucasians is very low (Holt 1968), it is likely that the increase of ulnar ridge counts is produced by a higher frequency of whorls on digit five in females and on digits four and five in male children of older mothers. The decrease of radial counts on digits four and five in male offspring of older mothers may indicate that the ulnar side of whorls is reduced in size, while the radial side continues to increase in number of ridges.

On palms, the effect of maternal age differs in male and female offspring. In females, <u>a-b</u> ridge counts show a U-shaped distribution, with highest ridge counts found in low and high maternal age groups, and lower counts at intermediate maternal ages. These results are graphed in Figure 9.

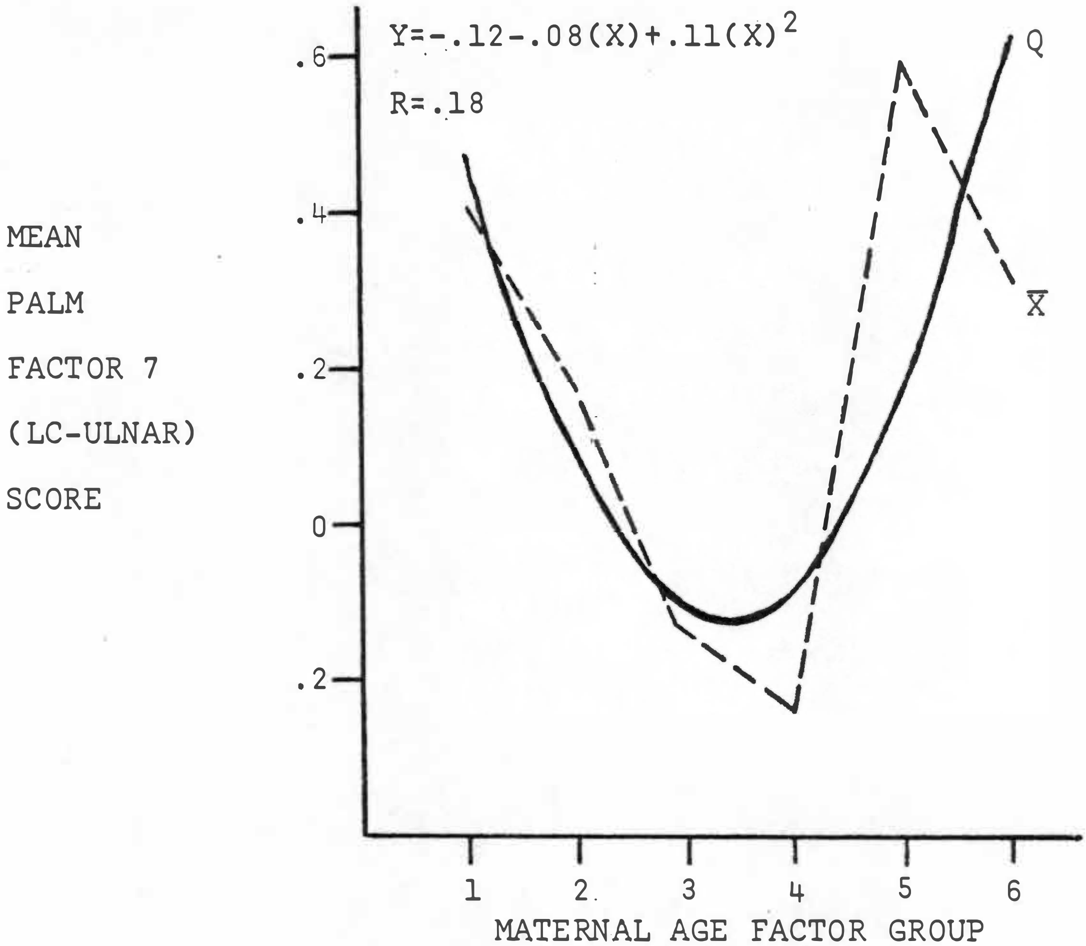
A U-shaped distribution for CU ridge counts on the left hand of males is also observed. Highest values for this trait are found at low and high maternal ages, with low values occurring at intermediate ages, as seen in Figure 10. This indicates that the size and/or frequency of CU patterns is greatest in offspring of very young and older mothers.



Maternal Age Factor Groups

Code	Value	N
1	< -1.0	33
2	-1.0 to 0.0	88
3	0.0 to 1.0	94
4	1.0 to 2.0	21
5	> 2.0	11

Figure 9. Means ($\bar{X}$) and quadratic regression (Q) of maternal age factor on palm factor 1 (*a-b*) in females.



Maternal Age Factor Groups

Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

Figure 10. Means ($\overline{X}$) and quadratic regression (Q) of maternal age factor on palm factor 7 (Left C-Ulnar) in males.

II. PATERNAL AGE EFFECTS

Paternal age effects are expressed for several finger and palm variables. These are summarized in Tables 14 and 15. In males, ulnar counts on the thumbs (finger factor three) form a parabolic shaped curve when regressed with paternal age. From Figure 11, it may be seen that low ulnar counts on the thumbs are found at low and high paternal ages, and high ulnar counts are observed in offspring of intermediate aged fathers.

In females, ulnar counts on digit three of left hands (finger factor seven) are positively correlated with paternal age. Figure 12 shows that there is a linear increase in ulnar counts as paternal age increases. Such a distribution could be produced by a high frequency of arches at low paternal ages, as well as by an increase in magnitude of ulnar counts *per se as* paternal age increases.

For palm ridge counts in females, only one factor was affected by paternal age: *b-c* ridge count. As paternal age increases, the number or ridges in the third interdigital area decreases, as shown in Figure 13. Although *b-c* count does not appear to be affected by paternal age in male offspring, ridge counts in the other two interdigital areas do reveal significant paternal age effects. The *c-d* count (palm factor one) is graphed

Table 14. Results of linear and quadratic regressions of paternal age factor on finger and palm factors (males).

Variable	d.f.	F3 (l-Ulnar) S.S.	M.S.	F	P1 (c-d) S.S.	M.S.	F
Due to linear	1	.00	.00	.00	3.77	3.77	3.82+
Residual	211	212.00	1.00		208.23	.99	
Due to quadratic	2	4.77	2.38	2.41	4.11	2.05	2.07
Residual	210	207.24	.99		207.90	.99	
Reduction in S.S. due to quadratic	1	4.76	4.76	4.83*	.33	.33	.34

	P3 (a-b) S.S.	M.S.	F	P8 (LD-accessory) S.S.	M.S.	F
Due to linear	2.35	2.35	2.36	2.28	2.28	2.30
Residual	209.65	.99		209.72	.99	
Due to quadratic	10.29	5.14	5.35**	6.93	3.47	3.55*
Residual	201.72	.96		205.07	.98	
Reduction in S.S. due to quadratic	7.93	7.93	8.26**	4.65	4.65	4.76**

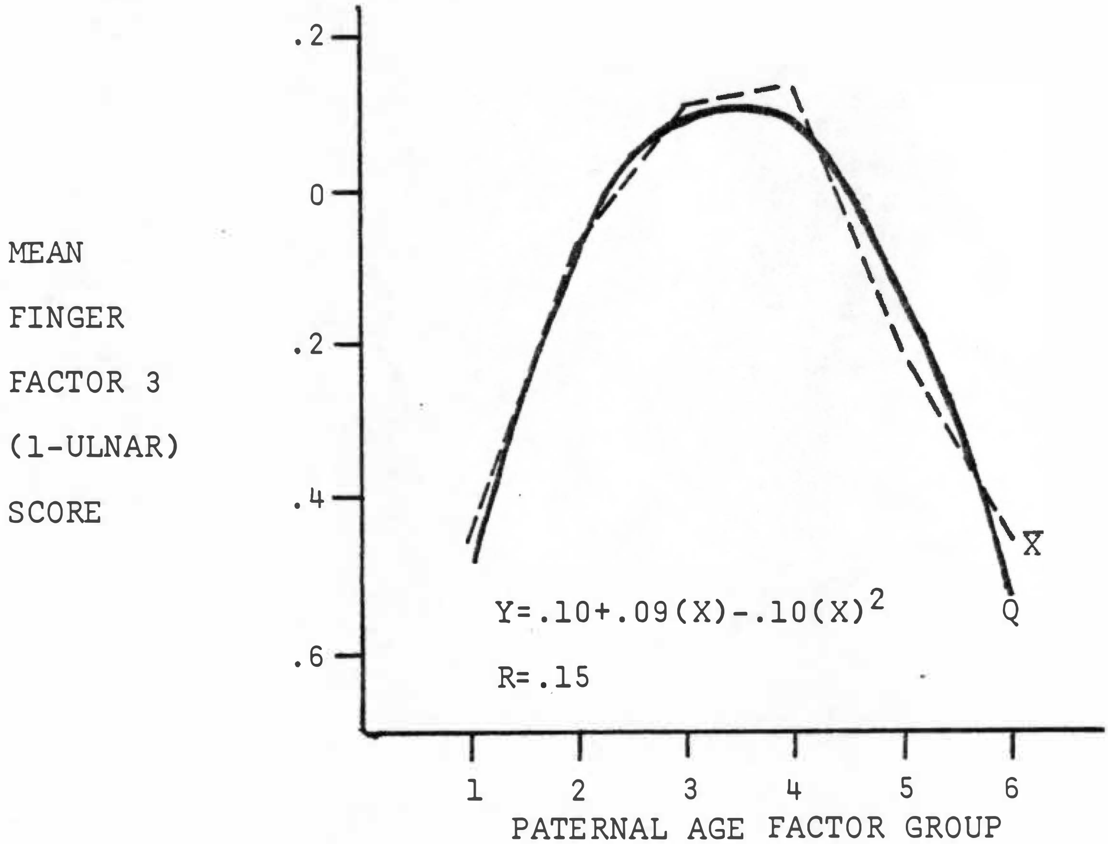
* $p<.05$ ** $p<.01$ + $p<.06$

S.S.=Sum of Squares   M.S.=Mean Square

Table 15. Results of linear and quadratic regression of paternal age factor on finger and palm factors (females).

Variable	d.f.	F7 (L3-Ulnar) S.S.	M.S.	F	P3 (b-c) S.S.	M.S.	F
Due to linear	1	6.25	6.25	6.39*	4.95	4.95	5.03*
Residual	245	239.75	.98		241.06	.98	
Due to quadratic	2	6.28	3.14	3.20*	6.64	3.32	3.39*
Residual	244	239.72	.98		239.36	.98	
Reduction in S.S. due to quadratic	1	.03	.03	.03	1.70	1.70	1.73

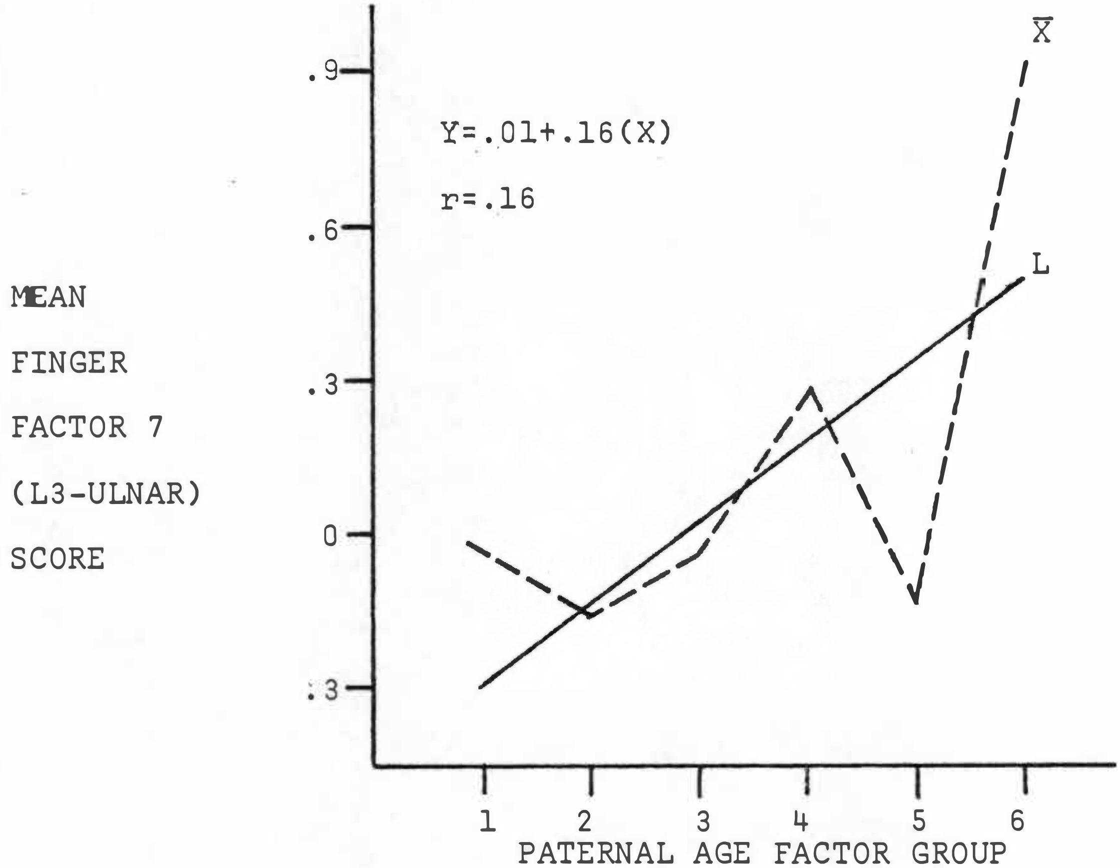
* $p<.05$ S.S.=Sum of Squares M.S.=Mean Square



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

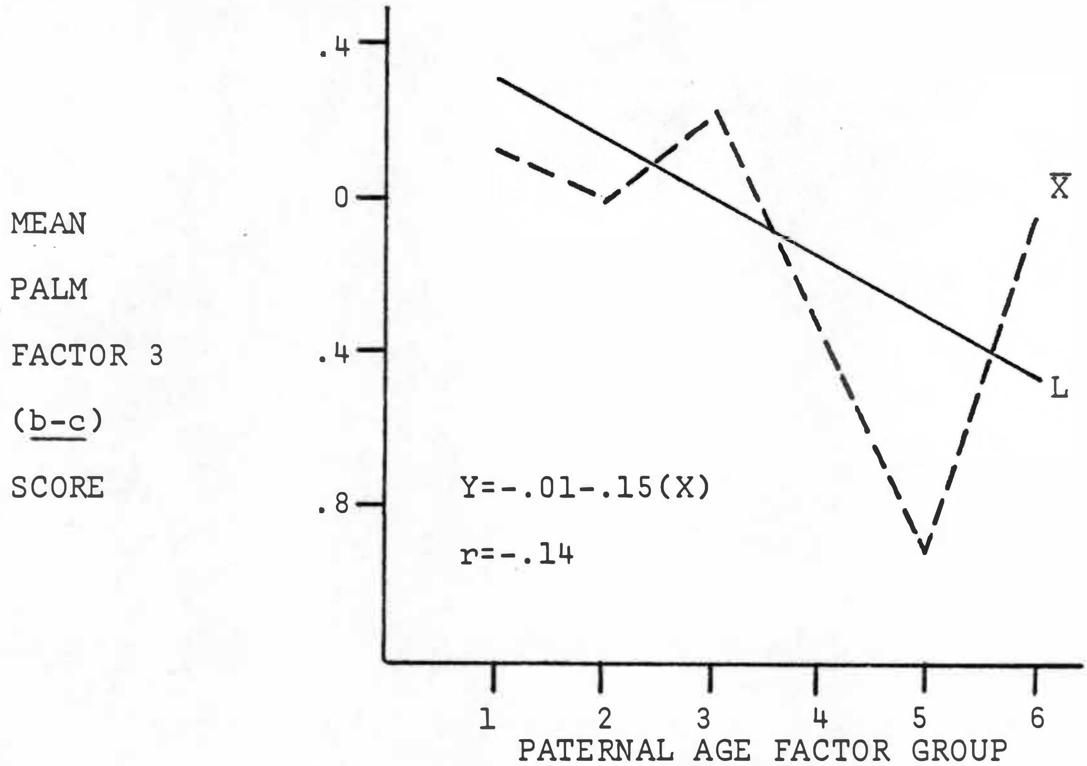
Figure 11. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on finger factor 3 (1-Ulnar) in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	12
2	-1.5 to -0.5	75
3	-0.5 to 0.5	97
4	0.5 to 1.5	49
5	1.5 to 2.5	9
6	> 2.5	5

Figure 12. Means ($\overline{X}$) and linear regression (L) of paternal age factor on finger factor 7 (Left 3-Ulnar) in females.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	12
2	-1.5 to -0.5	75
3	-0.5 to 0.5	97
4	0.5 to 1.5	49
5	1.5 to 2.5	9
6	> 2.5	5

Figure 13. Means ($\overline{X}$) and linear regression (L) of paternal age factor on palm factor 3 (<u>b-c</u>) in females.

by paternal age factor in Figure 14. As paternal age increases, mean c-d ridge count increases linearly, with highest values in the highest paternal age groups.

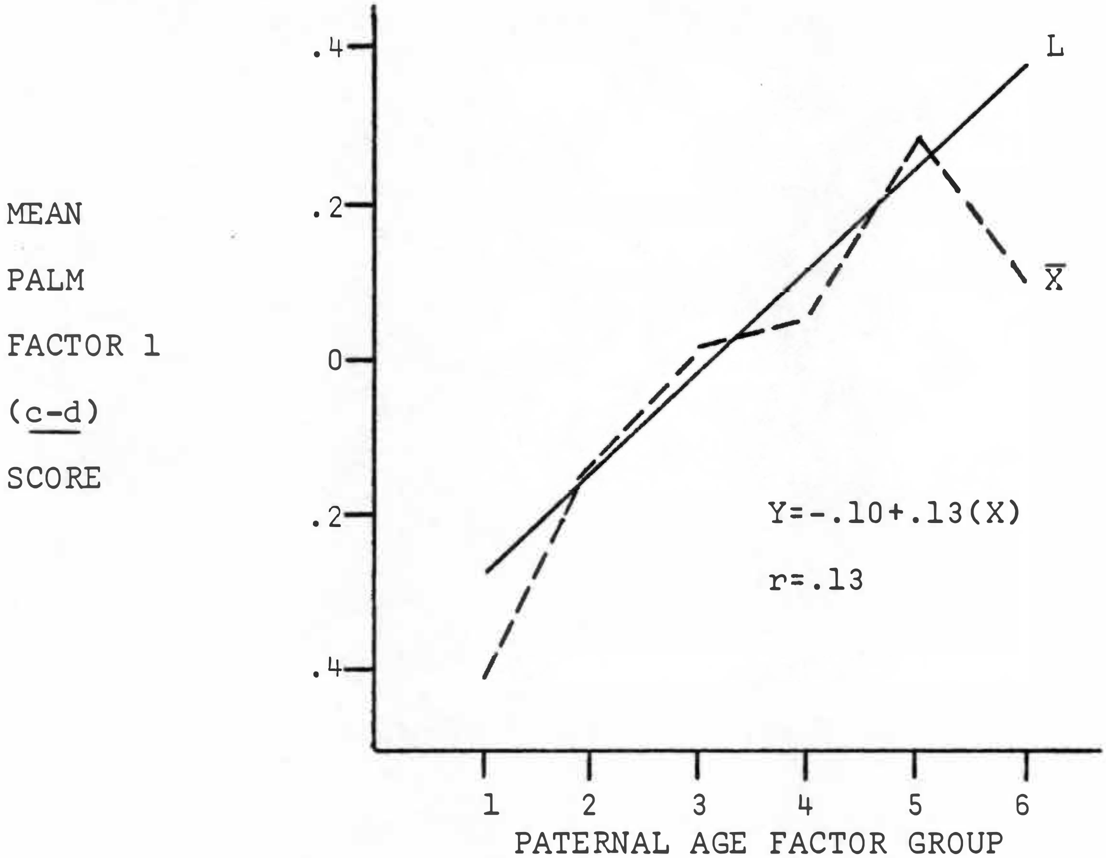
The data also indicate that a-b ridge counts (palm factor three) are highest in male offspring of intermediate aged fathers, as shown in Figure 15, while lowest a-b ridge counts are found in offspring of older fathers.

In addition to the paternal age effects on interdigital area ridge counts, a U-shaped distribution of ridge counts of left D-accessory patterns is found in male offspring. As shown in Figure 16, highest values for this trait are found at low and high paternal ages.

III. BIRTH ORDER EFFECTS

Birth order appears to produce significant variation in ridge counts on both fingers and palms in females and on palms in males. Results of linear and quadratic regressions are summarized in Tables 16 to 18.

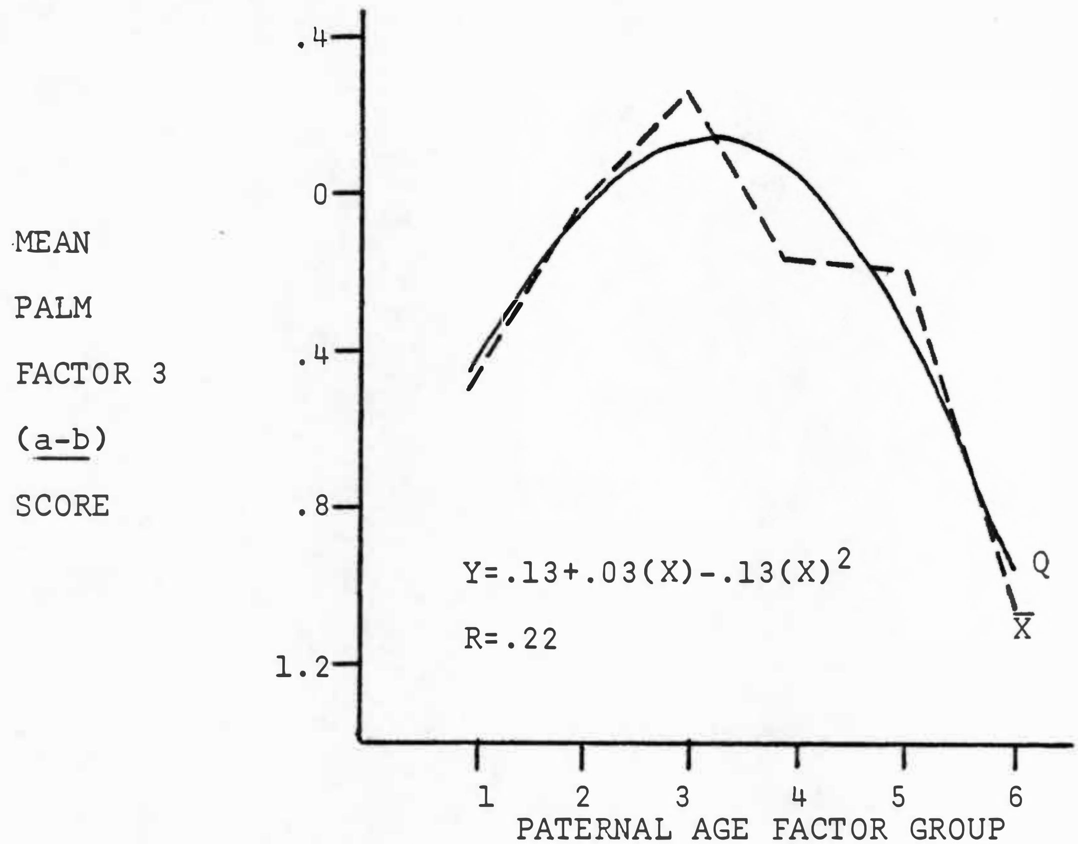
Although birth order does not appear to affect finger ridge counts in males, in females three finger ridge count factors show significant trends as birth order increases; these factors involve digits one, two, four and five. On the thumb (finger factor three), ulnar counts are lowest in the lowest birth order categories; they tend to increase steadily through the intermediate



Paternal Age Factor Groups

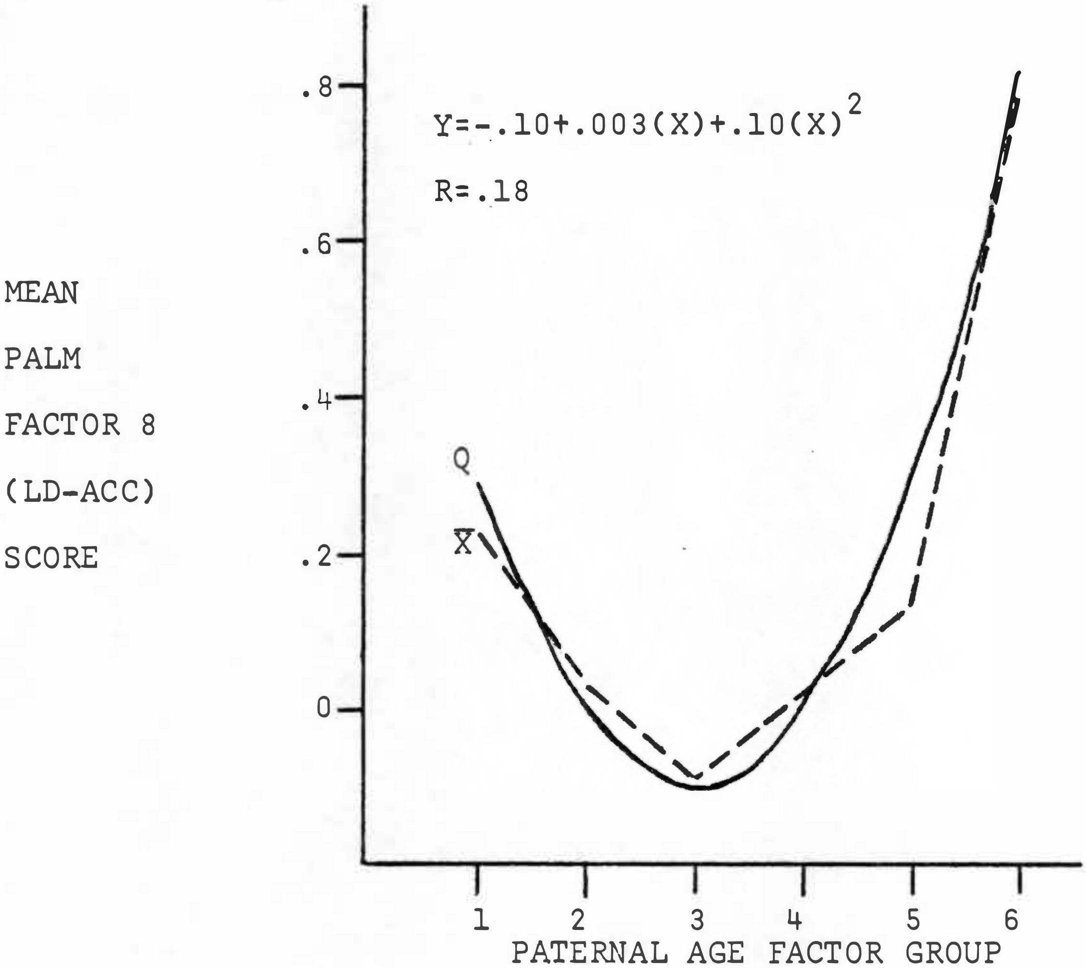
Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 14. Means ($\overline{X}$) and linear regression (L) of paternal age factor on palm factor 1 (c-d) in males.



Paternal Age Factor Group		
Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 15. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on palm factor 3 (a-b) in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 16. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on palm factor 8 (Left D-accessory) in males.

Table 16. Results from linear and quadratic regressions of birth order factor on dermatoglyphic factors (males).

Variable	d.f.	P4 (RC-Uln vs. RC-Rad) S.S.	M.S.	F	P11 (RD-accessory) S.S.	M.S.	F
Due to linear	1	.24	.24	.24	6.29	6.29	6.45*
Residual	211	211.76	1.00		205.72	.97	
Due to quadratic	2	5.07	2.54	2.57	8.63	4.31	4.45*
Residual	210	206.93	.98		203.38	.97	
Reduction in S.S. due to quadratic	1	4.83	4.83	4.90*	2.34	2.34	2.42

* p<.05 S.S.=Sum of Squares M.S.=Mean Square

Table 17. Results from linear and quadratic regressions of birth order factor on finger factors (females).

Variable	d.f.	F1 (5-4 Radial)			F2 (2-Ulnar)		
		S.S.	M.S.	F	S.S.	M.S.	F
Due to linear	1	4.00	4.00	4.04*	1.26	1.26	1.26
Residual	245	242.01	.99		244.75	1.00	
Due to quadratic	2	4.18	2.09	2.10	4.41	2.20	2.22
Residual	244	241.82	.99		241.60	.99	
Reduction in S.S. due to quadratic	1	.19	.19	.19	3.15	3.15	3.18*

Variable	F3 (1-Ulnar)		
	S.S.	M.S.	F
Due to linear	3.16	3.17	3.20
Residual	242.83	.99	
Due to quadratic	10.83	5.44	5.65**
Residual	235.12	.96	
Reduction in S.S. due to quadratic	7.71	7.71	8.01**

* $p<.05$ ** $p<.01$

S.S.=Sum of Squares M.S.=Mean Square

Table 18. Results from linear and quadratic regressions of birth order factor on palm factors (females).

Variable	d.f.	P1 (a-b) S.S.	P1 (a-b) M.S.	P1 (a-b) F	P3 (b-c) S.S.	P3 (b-c) M.S.	P3 (b-c) F
Due to linear	1	.01	.01	.01	6.22	6.22	6.36*
Residual	245	246.00	1.00		239.78	.98	
Due to quadratic	2	10.48	5.24	5.43*	8.23	4.12	4.22*
Residual	244	235.52	.97		237.77	.97	
Reduction in S.S. due to quadratic	1	10.48	10.48	10.86**	2.01	2.01	2.06

Variable	P4 (RD-Radial) S.S.	P4 (RD-Radial) M.S.	P4 (RD-Radial) F	P9 (LD-Rad vs. LC-Uln) S.S.	P9 (LD-Rad vs. LC-Uln) M.S.	P9 (LD-Rad vs. LC-Uln) F
Due to linear	.00	.00	.00	6.24	6.24	6.38*
Residual	246.00	1.00		239.77	.98	
Due to quadratic	4.38	2.19	2.21	10.09	5.04	5.21**
Residual	241.62	.99		235.92	.97	
Reduction in S.S. due to quadratic	4.38	4.38	4.42*	3.85	3.85	3.98*

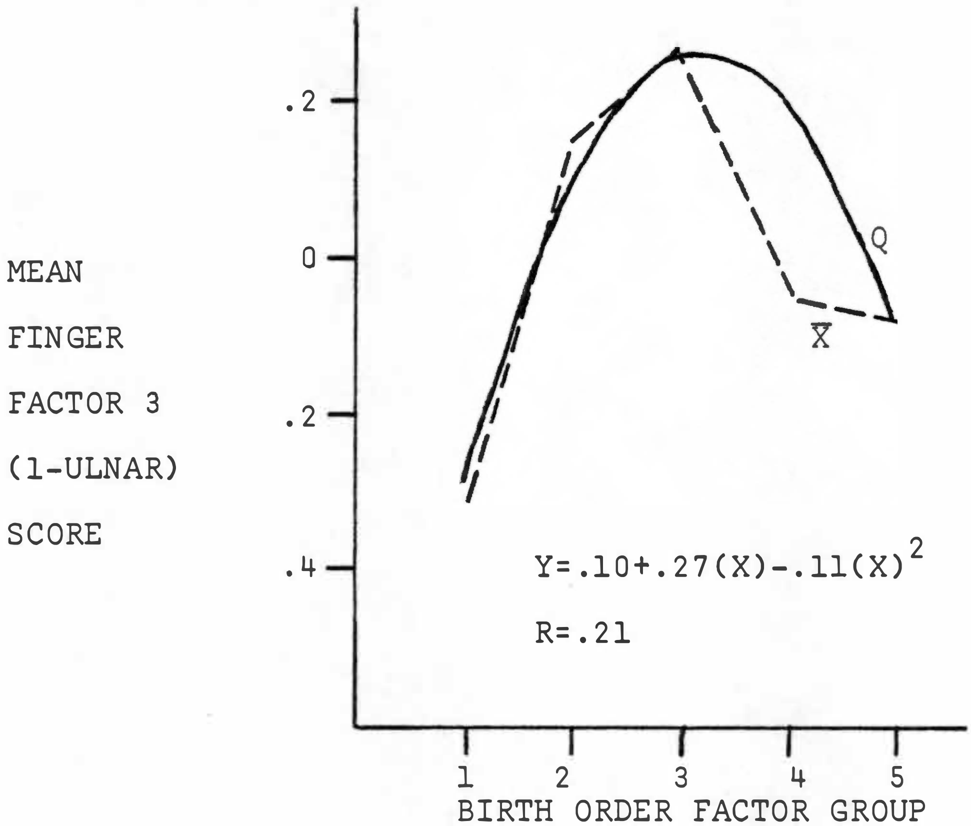
* $p<.05$ ** $p<.01$
S.S.=Sum of Squares M.S.=Mean Square

birth orders, and finally decrease again in high birth order groups, as shown in Figure 17.

Ulnar counts on digit two (finger factor two) of females also have a parabolic distribution in relation to birth order; lowest values are found at the highest birth orders, and there is a slight elevation in ulnar counts in intermediate birth orders. The regression of birth order on ulnar counts for digit two is graphed in Figure 18. In females there is also a linear decrease in radial counts on digits four and five (finger factor one) as birth order increases, as shown in Figure 19.

Birth order is also associated with dermatoglyphic variation on the palms of both males and females. On male palms, a linear increase in the value of right D-accessory ridge counts (palm factor 11) is associated with a rise in birth order. As may be seen in Figure 20, mean ridge count for this variable is low in the highest birth order; however, the sample size for this group is small (N=3), and means for the other birth order categories fit the linear regression quite well.

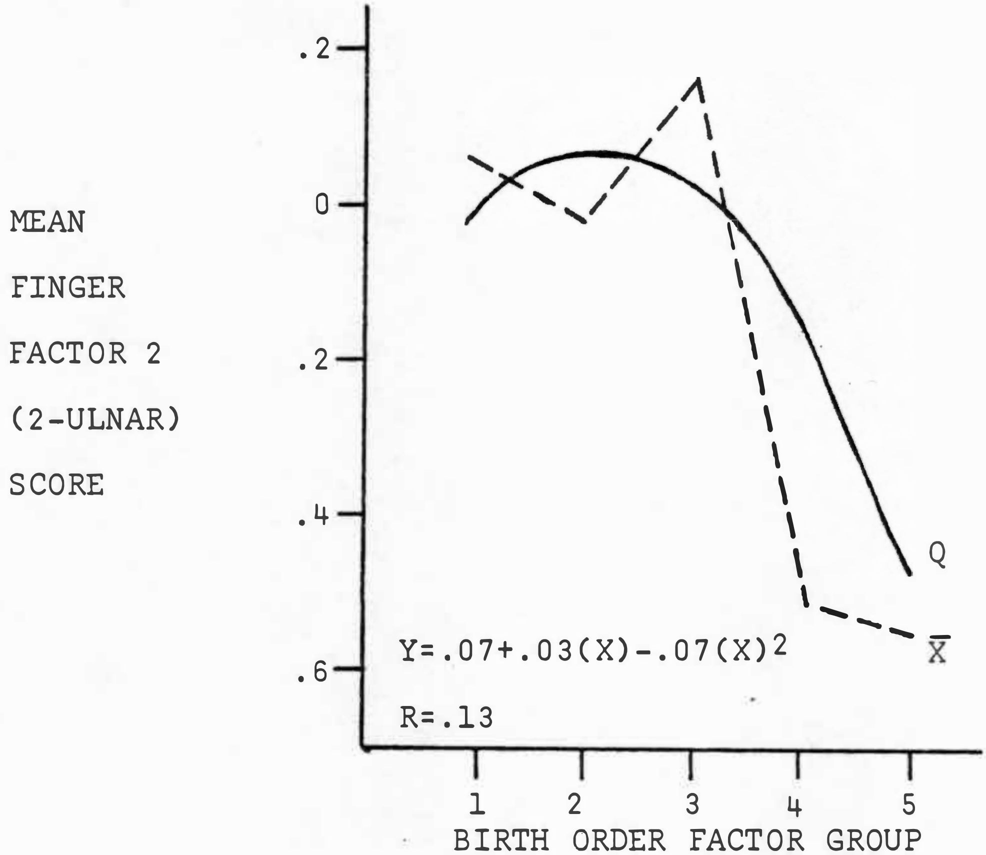
Palm factor four in males, which is graphed in Figure 21, revealed a parabolic shaped distribution in relation to birth order; low values are found in high and low birth order groups. Factor four contrasts CU with CR counts on the right hand. A high score for this factor is produced by high mean ridge counts for CR



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

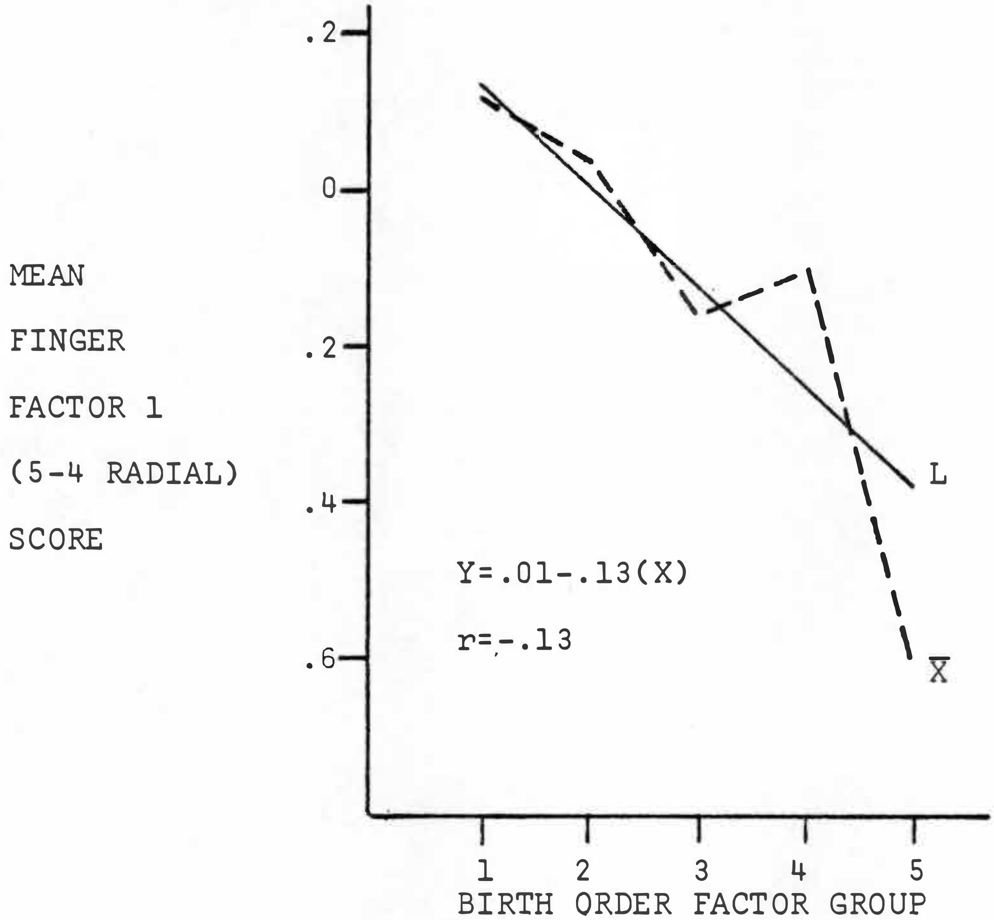
Figure 17. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on finger factor 3 (1-Ulnar) in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

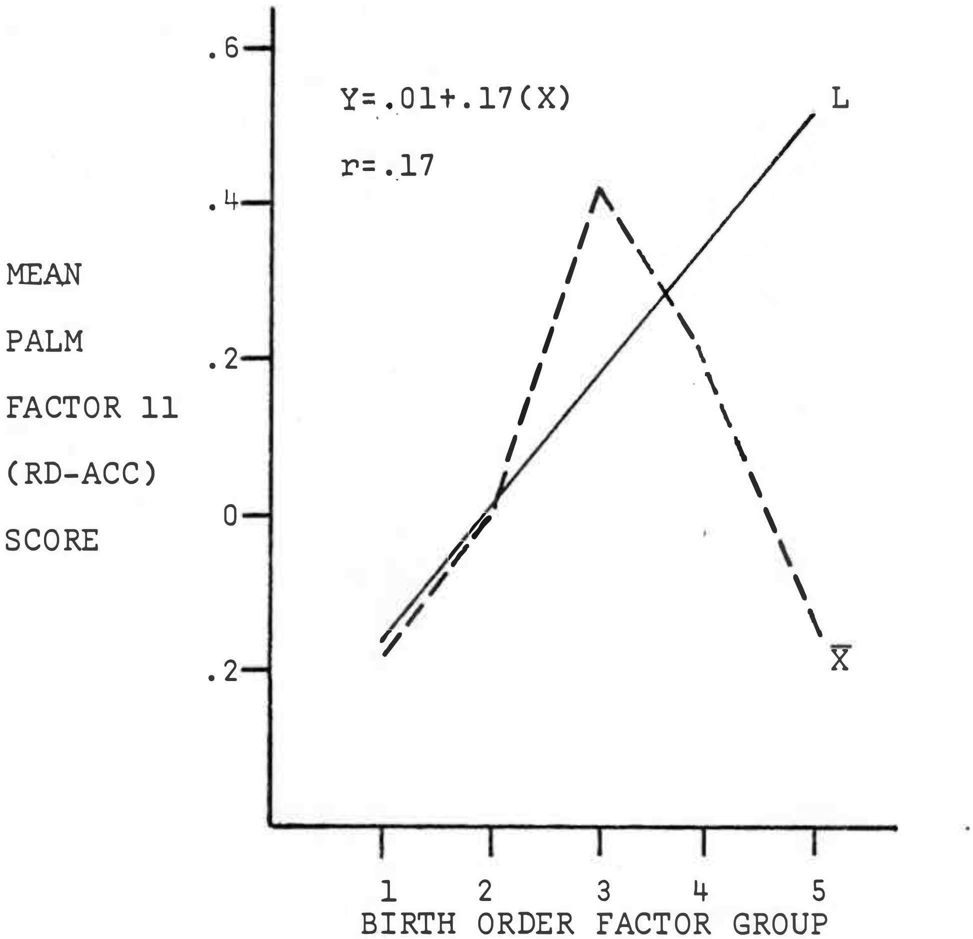
Figure 18. Means ($\bar{X}$) and quadratic regression (Q) of birth order factor on finger factor 2 (2-Ulnar) in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

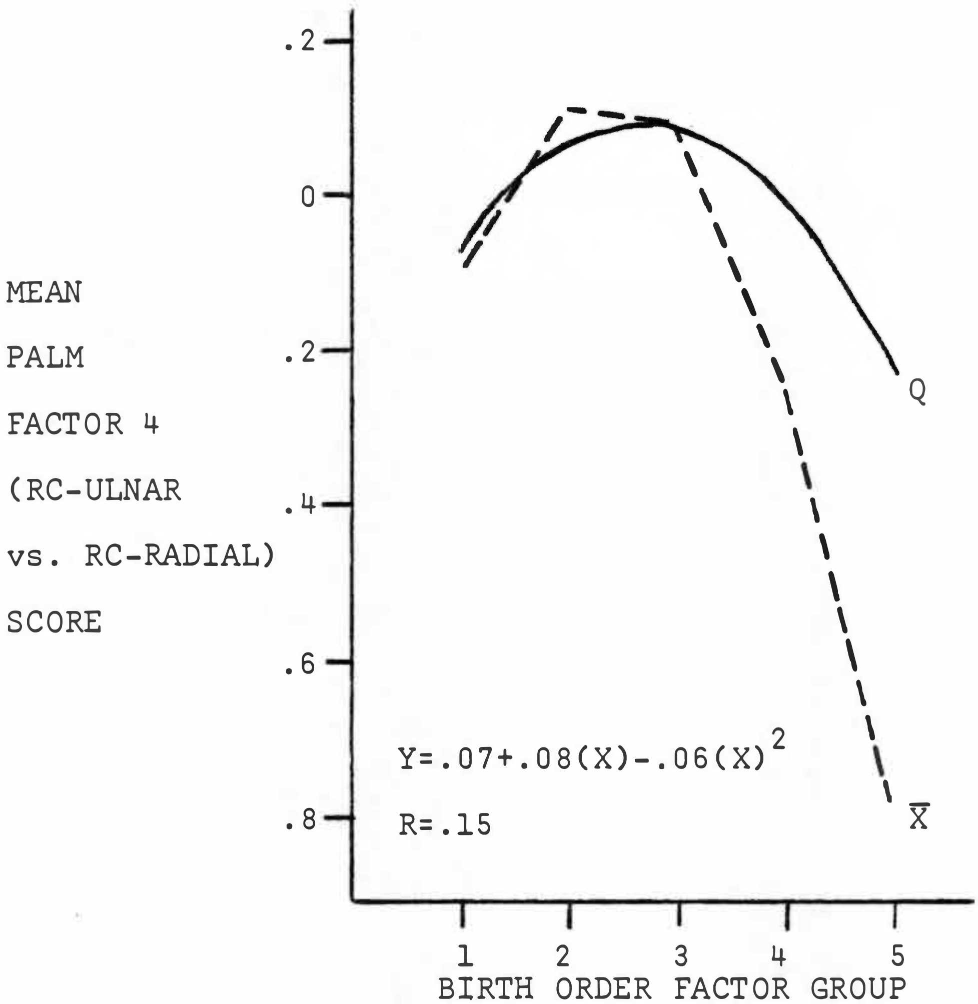
Figure 19. Means ($\overline{X}$) and linear regression (L) of birth order factor on finger factor 1 (5-Radial, 4-Radial) in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	78
2	-0.5 to 0.5	87
3	0.5 to 1.5	34
4	1.5 to 2.5	11
5	> 2.5	3

Figure 20. Means ($\overline{X}$) and linear regression (L) of birth order factor on palm factor 11 (Right D-accessory) in males.



Birth Order Factor Groups

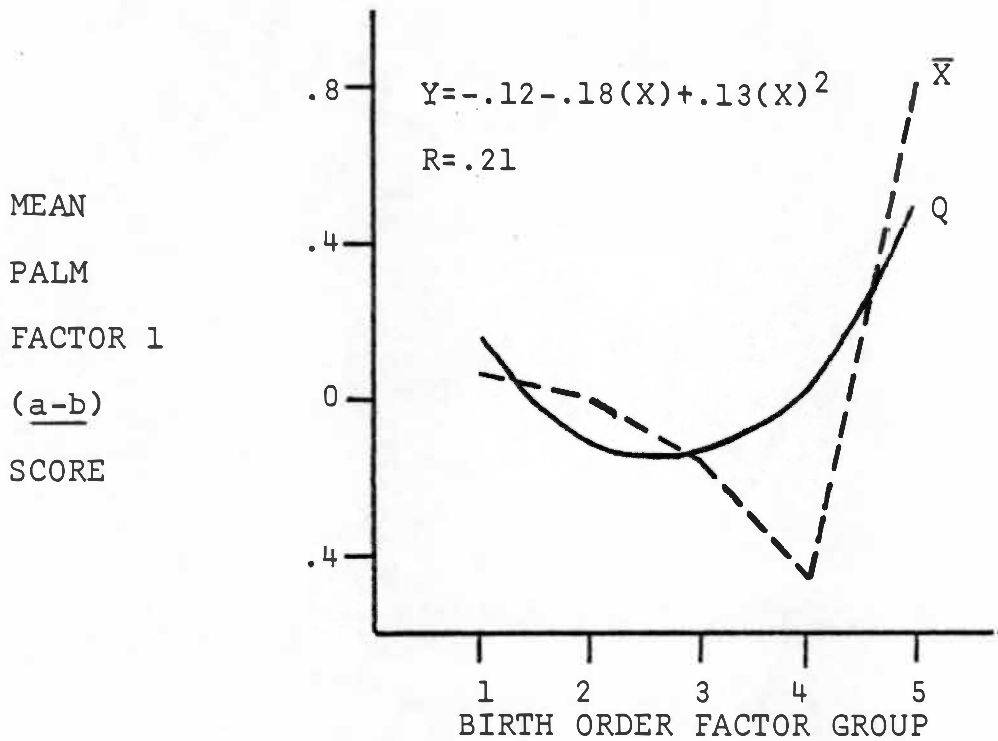
Code	Value	N
1	< -0.5	78
2	-0.5 to 0.5	87
3	0.5 to 1.5	34
4	1.5 to 2.5	11
5	> 2.5	3

Figure 21. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on palm factor 4 (Right C-Ulnar versus Right C-Radial) in males.

patterns or an increased frequency of these patterns. A low score for this factor results from greater size or frequency of CU patterns. Mean scores for each birth order category suggest that the highest frequency or or largest size of CR patterns occurs in individuals of intermediate birth orders; CU patterns are larger or more frequent than CR patterns at low and high birth orders on the right hands of males.

Birth order appears to affect the palms of females to a greater extent than those of males. Four ridge count factors reveal significant linear or U-shaped trends as birth order increases. As may be seen in Figure 22, a-b ridge count (palm factor one) has a U-shaped distribution, with elevated counts observed at low and high birth orders. A linear increase of ridge counts in the third interdigital area (palm factor three) occurs as birth order increases (Figure 23). High birth order, therefore, appears to be associated with the largest ridge counts for the second and third interdigital areas of the palm in females.

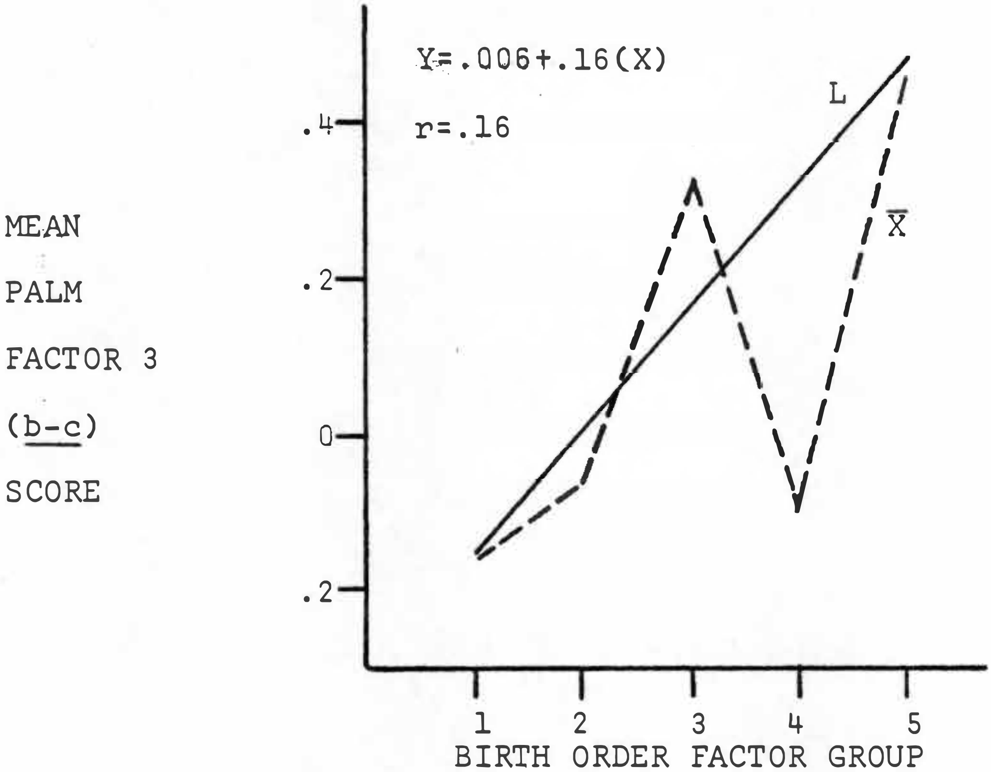
The two remaining factors which are correlated with birth order involve ridge counts of palmar patterns. DR counts on the right hands of females have a U-shaped distribution, which is presented in Figure 24. The intermediate birth order categories show the lowest values for right DR ridge counts, while low and high



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

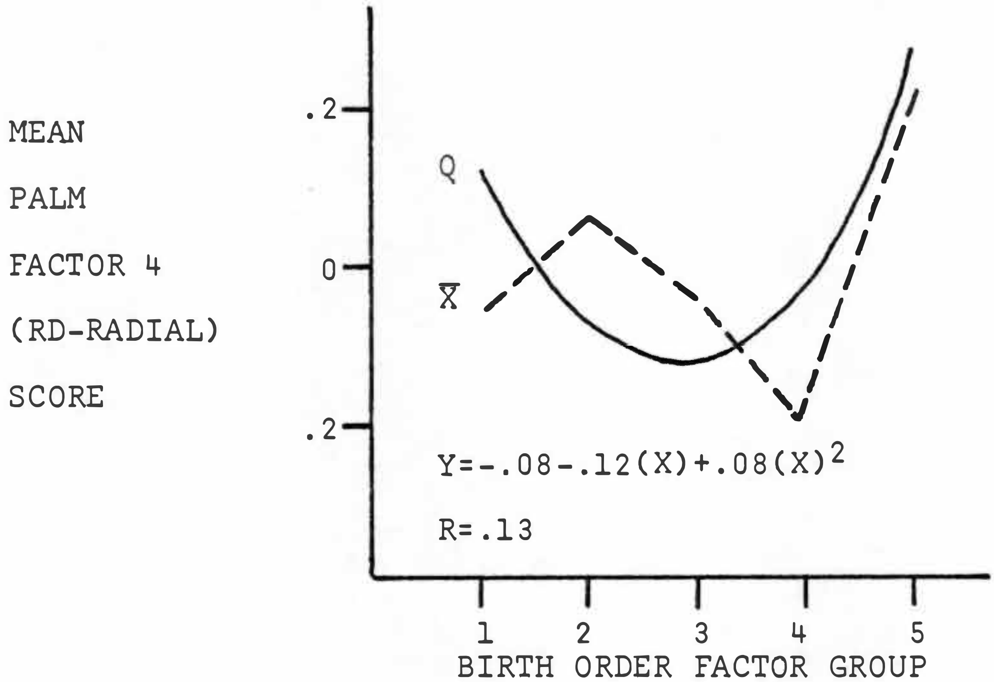
Figure 22. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on palm factor 1 (a-b) in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

Figure 23. Means ($\overline{X}$) and linear regression (L) of birth order factor on palm factor 3 (b-c) in females.



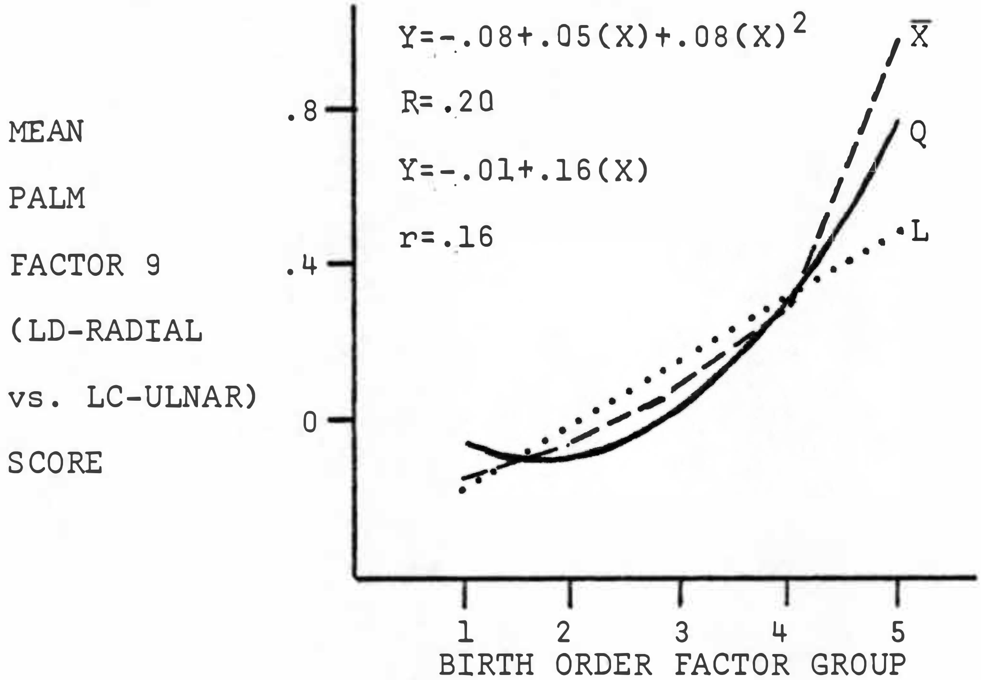
Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

Figure 24. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on palm factor 4 (Right D-Radial) in females.

birth order are associated with larger ridge counts.

A similar tendency is found on the left hand of females. Palm factor nine, which contrasts DR with CU ridge counts on the left hand, exhibits a significant fit to both linear and quadratic regression lines, as shown in Figure 25. Mean scores for this factor suggest that the largest size or frequency of DR patterns occurs in the highest birth orders, though they may be slightly elevated at low birth order. Although this trend is not as marked as it is on the right hand, the two hands are nonetheless similar. Regressions of birth order on palm factor nine also suggest that the greatest size or frequency of CU patterns on left hands of females occurs at low birth orders, and it decreases as birth order increases.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

Figure 25. Means ($\overline{X}$), linear regression (L) and quadratic regression (Q) of birth order factor on palm factor 9 (Left D-Radial versus Left C-Ulnar) in females.

CHAPTER VII

PARENTAL AGE AND BIRTH ORDER EFFECTS ON RIDGE WIDTH

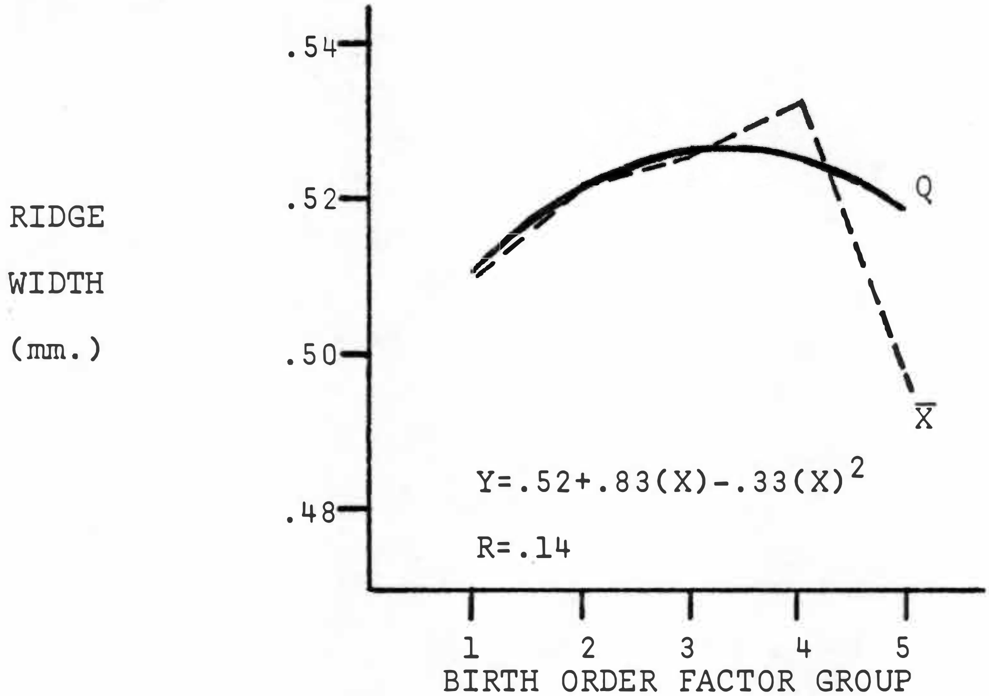
The data do not support the hypothesis that either paternal age or maternal age affects the width of ridges in the second interdigital area. However, birth order does produce a parabolic shaped distribution of ridge width. In females the quadratic regression of the birth order factor on ridge width causes a significant reduction in the sum of squares, while in males it approaches significance. Results of regressions on ridge width may be found in Table 19.

Regression lines and mean ridge width for each birth order factor group are presented in Figures 26 and 27. As may be seen in these figures, ridges in the second interdigital area tend to increase in width as birth order increases. This trend continues until the highest birth order factor group, in which ridge width decreases sharply in both males and females. It appears from the data that the most narrow ridges occur in individuals of very high birth order. Primogeniture also appears to be associated with narrow ridges, although they are not as narrow as those in the very high birth order group. Intermediate birth order seems to be associated with increased ridge width in both sexes.

Table 19. Results from linear and quadratic regressions of birth order factor on ridge width.

Variable	Males				Females			
	d.f.	S.S.	M.S.	F	d.f.	S.S.	M.S.	F
Due to linear	1	.000	.000	.05	1	.003	.003	1.61
Residual	211	.574	.003		245	.499	.002	
Due to quadratic	2	.008	.004	1.48	2	.010	.005	2.53
Residual	210	.567	.003		244	.492	.002	
Reduction in S.S. due to quadratic	1	.007	.007	2.93	1	.007	.007	3.45*

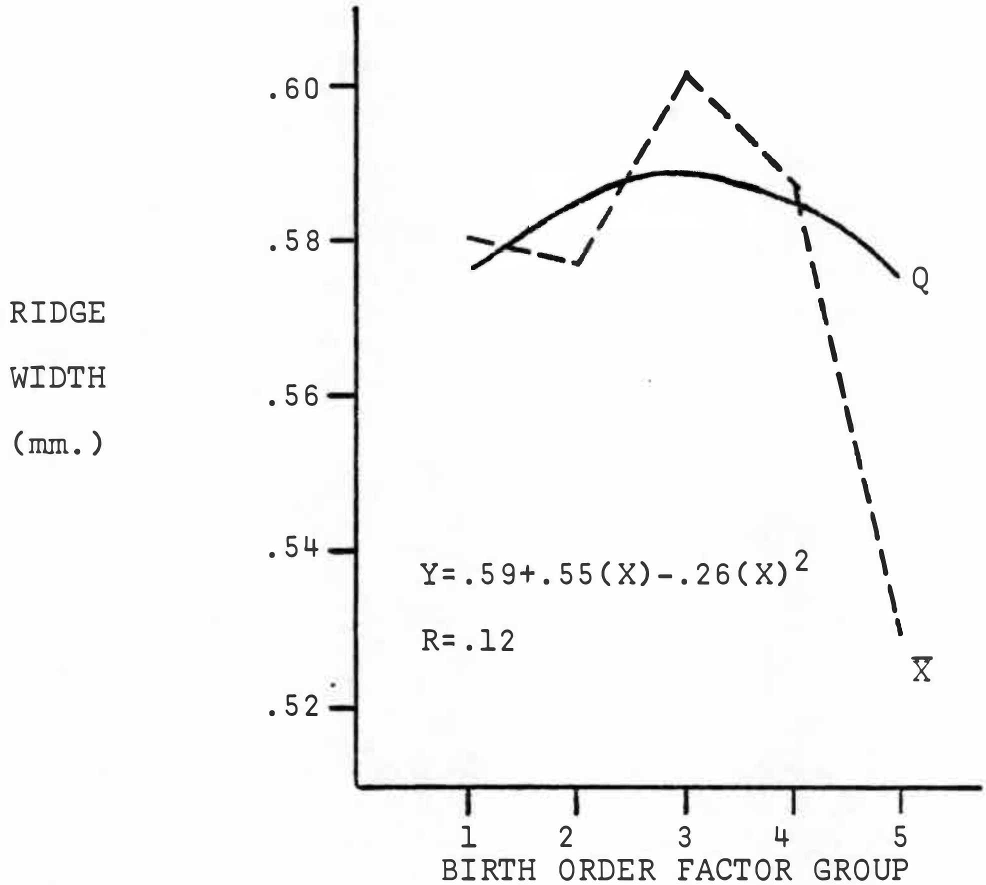
* $p<.05$ S.S.=Sum of Squares M.S.=Mean Square



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

Figure 26. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on ridge width in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	78
2	-0.5 to 0.5	87
3	0.5 to 1.5	34
4	1.5 to 2.5	11
5	> 2.5	3

Figure 27. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on ridge width in males.

CHAPTER VIII

PARENTAL AGE AND BIRTH ORDER EFFECTS ON ASYMMETRY

All three variables under consideration--maternal age, paternal age, and birth order--appear to have an effect upon the magnitude of dermatoglyphic asymmetry. In the following sections, significant results will be presented from regression analyses of the relationships between dermatoglyphic asymmetry and each of these variables.

I. MATERNAL AGE EFFECTS

In male offspring, increasing age of the mother appears to produce a linear increase in bimanual asymmetry of finger ridge counts. Results of linear and quadratic regressions of the maternal age factor on asymmetry in males are presented in Table 20. Maternal age effects on digital asymmetry in males seems to be more pronounced for ulnar than for radial counts, since two of the three significant asymmetry variables reflect ulnar counts (5-Ulnar, summed ulnar counts), and the third variable incorporates ulnar ridge counts (total asymmetry). Regressions of maternal age on these three variables are graphed in Figures 28 to 30. An increasing trend

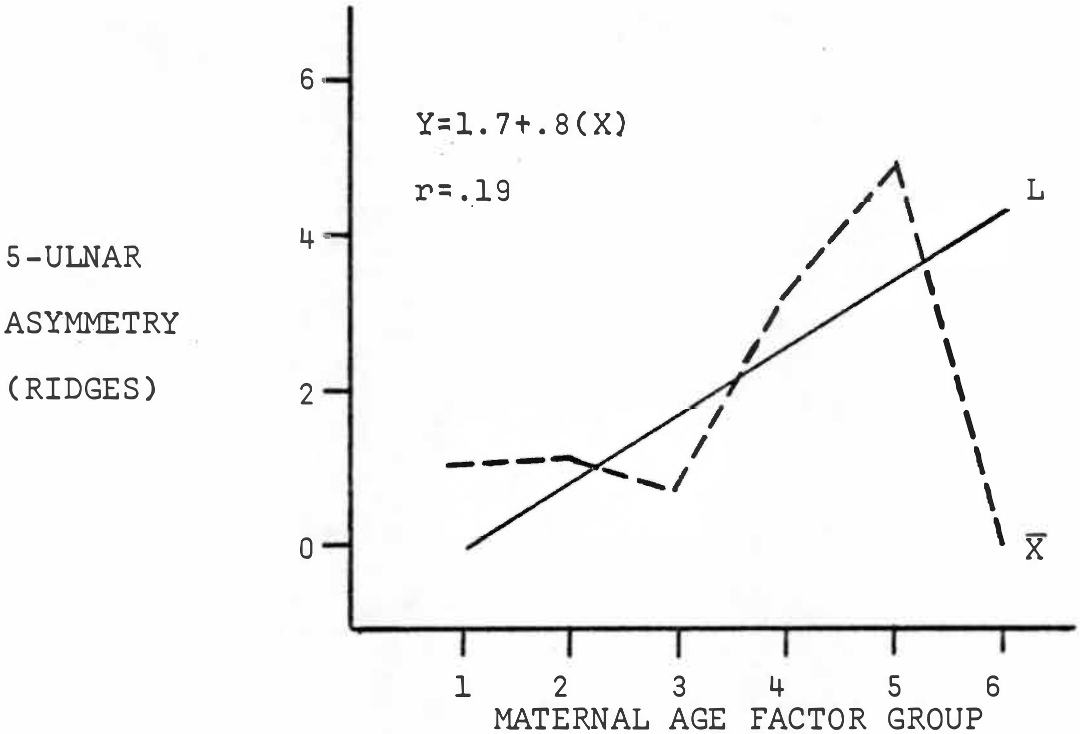
Table 20. Results of linear and quadratic regressions of maternal age factor on asymmetry (males).

Variable	d.f.	5-Ulnar S.S.	5-Ulnar M.S.	5-Ulnar F	Ulnar S.S.	Ulnar M.S.	Ulnar F
Due to linear	1	154.09	154.09	8.09**	1,051.95		4.76*
Residual	211	4,021.35	19.06		46,629.75	220.99	
Due to quadratic	2	163.60	81.80	4.28*	1,131.70	565.85	2.55
Residual	210	4,011.83	19.10		46,550.00	221.67	
Reduction in S.S. due to quadratic	1	9.52	9.52	.50	79.75	79.75	.36

Variable	Total S.S.	Total M.S.	Total F	C-Ulnar S.S.	C-Ulnar M.S.	C-Ulnar F
Due to linear	2,056.68	2,056.68	6.00*	26.80	26.80	.91
Residual	72,290.50	342.61		6,207.12	29.42	
Due to quadratic	2,150.38	1,075.19	3.13*	158.37	79.18	2.74
Residual	72,196.80	343.79		6,075.55	28.93	
Reduction in S.S. due to quadratic	93.70	93.70	.27	131.57	131.57	4.55*

* $p<.05$ ** $p<.01$

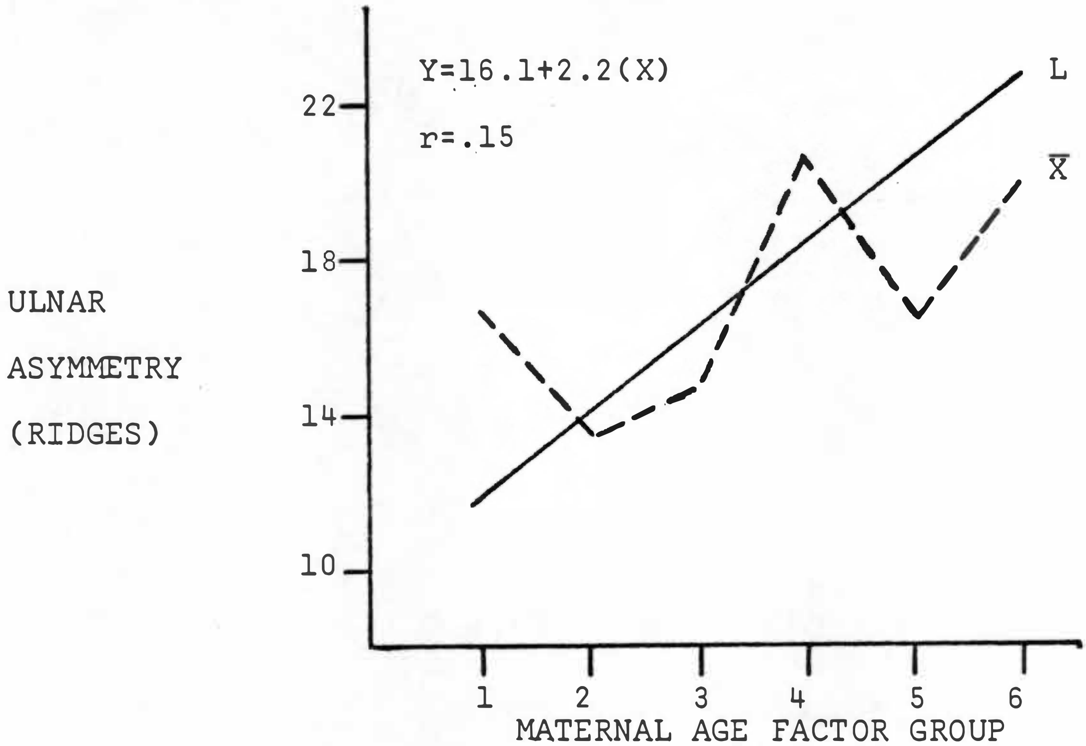
S.S.=Sum of Squares M.S.=Mean Square



Maternal Age Factor Groups

Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

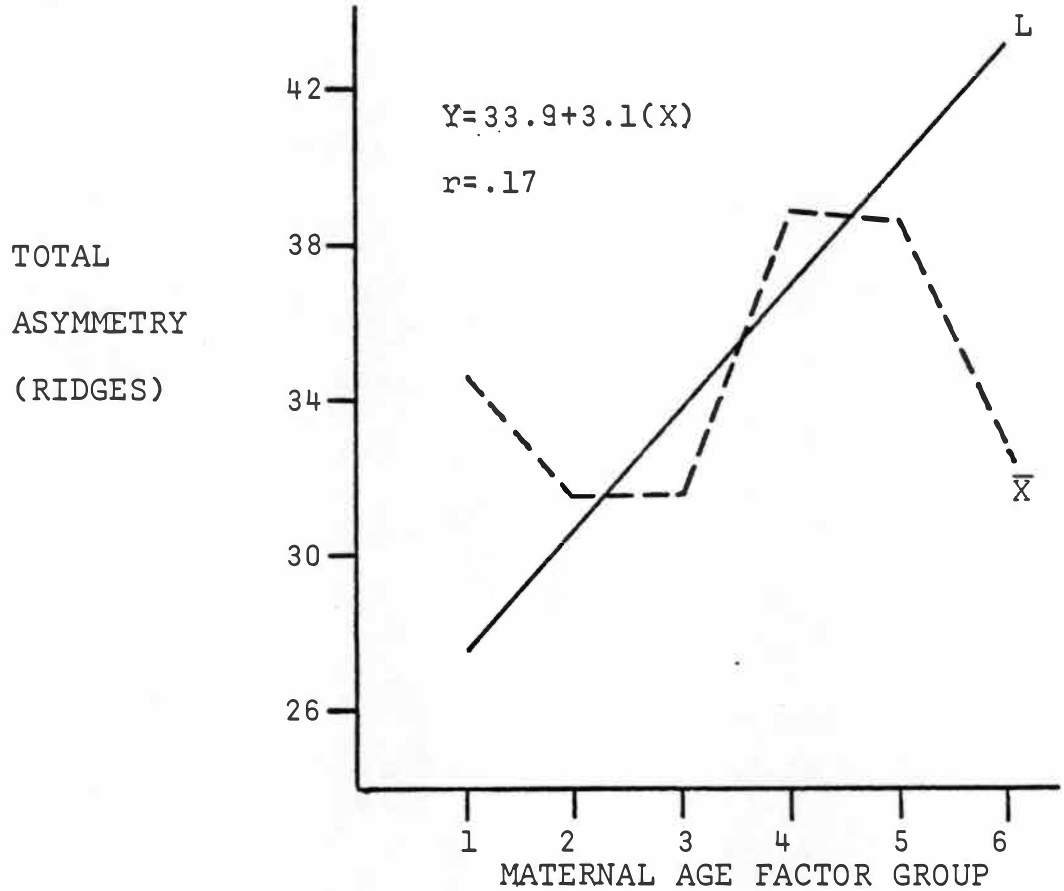
Figure 28. Means ($\overline{X}$) and linear regression (L) of maternal age factor on 5-Ulnar asymmetry in males.



Maternal Age Factor Groups

Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

Figure 29. Means ($\overline{X}$) and linear regression (L) of maternal age factor on total asymmetry of ulnar counts in males.



Maternal Age Factor Groups

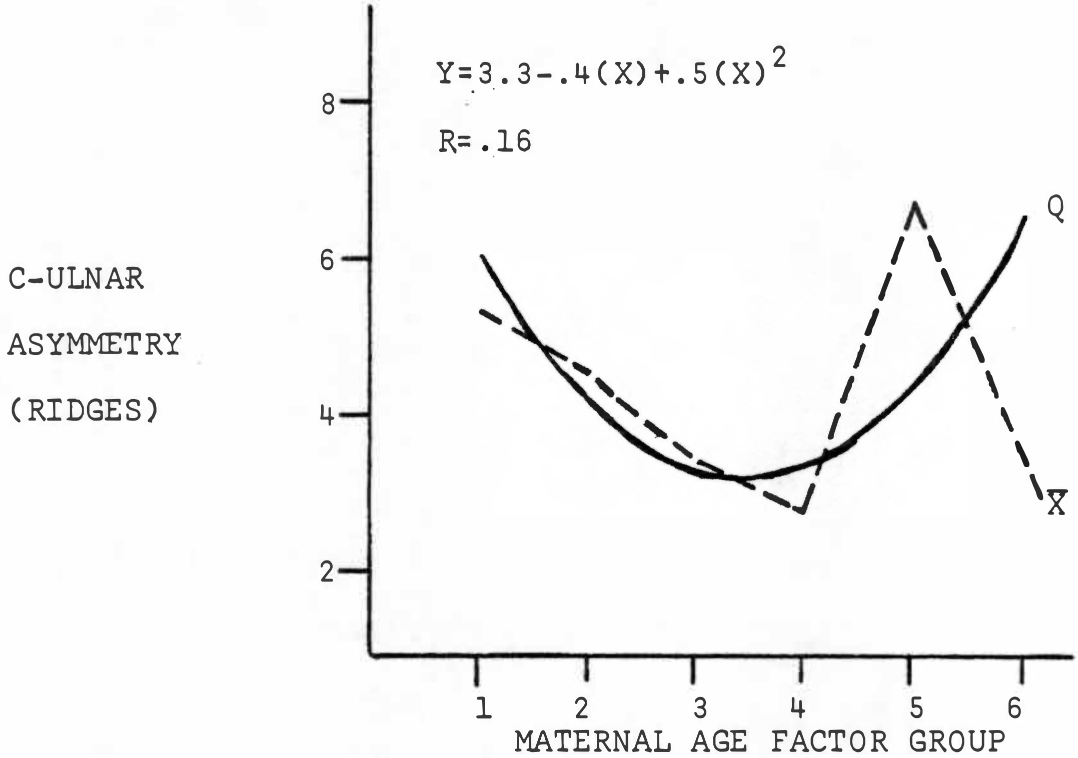
Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

Figure 30. Means ($\overline{X}$) and linear regression (L) of maternal age factor on total finger ridge count asymmetry in males.

in level of asymmetry as maternal age increases is clearly shown by the linear regressions, and it is likely that ulnar asymmetry on digit five makes a large contribution to the summary variables, since it is significant when considered separately. Examination of mean asymmetry values for these three variables indicates that asymmetry in males is also slightly elevated at very young maternal ages, and that there may be a tendency for low asymmetry at very high maternal ages. However, the very small sample size in the highest maternal age group (N=3) makes the latter observation somewhat tenuous. On male palms, a U-shaped distribution of asymmetry for CU ridge counts is observed. As shown in Figure 31, asymmetry is high at low and high maternal ages, while it is reduced at intermediate maternal ages.

Thus, in male offspring, ridge count asymmetry appears to be lowest at intermediate maternal ages. It is elevated at advanced maternal ages, and it is somewhat higher in offspring of very young mothers. In general, the data indicate that advancing maternal age produces an increase of finger and palm asymmetry in male offspring.

However, the maternal age effect is quite different in female offspring. Only one variable, ulnar counts on digit two, shows a significant maternal age effect. Results of the regression of maternal age on this variable



Maternal Age Factor Groups

Code	Value	N
1	< -1.5	10
2	-1.5 to -0.5	60
3	-0.5 to 0.5	80
4	0.5 to 1.5	48
5	1.5 to 2.5	12
6	> 2.5	3

Figure 31. Means ($\overline{X}$) and quadratic regression (Q) of maternal age factor on C-Ulnar asymmetry in males.

are presented in Table 21, and the regression line and means are graphed in Figure 32. As may be seen from the graph, asymmetry tends to increase through intermediate maternal ages, then shows a decreasing trend in the higher maternal age groups. Ulnar asymmetry on digit two in females, therefore, appears to be low in female offspring of very young and older mothers.

II. PATERNAL AGE EFFECTS

Perhaps the most surprising result of this analysis is the large number of paternal age effects found in male offspring. Eight variables in males and one in females indicate a significant paternal age effect on dermatoglyphic asymmetry. These are summarized in Tables 22 to 25.

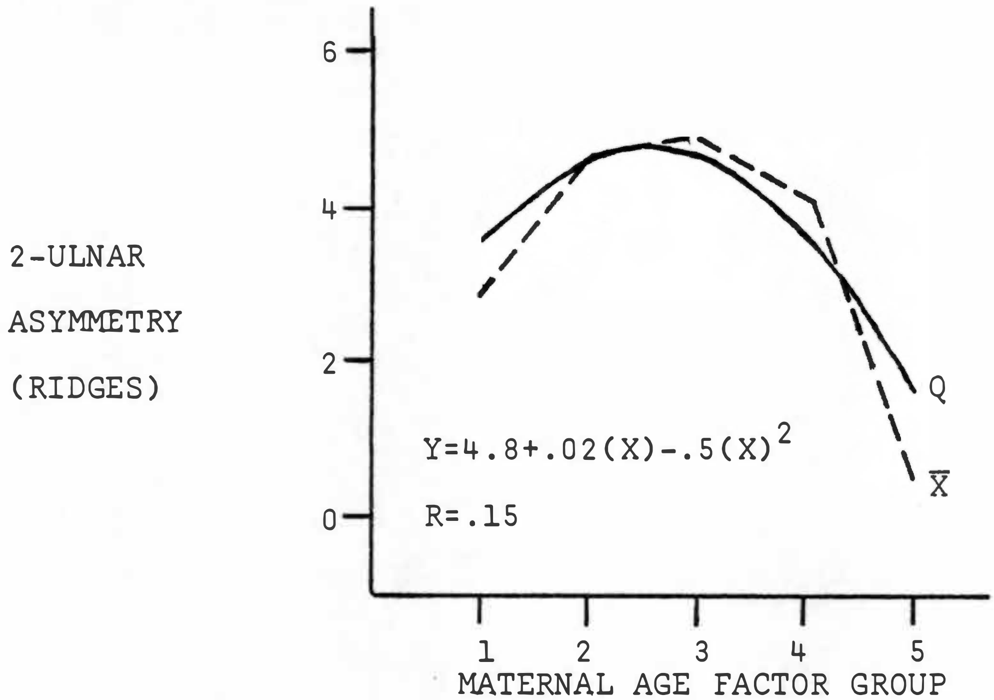
In males, asymmetry of ulnar ridge counts on digits one and two has a significant parabolic distribution. Asymmetry is lowest in offspring of young fathers; it tends to increase sharply through intermediate paternal ages, then begins to decrease at the highest paternal ages, as seen in Figures 33 and 34. Asymmetry or radial counts on digit four is low until the advanced paternal ages, when it tends to increase markedly (Figure 35).

In addition to these variables, the three summed asymmetry values for fingers--ulnar, radial, and total--reflect significant differences in males in relationship

Table 21. Results of linear and quadratic regressions of maternal age factor on asymmetry (females).

		2-Ulnar		
Variable	d.f.	S.S.	M.S.	F
Due to linear	1	16.01	16.01	.48
Residual	245	8,179.89	33.39	
Due to quadratic	2	179.52	89.76	2.73
Residual	244	8,016.37	32.85	
Reduction in S.S. due to quadratic	1	163.52	163.52	4.98**

** $p<.01$
S.S.=Sum of Squares
M.S.=Mean Square



Maternal Age Factor Groups

Code	Value	N
1	< -1.0	33
2	-1.0 to 0.0	88
3	0.0 to 1.0	94
4	1.0 to 2.0	21
5	> 2.0	11

Figure 32. Means ($\overline{X}$) and quadratic regression (Q) of maternal age factor on 2-Ulnar asymmetry in females.

Table 22. Results of linear and quadratic regressions of paternal age factor on individual finger asymmetry (males).

		4-Radial			2-Ulnar		
Variable	d.f.	S.S.	M.S.	F	S.S.	M.S.	F
Due to linear	1	35.36	35.36	3.47	44.67	44.67	1.54
Residual	211	2,152.56	10.20		6,096.43	28.89	
Due to quadratic	2	66.77	33.39	3.30*	187.56	93.78	3.31*
Residual	210	2,121.14	10.10		5,953.53	28.35	
Reduction in S.S. due to quadratic	1	31.42	31.42	3.11*	142.90	142.90	5.04**

	1-Ulnar		
	S.S.	M.S.	F
Due to linear	53.58	53.58	1.22
Residual	9,267.16	43.92	
Due to quadratic	266.41	133.21	3.09*
Residual	9,054.32	43.12	
Reduction in S.S. due to quadratic	212.84	212.84	4.94**

* $p<.05$ ** $p<.01$

S.S.=Sum of Squares M.S.=Mean Square

Table 23. Results of linear and quadratic regressions of paternal age factor on summed finger asymmetry (males).

Variable	d.f.	Radial S.S.	Radial M.S.	Radial F	Ulnar S.S.	Ulnar M.S.	Ulnar F
Due to linear	1	354.79	354.79	5.03*	790.24	790.24	3.56
Residual	211	14,886.49	70.55		46,891.46	222.23	
Due to quadratic	2	359.65	179.82	2.53	1,501.51	750.75	3.41*
Residual	210	14,881.63	70.86		46,180.19	219.91	
Reduction in S.S. due to quadratic	1	4.86	4.86	.07	711.27	711.27	3.23*

	Total S.S.	Total M.S.	Total F
Due to linear	2,204.02	2,204.02	6.45*
Residual	72,143.16	341.30	
Due to quadratic	2,802.60	1,401.30	4.11*
Residual	71,544.58	340.69	
Reduction in S.S. due to quadratic	598.58	598.58	1.76

* $p<.05$ S.S.=Sum of Squares M.S.=Mean Square

Table 24. Results of linear and quadratic regressions of paternal age factor on palm asymmetry (males).

Variable	d.f.	c-d S.S.	c-d M.S.	c-d F	b-c S.S.	b-c M.S.	b-c F
Due to linear	1	22.16	22.16	1.64	29.90	29.90	4.59*
Residual	211	2,851.14	13.51		1,374.72	6.52	
Due to quadratic	2	97.56	48.78	3.69*	30.24	15.12	2.31
Residual	210	2,775.73	13.22		1,374.38	6.54	
Reduction in S.S. due to quadratic	1	75.41	75.41	5.71**	.34	.34	.05

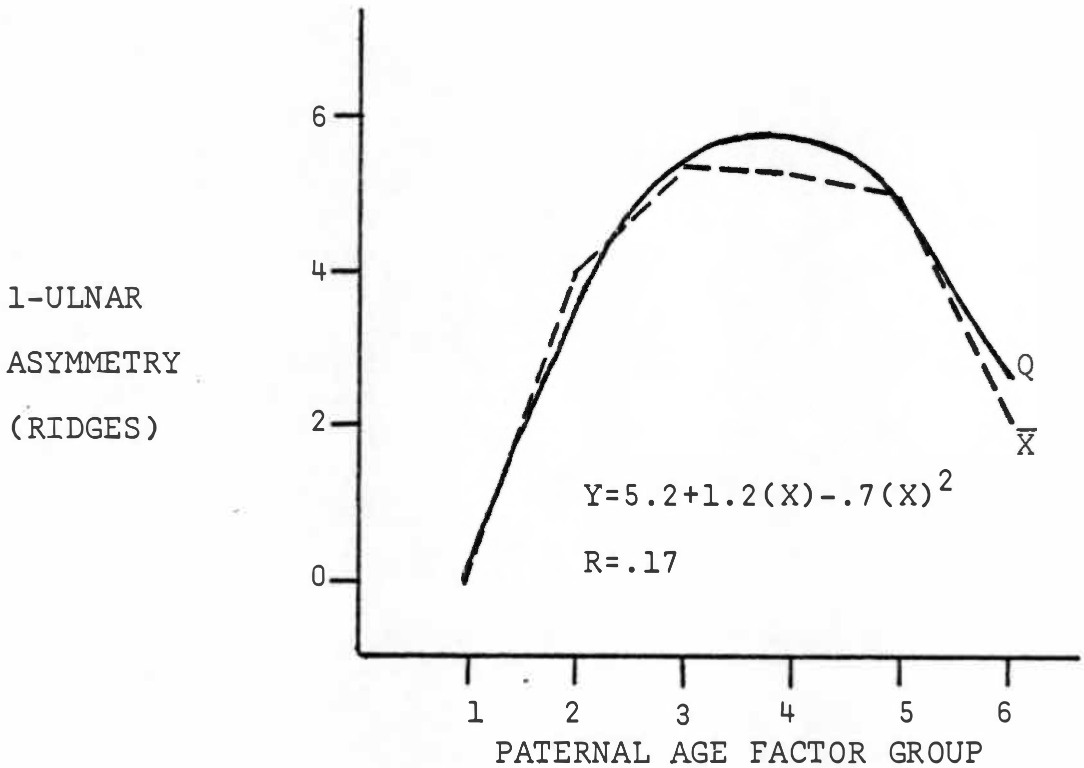
* $p<.05$ ** $p<.01$

S.S.=Sum of Squares M.S.=Mean Square

Table 25. Results of linear and quadratic regressions of paternal age factor on asymmetry (females).

Variable	d.f.	1-Radial S.S.	M.S.	F
Due to linear	1	48.26	48.26	4.70*
Residual	245	2,513.28	10.26	
Due to quadratic	2	52.84	26.42	2.57
Residual	244	2,508.70	10.28	
Reduction in S.S. due to quadratic	1	4.58	4.58	.45

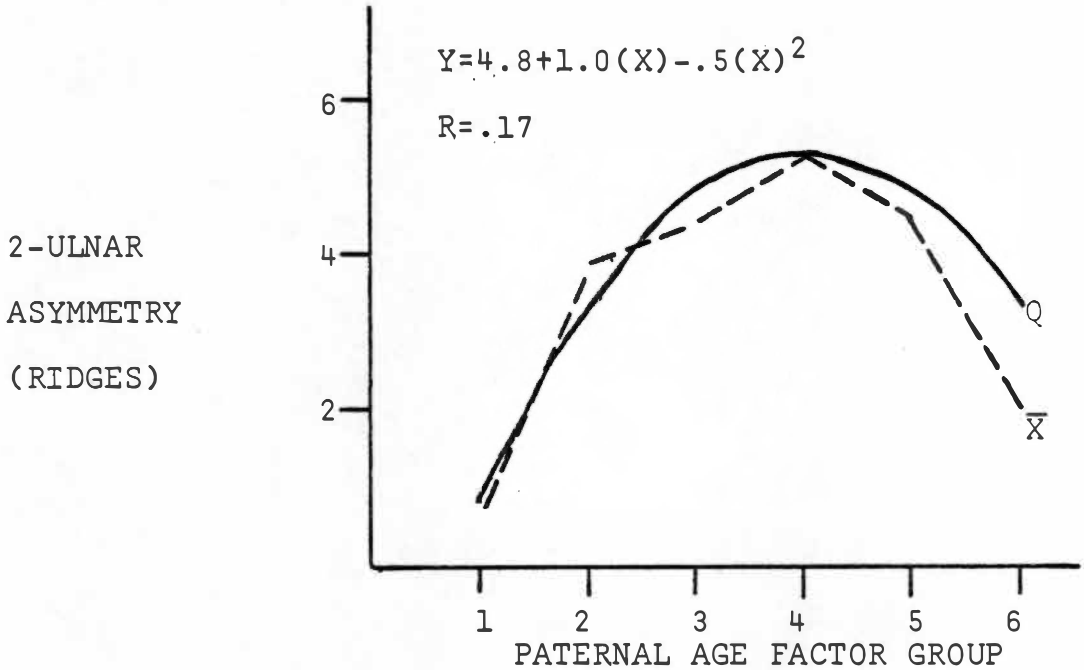
* $p<.05$
S.S.=Sum of Squares
M.S.=Mean Square



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

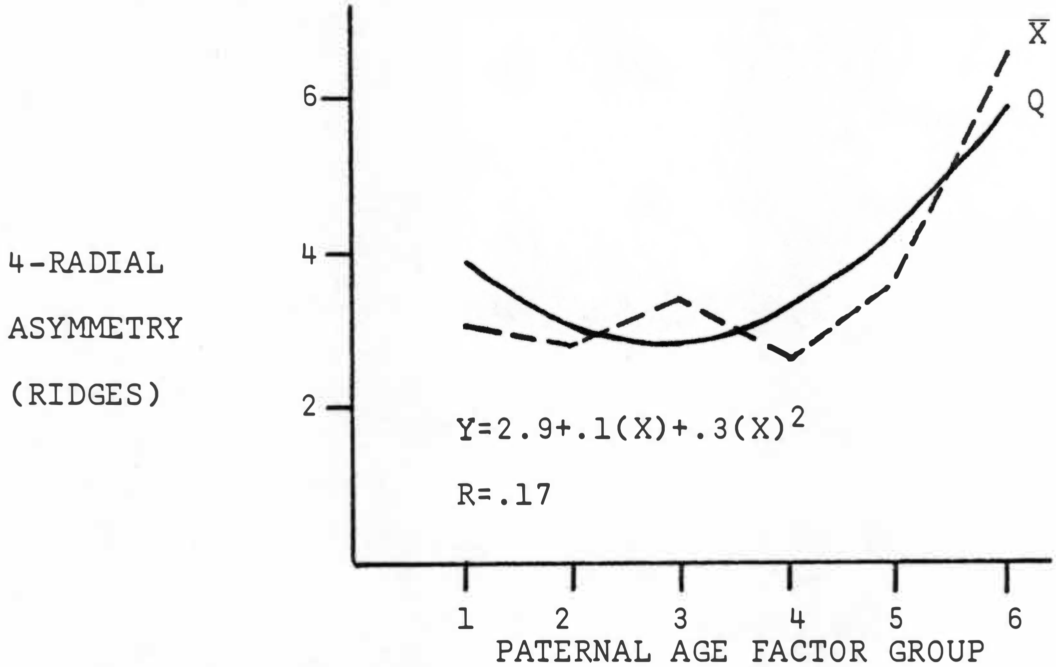
Figure 33. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on 1-Ulnar asymmetry in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 34. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on 2-Ulnar asymmetry in males.



Paternal Age Factor Groups

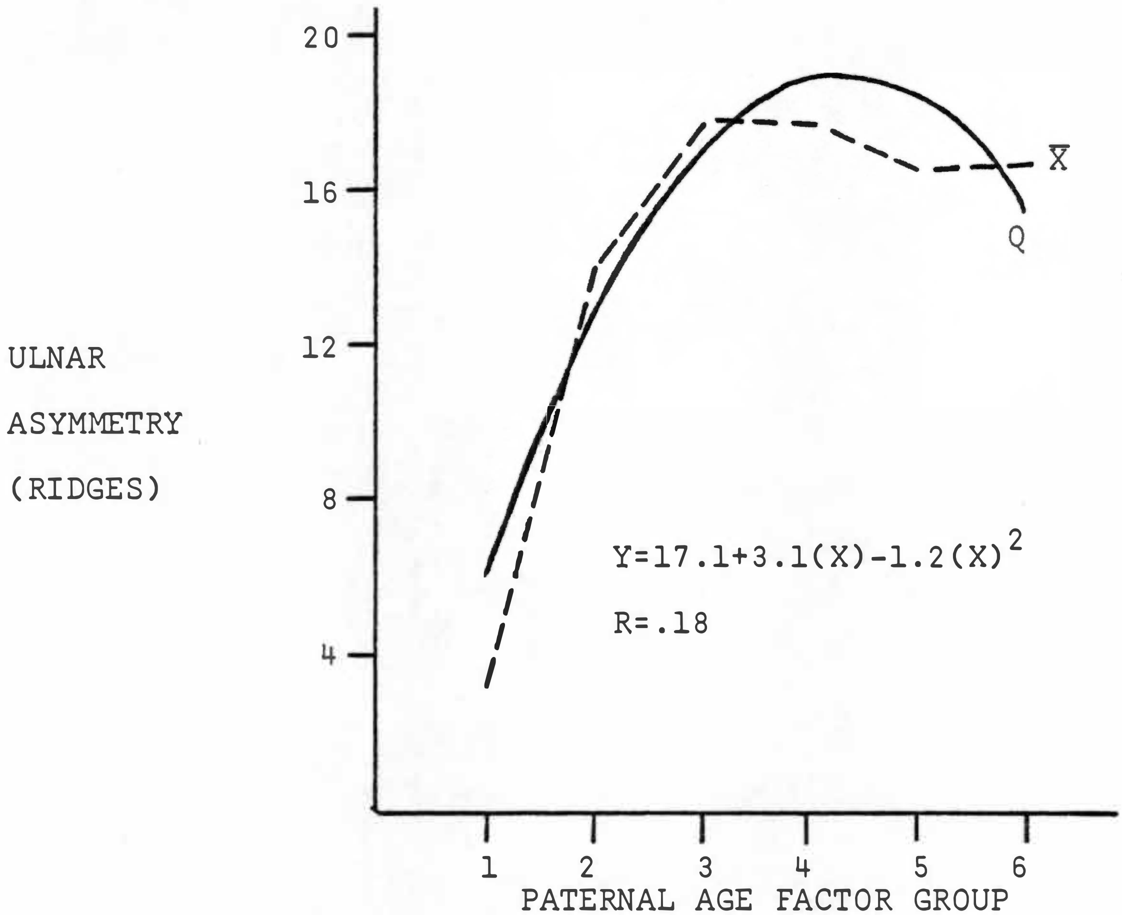
Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 35. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on 4-Radial asymmetry in males.

to paternal age. The distribution of summed ulnar asymmetry on the digits is similar to that for digits one and two; lowest asymmetry is observed in offspring of very young fathers. It increases markedly through the intermediate paternal ages, then seems to level off or decrease slightly (Figure 36).

Summed radial asymmetry in males shows a significant linear increase with low values of asymmetry in offspring of young fathers and highest values in children of older fathers (Figure 37). The radial and ulnar asymmetry components combined reveal a significant linear increase in total asymmetry as father's age increases. Lowest total asymmetry is observed in offspring of very young fathers, and the greatest asymmetry is found in offspring of the older fathers, as seen in Figure 38.

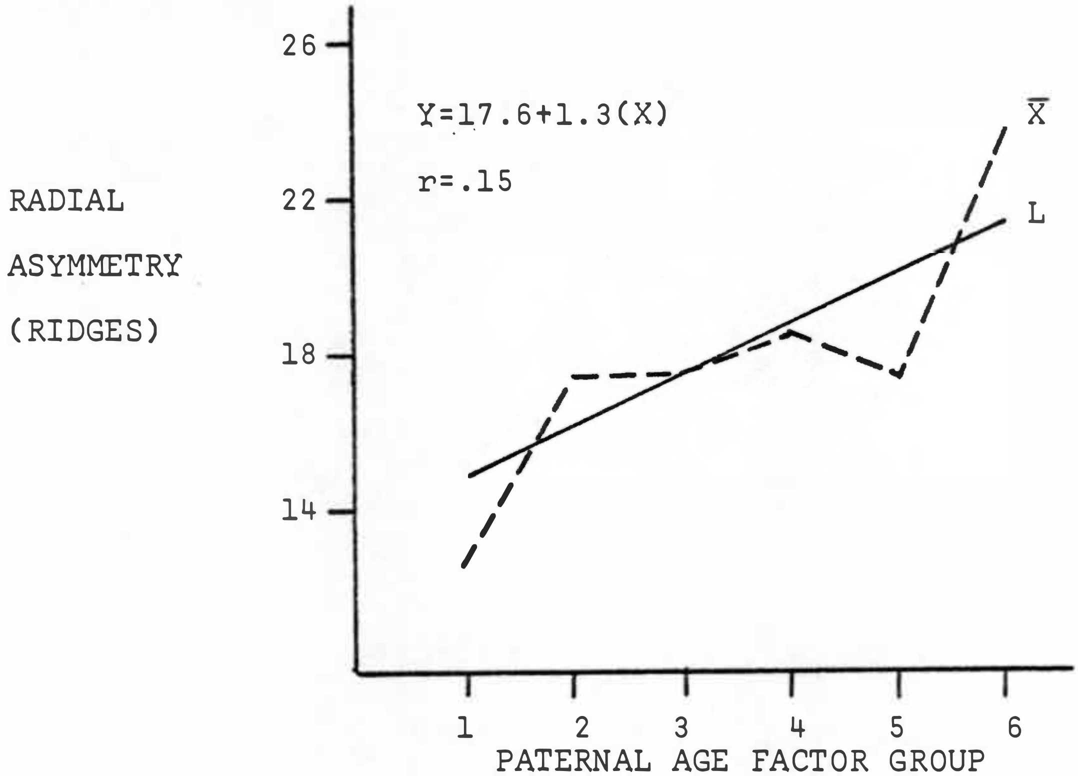
On palms of males, paternal age affects asymmetry in the third and fourth interdigital areas. Figure 39 shows that asymmetry of b-c ridge count decreases linearly as paternal age increases, with lowest asymmetry occurring in the offspring of the oldest fathers. Asymmetry of c-d counts also shows a tendency to decrease. As shown in Figure 40, the highest asymmetry for c-d counts is observed at young paternal ages; a slight increase in asymmetry occurs at high paternal ages, but it is not as pronounced as in offspring of very young fathers.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

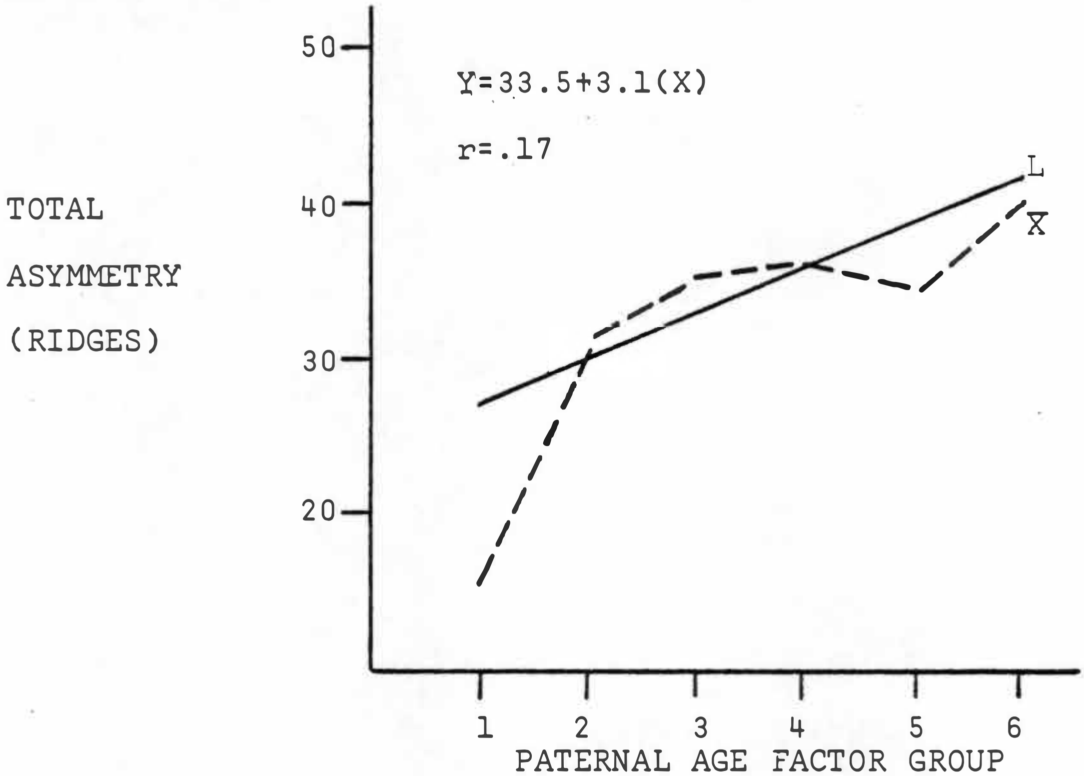
Figure 36. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on total asymmetry of ulnar counts in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

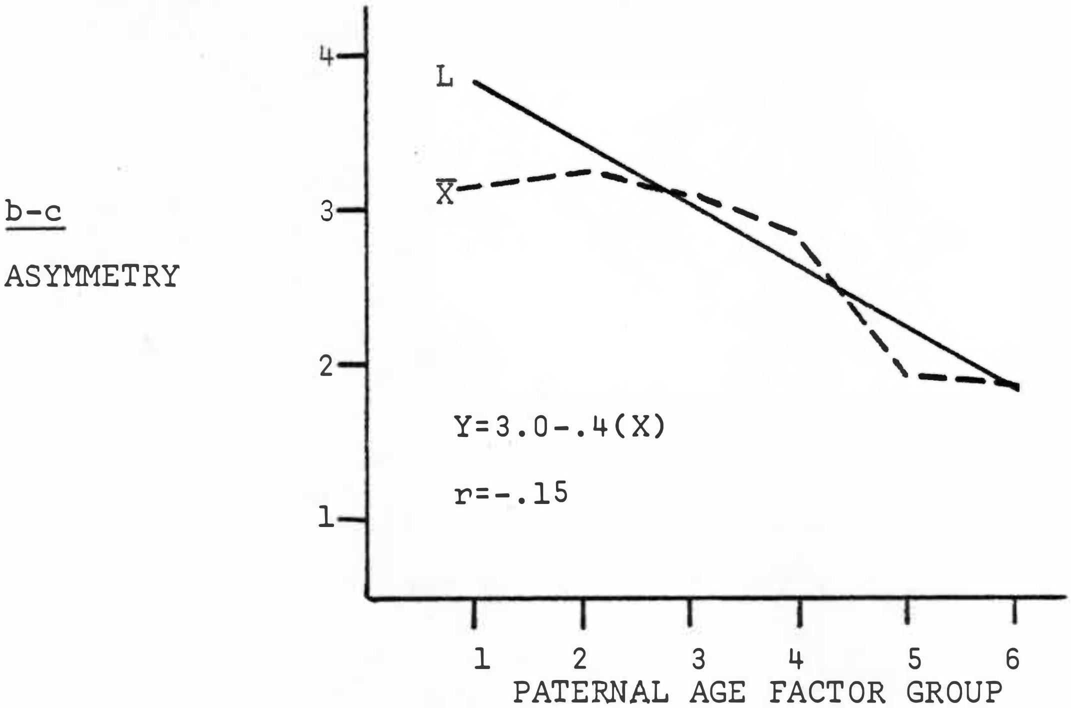
Figure 37. Means ($\overline{X}$) and linear regression (L) of paternal age factor on total asymmetry of radial counts in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

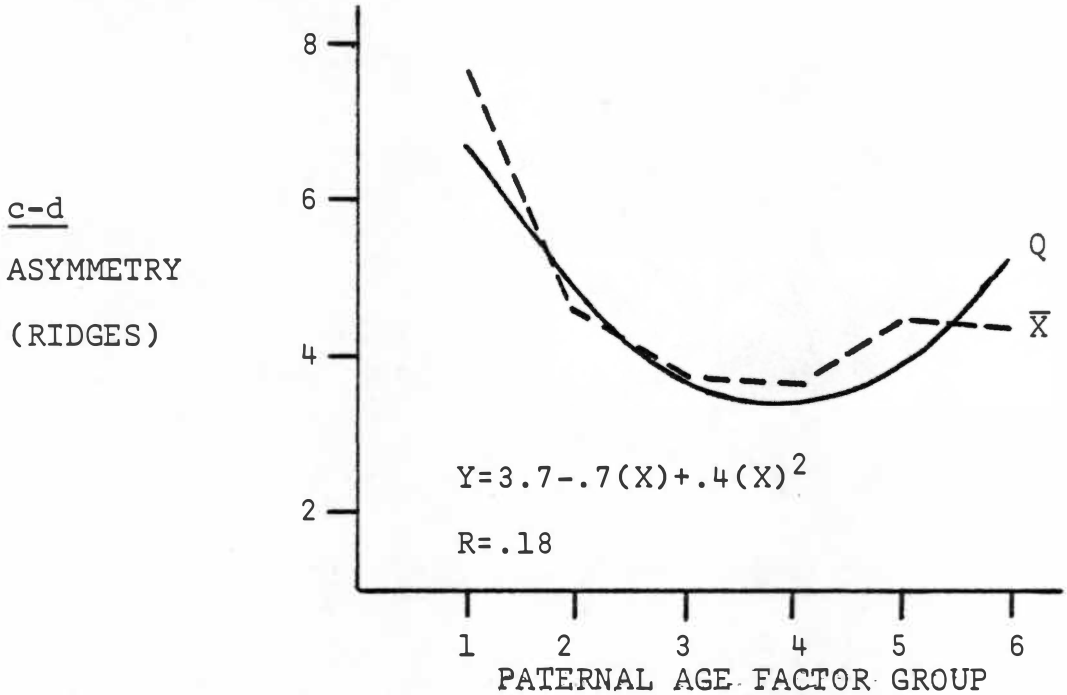
Figure 38. Means ($\overline{X}$) and linear regression (L) of paternal age factor on total finger ridge count asymmetry in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 39. Means ($\overline{X}$) and linear regression (L) of paternal age factor on b-c asymmetry in males.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	7
2	-1.5 to -0.5	62
3	-0.5 to 0.5	79
4	0.5 to 1.5	45
5	1.5 to 2.5	14
6	> 2.5	6

Figure 40. Means ($\overline{X}$) and quadratic regression (Q) of paternal age factor on c-d asymmetry in males.

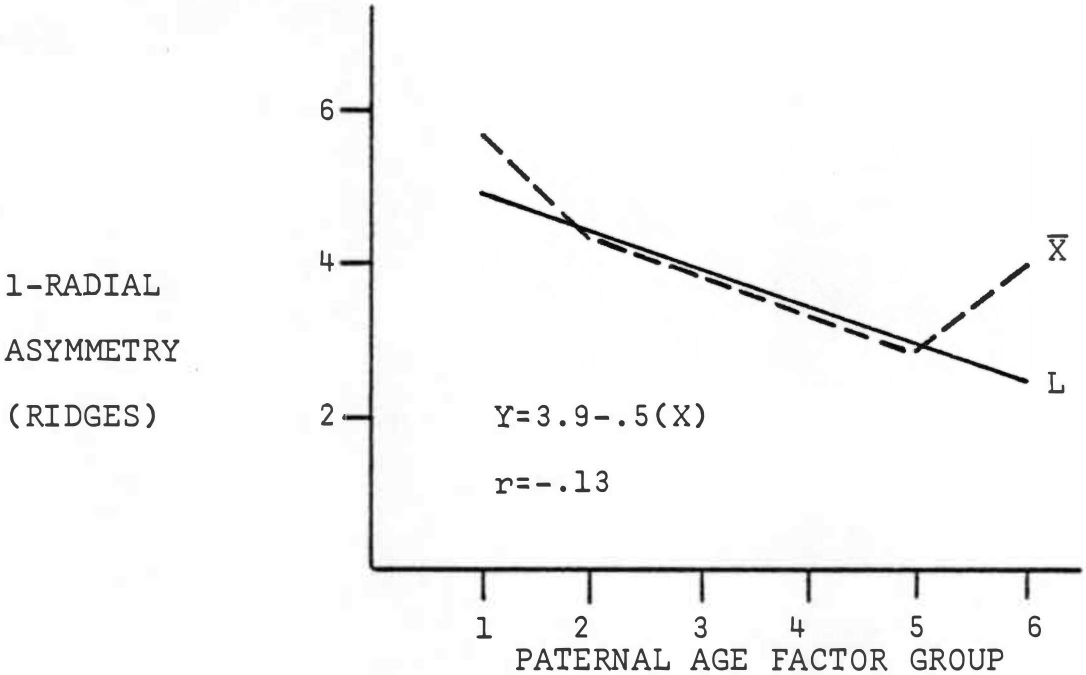
In females, only one variable shows a significant paternal age effect: radial counts on the thumb. Figure 41 shows that as father's age increases, asymmetry of radial counts on the thumb decreases linearly in female offspring.

III. BIRTH ORDER EFFECTS

The effects of birth order on dermatoglyphic asymmetry are reflected on the palms of males and females rather than on the fingers. Significant results of regression analyses are presented in Tables 26 and 27.

In females, two pattern areas show a linear increase in asymmetry as birth order increases: CR and DR patterns. These are graphed in Figures 42 and 43. An opposite trend is observed in the fourth interdigital ridge count; c-d asymmetry tends to decrease linearly in females as birth order increases, although mean asymmetry values suggest that level of asymmetry is somewhat elevated in the highest birth order groups, as shown in Figure 44.

In males, CU asymmetry shows a birth order effect, as may be seen in Figure 45. The distribution of CU asymmetry is U-shaped, with highest asymmetry found in very low and high birth orders, and low asymmetry observed in intermediate birth order groups.



Paternal Age Factor Groups

Code	Value	N
1	< -1.5	12
2	-1.5 to -0.5	75
3	-0.5 to 0.5	97
4	0.5 to 1.5	49
5	1.5 to 2.5	9
6	> 2.5	5

Figure 41. Means ($\overline{X}$) and linear regression (L) of paternal age factor on 1-Radial asymmetry in females.

Table 26. Results of linear and quadratic regressions of birth order factor on asymmetry (males).

	d.f.	C-Ulnar S.S.	C-Ulnar M.S.	C-Ulnar F
Due to linear	1	8.34	8.34	.28
Residual	211	6,225.57	29.51	
Due to quadratic	2	276.03	138.01	4.86**
Residual	210	5,957.89	28.37	
Reduction in S.S. due to quadratic	1	267.68	267.68	9.44**

** $p<.01$
S.S.=Sum of Squares
M.S.=Mean Square

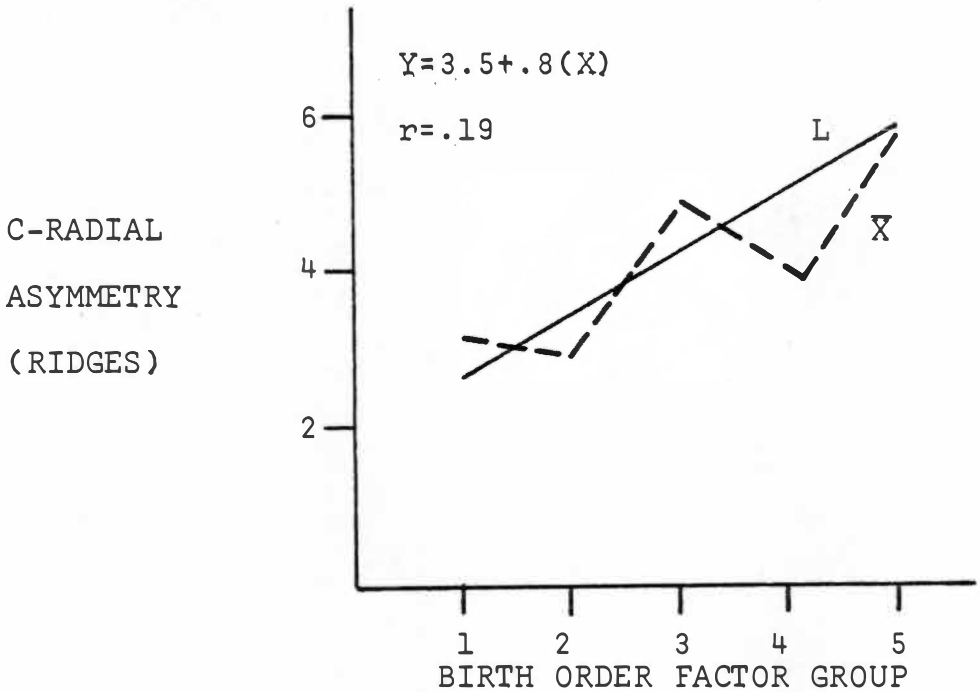
Table 27. Results of linear and quadratic regressions of birth order factor on asymmetry (females).

		c-d			D-Radial		
Variable	d.f.	S.S.	M.S.	F	S.S.	M.S.	F
Due to linear	1	98.41	98.41	4.98*	192.26	192.26	7.31**
Residual	245	4,841.57	19.76		6,440.35	26.29	
Due to quadratic	2	127.18	63.59	3.22*	220.67	110.34	4.20*
Residual	244	4,812.80	19.72		6,411.94	26.28	
Reduction in S.S. due to quadratic	1	28.77	28.77	1.46	28.41	28.41	1.08

	C-Radial		
	S.S.	M.S.	F
Due to linear	162.99	162.99	8.86**
Residual	4,504.76	18.39	
Due to quadratic	163.14	81.57	4.42*
Residual	4,504.61	18.46	
Reduction in S.S. due to quadratic	.15	.15	.01

* $p<.05$ ** $p<.01$

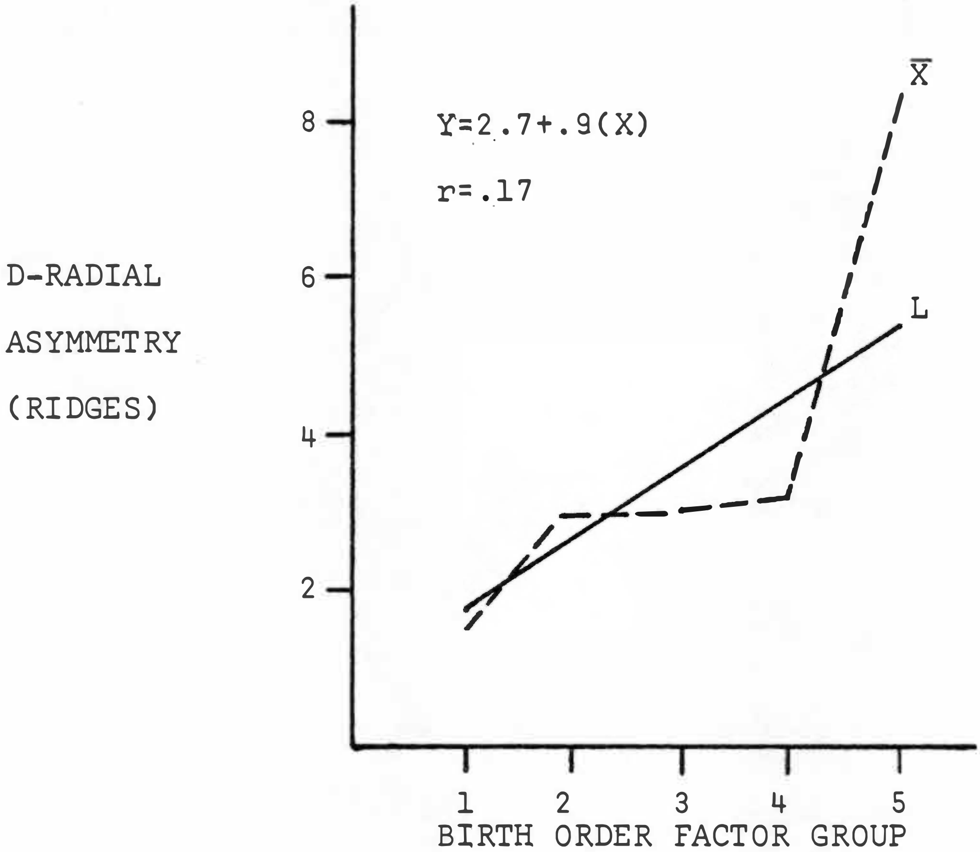
S.S.=Sum of Squares   M.S.=Mean Square



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

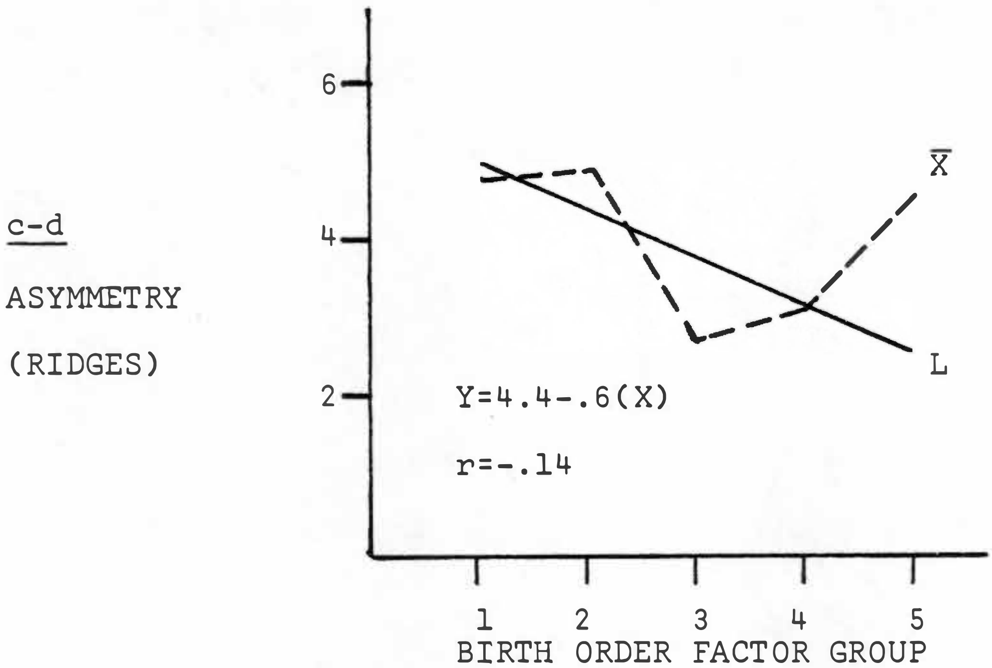
Figure 42. Means ($\overline{X}$) and linear regression (L) of birth order factor on C-Radial asymmetry in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

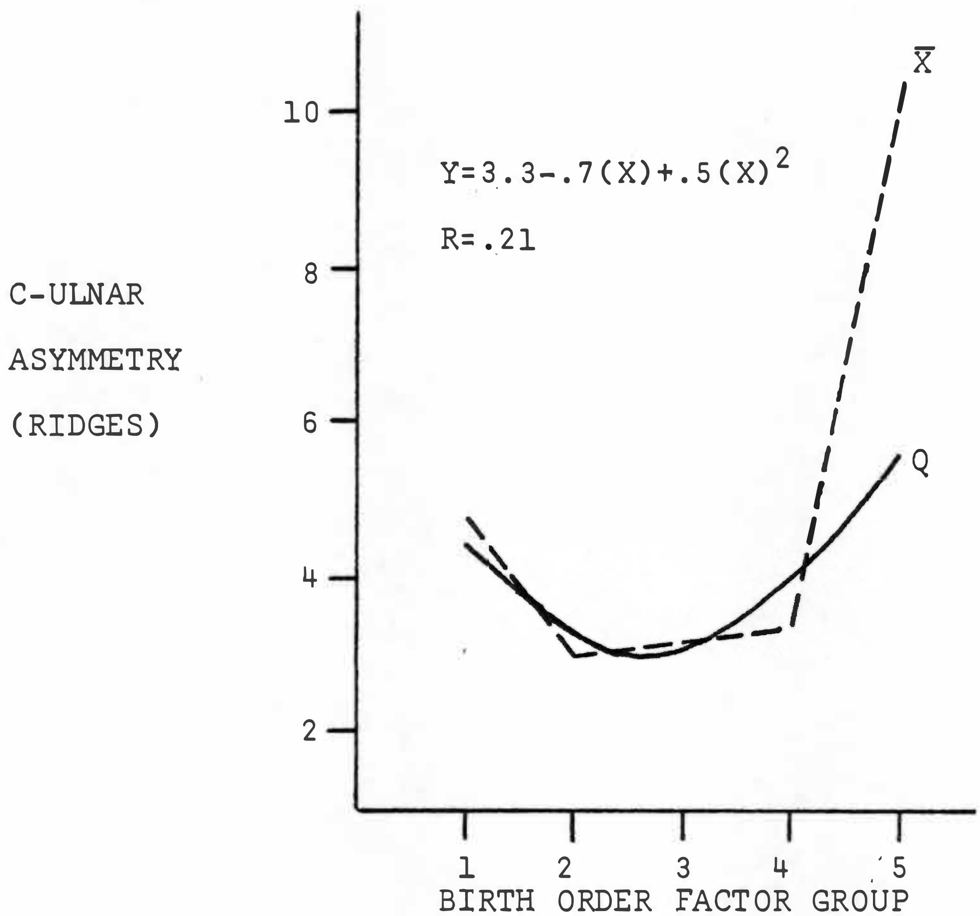
Figure 43. Means ($\bar{X}$) and linear regression (L) of birth order factor on D-Radial asymmetry in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	86
2	-0.5 to 0.5	94
3	0.5 to 1.5	47
4	1.5 to 2.5	12
5	> 2.5	8

Figure 44. Means ($\overline{X}$) and linear regression (L) of birth order factor on c-d asymmetry in females.



Birth Order Factor Groups

Code	Value	N
1	< -0.5	78
2	-0.5 to 0.5	87
3	0.5 to 1.5	34
4	1.5 to 2.5	11
5	> 2.5	3

Figure 45. Means ($\overline{X}$) and quadratic regression (Q) of birth order factor on C-Ulnar asymmetry in males.

CHAPTER IX

DISCUSSION

This study has revealed a large number of dermatoglyphic variables which are affected by parental age and birth order. Both linear and parabolic trends have been observed in the data, as was expected from the existence of similar distributions in relation to congenital defects, stillbirths, twinning rates, and other variables. In this chapter, the results will be discussed as they relate to rates of fetal growth and differences in the degree of developmental canalisation as it is reflected in dermatoglyphic asymmetry.

In the objectives chapter, it was suggested that low birth weight is indicative of a slow fetal growth rate and vice versa. Evidence from sex chromosome aneuploidies indicates that a slow rate of fetal growth is associated with reduced ridge counts and increased ridge breadth in the a-b area. Based on the negative correlation between maternal age and birth weight, and upon evidence that cleavage rates in fertilized eggs of older mothers is slower, it was suggested that as maternal age increases, ridge count decreases and ridge width increases. This hypothesis is not supported by the data from this study. In actuality, the exactly opposite trend emerges. In both males and females,

ulnar ridge counts on digit five show a linear increase with advancing maternal age. In males, radial counts on digits four and five increase until the high maternal age categories, then tend to decrease. On palms, a U-shaped distribution of ridge counts occurs, with the highest ridge counts observed at low and high maternal ages for a-b ridge count on both hands of females and for CU patterns on left hands of males. No effect of maternal age was found for ridge width in the a-b area.

Based on the above evidence, it appears that ridge counts tend to be higher in offspring of older mothers and of very young mothers. The correlation between maternal age and birth weight is slight (r=-.04), although significant (Karn and Penrose 1951). Thus, it is possible that slower fetal growth rate (as measured by birth weight) does not appear to be of enough magnitude to affect ridge counts or ridge breadth in offspring of older mothers. Another possible explanation of the results is that slower growth rates in offspring of older mothers increase rather than decrease ridge count. If this were true, then the reduced ridge counts observed in individuals with sex chromosome anomalies might be due to the effect of the aneuploidies rather than to the rate of fetal growth per se. However, ridge counts on the palm are elevated at low maternal

age, creating a more complex situation. It should be noted that throughout this study, the effects on fingers and palms are not necessarily similar in direction or magnitude. Since fingers and palms develop at different times, some variation could be expected due to differential timing and fluctuations in the uterine environment. The independence of various areas on fingers and palms also becomes apparent when effects of paternal age and birth order are examined. This lends support to the study of individual areas of dermal configurations, as opposed to merely summing ridge counts from various areas, as has often been done in dermatoglyphic research.

Maternal age effects on finger dermatoglyphics involve the fourth and fifth digits, and especially the fifth digit in both sexes. The fifth finger is often implicated in the appearance of unusual dermatoglyphic traits in individuals with chromosome disorders. For example, a single flexion crease is frequently found on the fifth finger in individuals with trisomies 18 and 21. Also, individuals with trisomies 13, 18, and 21 tend to show a displacement of radial loops from the second to the fifth digit. The occurrence of radial loops on digit five in normal Caucasian populations is extremely low; thus, an increase

in ulnar counts on right hands of males and females observed in our data is probably due to an increased frequency of whorls. Frequency of whorls on the fifth digit also tends to be low in comparison to other digits, so an increased proportion of whorls in high risk maternal age groups would be somewhat unusual (Holt 1968).

The increase of CU ridge counts on left hands of males at low and high maternal ages is also interesting, since different pattern frequencies in this interdigital area are noted for various anomalies. An elevated frequency of patterns in interdigital area four is found in patients with Turner's syndrome, Wolf-Hirschorn syndrome (deletion of the short arm of chromosome 4) (Schaumann and Alter 1976) and early-onset diabetes mellitus (Verbov 1973). Decreased frequencies in the fourth interdigital area are usually associated with trisomy 13, 18 and 21. (Trisomies 13 and 21 tend to show increased frequencies in the third interdigital area.) (Schaumann and Alter 1976).

One objective of this study was to examine the effect of maternal age on dermatoglyphic asymmetry. It was suggested that increased levels of asymmetry would be observed in offspring of high risk mothers, namely mothers of advanced and very young maternal ages.

The data from males support this hypothesis; a linear increase in asymmetry is observed for ulnar counts on digit five, summed ulnar counts, and total asymmetry on the digits; a U-shaped distribution occurs for CU ridge counts on the palm, with higher asymmetry at very young and advanced maternal ages. These results accord well with the suggestion that increased levels of intrauterine stress and/or a decrease in developmental canalization are found in offspring of high risk mothers.

The data for females yield different results, however. A significant maternal age effect was observed for asymmetry of ulnar counts on digit two, with lowest levels of asymmetry found in female offspring of very young and older mothers. Highest levels of asymmetry were observed at intermediate maternal ages. According to the proposed hypothesis, this would indicate that female children of intermediate aged mothers are less well canalised or are subjected to increased environmental stress. It seems unlikely that the uterine environment at intermediate ages would be less stressful than at the beginning or end of the reproductive cycle; thus, the differences in asymmetry in females may be due to differences in the capacity of the offspring to resist disturbances of development. However, the mechanism which would produce better canalisation in female offspring of young and older mothers is unclear.

A surprisingly large number of paternal age effects were observed in the data. Under the assumption that rate of fetal growth affects number and width of dermal ridges, it was suggested that lower ridge counts and wider ridges would be expected in offspring of very young and older fathers, since the proportion of low birth weight infants is greater for these fathers. Several ridge count variables reveal a significant paternal age effect. Two of these lend support to the proposed hypothesis: ulnar counts on the thumb and a-b ridge count are lowest in male offspring of very young and of older fathers, and they are elevated at intermediate paternal ages. However, the remaining variables do not fit the model. The c-d count in males and ulnar counts on left digit three in females increase linearly as paternal age increases; D-accessory pattern counts on left palms of males show elevated values at low and high paternal ages; and b-c count on female palms decreases linearly as paternal age increases. Such variability in the expression of paternal age effects makes interpretation unlikely in terms of fetal growth rates. In addition, ridge width in the a-b area does not seem to be affected by paternal age.

As in the case with maternal age, the fourth interdigital area in males is involved in paternal age effects. Increasing father's age is associated with

a linear increase in c-d ridge count, a trait which appears to be influenced by additive genes (Pateria 1974). D-accessory ridge counts of left hands show a U-shaped distribution with increasing paternal age. Bansal and Rife (1962) suggested that a single dominant gene is responsible for the presence of accessory patterns on the second and fourth interdigital areas, but this was not confirmed by Loesch (1971). As mentioned in the discussion of maternal age effects, pattern frequencies in the fourth interdigital area vary with several syndromes. Thus, increased activity in this area in relation to paternal age may be indicative of variation in developmental processes which are age-related and which influence the expression of the dermatoglyphic genotype.

On female palms, b-c ridge count decreases linearly as paternal age increases. This trait has a strong hereditary component; Pateria (1974) has suggested an additive genetic model for the b-c ridge count. Population or clinical studies utilizing the b-c ridge count are few, probably due to the relatively high frequency of an absent c triradius, which makes ridge counting more complicated. However, Maté (1975) noted a significantly higher b-c ridge count on the right hand of cerebrally damaged males than in normal controls. Variations occur in pattern frequencies in this area

of the palm in association with several abnormal conditions, as previously mentioned. Therefore, the third interdigital area may warrant greater consideration in future studies of dermatoglyphic variation.

Although paternal age effects on ridge counts are difficult to interpret, the effect of father's age on dermatoglyphic asymmetry is much more consistent among variables. Based on the increase in congenital defects in offspring of older fathers and the age-related changes in the male gonads, it was suggested that increasing paternal age would produce increased levels of dermatoglyphic asymmetry. The data indicate that paternal age effects on asymmetry are more pronounced in male offspring than in females; eight variables in males and one in females show significant paternal age effects.

As father's age increases, dermatoglyphic asymmetry on fingers of male offspring shows a tendency to increase. Ulnar asymmetry on digits one and two and the summed ulnar asymmetry from all digits tend to increase until the highest paternal age groups, where they begin to decrease; however, asymmetry in the highest paternal ages is still greater than at very low paternal ages. Radial asymmetry on digit four fits a parabolic curve very well; lowest asymmetry values occur at low and intermediate paternal ages, and there is a marked increase

of asymmetry in the highest father's age groups. Summed radial asymmetry in male offspring increases linearly with advancing paternal age. Thus, ridge count asymmetry appears to be elevated in male offspring of older fathers, though there may exist a tendency for the magnitude of asymmetry to level off or decrease at advanced ages. These results are in accord with the proposed hypothesis, and they indicate that aging in fathers can produce greater stress on the gamete or result in less well-canalised offspring.

However, on the palms of males and on female thumbs, a different trend is observed. In the b-c area of males, low paternal age appears to be associated with greater asymmetry than advanced age. In the c-d area, asymmetry is highest at low paternal ages, but it also shows an increase at advanced paternal ages. Differences in asymmetry between fingers and palms indicate that the control mechanisms for these two general areas respond differently to developmental disturbances. Correlations between patterns on fingers and palms are low (Loesch 1971), and the timing of ridge differentiation is different between digits and palms, with ridges on fingers forming at an earlier stage of development than those on palms (Holt 1968). Therefore, dermatoglyphic differences between fingers and palms are not totally unexpected. Our data suggest that the higher

risk for developmental disturbances on male fingers occurs at intermediate or high paternal ages, while for palms young paternal ages create greater asymmetry.

Radial asymmetry on female thumbs is also observed to decrease linearly as father's age increases. It may be remembered that ulnar counts on digit two in females showed highest levels of asymmetry at low and high maternal ages; this finding in conjunction with a decreasing level of asymmetry on digit one (radial) in females as paternal age increases underlines the differences between males and females in their response to developmental stress, or in the degree of stress to which they are subjected, as age of parents increases. Decreased asymmetry in female fingers at advanced parental age could indicate that females tend to become better canalised as the age of parents increases; it might also indicate that selective pressures on female fetuses increase as parental age increases, so that only the well-canalised offspring survive. Pertinent in this regard is the decrease in secondary sex ratio which has been observed with advancing parental ages (Takahashi 1954, Novitski and Sandler 1956). Since the number of males decreases in proportion to females at advanced parental ages, it is possible that either intrauterine selection against male fetuses increases or selection against females decreases, thereby producing a more

equal sex ratio. A decrease in sex ratio could also be caused by differential selection against X- and Y-bearing sperm before fertilization. In either case, it appears unlikely that greater selective pressures occur on females than on males with advancing parental age; thus, the decrease in dermatoglyphic asymmetry observed in females is possibly due to an increase in their ability to withstand developmental disturbances, i.e., better canalisation. In this study, females tend to be less asymmetrical, in general, than males, as evidenced by lower asymmetry on more areas of the fingers and palms, and they seem to be less affected than males by advancing age of parents. Males appear to be less well canalised than females, as suggested by increased dermatoglyphic asymmetry and higher frequency of some birth defects, such as cleft lip (palate) (Fraser and Calnan 1961). A rise in level of asymmetry and a reduction of the secondary sex ratio indicate that stresses on males may be higher in older parents than in younger ones.

While maternal age and paternal age affect male offspring to a greater extent than females, birth order influences more dermatoglyphic variables in females than in males. Birth order is associated with variations in birth weight, which led to the suggestion that dermato-glyphic variation could be expected to show either linear

or parabolic trends as birth order increases. Based on assumptions about fetal growth rates, it was suggested that a linear relationship might reflect a tendency for ridge counts to increase as birth order increases, while a parabolic distribution could show elevated ridge counts at intermediate birth orders. Such trends are observed in the data in relation to several variables. Ridge counts increase linearly for D-accessory patterns on right hands of males and for b-c counts in females. Ulnar counts on digits one and two in females are highest at intermediate birth orders and are decreased at low and high birth orders. These results accord well with the proposed hypothesis that a slow rate of fetal growth reduces the ridge count.

However, radial counts on digits four and five of females decrease linearly as birth order increases. Thus, it seems that digits one and two respond differently to birth order effects than digits four and five. The radial and ulnar sides of the hand have been observed to show contrasts in factor analyses of finger ridge counts (Roberts and Coope 1975) and pattern types (Oliveira 1975), and there appears to be a radio-ulnar gradient in the maturation of dermal ridges, with the thumb being most advanced and the fifth finger the least matured (Babler 1977). Thus, the different birth order

effects observed on radial and ulnar digits in females may reflect differences in control mechanisms for these general areas of the hand.

Birth order also affects the frequency of ridge counts in palmar interdigital areas. In males, the frequency of CU ridge counts is highest in both hands at low and high birth orders. At intermediate birth orders in males, the C-line tends to form a CR rather than a CU pattern. In females, DR ridge counts tend to be greater at low and high birth orders, and in intermediate birth orders a pattern in the fourth interdigital area on left hands has an increased tendency to be formed by the C-line rather than by the D-line. Results for males and females are not strictly comparable, since the dermatolgyphic factors involved do not reflect the same variables. However, it can be noted that the curvature of C and D mainlines in both males and females appear to be affected by birth order.

Interdigital ridge counts in the a-b area of females also reveal a birth order effect, with highest ridge counts observed at low and high birth orders. This result is in disagreement with the proposed hypothesis that slow fetal growth produces lower ridge counts. In addition, ridge width in the a-b area in females also shows a significant parabolic distribution, with the widest ridges occurring at intermediate birth orders,

and narrow ridges found at low and high birth orders. Although it does not reach statistical significance, the distribution of ridge width in males is similar. These results indicate that slow fetal growth is associated with higher ridge counts and more narrow ridges in the a-b area rather than vice versa. In females, a-b ridge count also has a U-shaped distribution with respect to maternal age, while the exact opposite trend occurs in males in relation to paternal age. Thus, the relationship of ridge width to fetal growth rate remains uncertain.

Since the effect of birth order on the proportion of low birth weight infants is more pronounced than that of either maternal or paternal age, the results of the analysis of birth order effects on ridge width in the a-b area may be more representative of biological reality, at least for females. Perhaps the effect, if any, of fetal growth rates on the formation of dermal ridges could be better understood by means of an embryological approach, rather than from postnatal examination of the epidermal ridges.

Effects of birth order on dermatoglyphic asymmetry are also observed in this study. As in the case for ridge counts, more effects are noted for females than for males. Increasing birth order was expected to cause a linear increase in asymmetry or a U-shaped distribution,

since the frequency of stillbirths and abnormalities have similar distributions. No effects of birth order were observed for finger dermatoglyphics. On palms, the distribution of pattern asymmetry was in accord with the proposed hypothesis. In males, asymmetry of CU counts is elevated at low and high birth orders; CR and DR counts on female palms reveal a linear increase in asymmetry as birth order increases. The only variable which does not conform to the proposed model is c-d count in females, which decreases linearly with advancing birth order. This variable also tends to decrease with advancing paternal age, although it is somewhat elevated at the high ages. Apparently c-d count is a relatively stable variable in higher risk female offspring.

Several observations may be made concerning the results of this study as a whole. The relationship between fetal growth rate and dermatoglyphic variation remains unclear. Ridge width in the a-b area does not appear to be affected by parental age, but wider ridges are more common in individuals of intermediate birth order, indicating that a faster rate of growth may produce wider ridges. Ridge count data from different areas of the fingers and palms vary considerably in their distribution, and thus they permit no consistent conclusions regarding the effect of fetal growth rates

on ridge counts.

In general, dermatoglyphic asymmetry is increased in individuals from high risk categories, which include offspring of older parents and those in low and high birth orders. Intermediate parental age and birth order appear to be optimal in terms of developmental stability. Effects of parental age are more pronounced in males, while birth order produces greater variation in females.

The data reveal differences in asymmetry between sexes and among the various digital and palmar areas. A surprising tendency for asymmetry to decrease in females was observed in relation to increasing parental age. It appears that the mechanisms which control the developmental stability of bilateral dermatoglyphic structures operate differently on different parts of the hand and in members of opposite sexes. A recent study by Webb (1977) on correlations between dermatoglyphic and dental asymmetry revealed that males and females infrequently produced the same set of correlated asymmetry values. Webb suggested that the variation between males and females in the expression of asymmetry serves as strong evidence for sexual differences in developmental stability.

In addition, asymmetry varies along population lines, suggesting a genetic rather than environmental basis

for such variation. Jantz (1975) observed that African Blacks (Dogon, Bedik-Bassari, Pygmy) and American Blacks have lower asymmetry levels than Whites. He also found that in most of the Black samples the females exceeded males in asymmetry, while the reverse was true among Easter Islanders, English, and American Whites. These observations, combined with the results of the present study, could indicate that genetic factors may be more important than environmental effects in the variable expression of bilateral asymmetry.

Summary

This study makes several important contributions to knowledge about dermatoglyphic variation in American Caucasians. Through factor analysis of ridge count data, three relationships between dermatoglyphic variables are pointed out. First, there appears to be an interaction between radial counts on the fourth and fifth fingers. These two digits have been found to vary together in other studies which used fewer factors (Jantz and Owsley 1977, Roberts and Coope 1975, Knussman 1967, 1969). Thus, the fact that the fourth and fifth fingers continue to vary jointly when more than twice as many factors are retained lends support to the idea that they form a distinct functional or biological unit.

Second, factor analysis of the palms indicates that independent mechanisms may be responsible for the

development of interdigital ridge counts and interdigital pattern size. Moreover, pattern size seems to function independently on right and left hands, whereas ridge counts for each interdigital area are more closely correlated between hands.

A third relationship is hinted at by factor analysis of palm ridge counts, i.e., the independent development of DR and CU patterns. However, this relationship does not follow a consistent pattern between hands or between sexes. It is a good subject for a future study in which factor analysis of the palmar dermatoglyphics of different populations are compared, thereby helping to clarify the relationship between patterns formed by recurvature of the C-line and those formed by the D-line.

This study revealed a number of significant parental age and birth order effects on dermatoglyphic variation. Effects on ridge count vary considerably between sexes and between fingers and palms, but several areas tend to be affected more often than others; these include the interdigital ridge counts, pattern ridge counts in the fourth interdigital area, ulnar counts on digits one and two, and on the fourth and fifth digits (acting as a unit). Dermatoglyphic asymmetry tends to be increased on fingers of individuals in high risk categories; intermediate parental ages and intermediate birth orders appear to be optimal in terms of developmental stability

of finger ridge counts. A surprising tendency for asymmetry to decrease was observed on male palms with advancing birth order and on female digits with increasing parental ages. Ridge width in the a-b area of the palm was found to be greatest in both males and females of intermediate birth orders.

In order to understand the significance of dermatoglyphic variation, much more information is needed about the morphogenesis and growth of dermal ridges, as well as about the genetic mechanisms which control their development. This study has pointed out several characteristics of dermatoglyphic variation which may in future research prove to be valuable components in identifying relevant biological relationships. As our knowledge about this extremely variable human trait increases, dermatoglyphics will become an increasingly useful tool in defining and explaining the processes which determine human variation.

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APPENDIX

Table 28. Summary statistics for finger factor 10 by maternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.10621		-0.7387	-0.1477	0.9365	3.5080	5
-1.68541		-1.4184	-1.4184	0.0	0.0	1
-1.51714		0.1020	0.1020	0.0	0.0	1
-1.45665		0.5118	0.0341	1.1931	19.9302	15
-1.34894		-0.4814	-0.4814	0.0	0.0	1
-1.32514		-0.0537	-0.0537	0.0	0.0	1
-1.29841		-0.6008	-0.3004	0.2831	0.0802	2
-1.09638		3.2288	0.4613	1.3751	11.3449	7
-0.96488		-0.0092	-0.0046	0.3294	0.1085	2
-0.92814		-0.8994	-0.4497	0.6947	0.4826	2
-0.86761		-7.9985	-0.5713	0.7635	7.5777	14
-0.80738		-2.0468	-0.2274	0.4623	1.7098	9
-0.69938		0.0670	0.0670	0.0	0.0	1
-0.67558		-0.1503	-0.1503	0.0	0.0	1
-0.63885		-4.0682	-0.3698	0.5516	3.0431	11
-0.60461		-0.1997	-0.1997	0.0	0.0	1
-0.50734		0.1742	0.0581	0.2856	0.1631	3
-0.47061		-0.3197	-0.3197	0.0	0.0	1
-0.44681		2.9356	0.7339	1.4668	6.4548	4
-0.33911		3.2257	3.2257	0.0	0.0	1
-0.31531		0.1785	0.1785	0.0	0.0	1
-0.30238		0.3260	0.3260	0.0	0.0	1
-0.27958		-1.4210	-0.1579	0.8012	5.1357	9
-0.21335		0.5512	0.0367	0.8298	9.6393	15
-0.11034		-0.4364	-0.4364	0.0	0.0	1
-0.08654		-1.9994	-1.9994	0.0	0.0	1
-0.04981		1.9831	0.1983	0.9634	8.3527	10
0.01072		0.0957	0.0038	0.5617	7.5728	25
0.08169		-0.0759	-0.0759	0.0	0.0	1
0.11942		-0.0183	-0.0183	0.0	0.0	1
0.14222		-0.1510	-0.0755	0.0158	0.0002	2
0.17395		-1.5831	-0.3166	0.7639	2.3344	5
0.31046		0.5588	0.2794	0.7367	0.5427	2
0.34719		-0.0637	-0.0637	0.0	0.0	1
0.37099		1.3038	0.1304	1.7766	28.4082	10
0.50249		-0.0919	-0.0919	0.0	0.0	1
0.53922		2.1533	0.7178	1.6336	5.3360	3
0.59975		-0.5582	-0.0465	1.2338	16.7446	12
0.67072		-0.1136	-0.1136	0.0	0.0	1
0.70745		0.0622	0.0622	0.0	0.0	1
0.73126		1.3555	0.3389	0.4534	0.6166	4
0.76799		-0.1544	-0.0772	0.2741	0.0751	2
0.82852		-5.4390	-0.4532	0.6443	4.5666	12
0.96002		0.6880	0.0860	0.9884	6.8391	8
0.99676		-1.6334	-0.5445	0.4011	0.3218	3
1.02955		-1.6134	-1.6134	0.0	0.0	1
1.18979		3.1488	0.4498	1.2981	10.1099	7
1.24932		-0.0674	-0.0674	0.0	0.0	1
1.32029		0.2933	0.2933	0.0	0.0	1
1.39732		-0.1467	-0.1467	0.0	0.0	1
1.41755		0.3034	0.0506	1.1012	6.0631	6
1.54906		-0.0814	-0.0814	0.0	0.0	1
1.64632		-0.1601	-0.1601	0.0	0.0	1
1.77792		0.3781	0.1890	0.9579	0.9176	2
2.00659		4.2577	2.1289	3.4150	11.6625	2
2.06712		4.5959	1.5320	1.6961	5.7535	3
2.17482		0.3095	0.3095	0.0	0.0	1
2.19862		-0.3102	-0.3102	0.0	0.0	1
2.49936		0.1018	0.1018	0.0	0.0	1
2.82439		2.2402	2.2402	0.0	0.0	1
3.30972		0.0199	0.0199	0.0	0.0	1
3.87096		-0.0464	-0.0464	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0000	0.0000	1.0011	195.3954	247

Table 29. Summary statistics for palm factor 1 by maternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.10621		-1.9738	-0.3948	0.8439	2.8484	5
-1.68541		0.5390	0.5390	0.0	0.0	1
-1.51719		0.2603	0.2603	0.0	0.0	1
-1.49665		5.1259	0.3417	1.2583	22.1653	15
-1.34894		-0.6979	-0.6979	0.0	0.0	1
-1.32514		0.9365	0.9365	0.0	0.0	1
-1.28841		-1.7376	-0.8688	0.9837	0.9676	2
-1.09638		1.7433	0.2490	0.5235	1.6444	7
-0.96485		0.4111	0.2055	0.9537	0.9095	2
-0.93914		0.0077	0.0039	0.5514	0.3040	2
-0.86761		-0.8408	-0.0601	1.4443	27.1177	14
-0.80708		2.6096	0.2900	0.8295	5.5045	9
-0.69938		-0.8254	-0.8254	0.0	0.0	1
-0.67558		0.0926	0.0926	0.0	0.0	1
-0.63955		-1.0362	-0.0942	1.0781	11.6233	11
-0.60461		3.6897	3.6897	0.0	0.0	1
-0.50734		-2.2602	-0.7534	1.1642	2.7107	3
-0.47061		-0.0206	-0.0206	0.0	0.0	1
-0.44681		-2.1769	-0.5442	0.9165	2.5201	4
-0.33911		1.4249	1.4249	0.0	0.0	1
-0.31531		-0.6295	-0.6295	0.0	0.0	1
-0.30239		0.1115	0.1115	0.0	0.0	1
-0.27858		-3.6888	-0.4099	0.6535	3.4161	9
-0.21935		-0.0158	-0.0011	0.8198	9.4093	15
-0.11034		0.7287	0.7287	0.0	0.0	1
-0.08654		-1.6256	-1.6256	0.0	0.0	1
-0.04981		0.2700	0.0270	0.8034	5.8088	10
0.01072		2.7054	0.1082	0.8607	17.7798	25
0.08169		-2.9742	-2.9742	0.0	0.0	1
0.11342		-0.3359	-0.3359	0.0	0.0	1
0.14222		-0.9431	-0.4715	0.9049	0.8188	2
0.17895		-2.1420	-0.4284	1.0035	4.0284	5
0.31046		-1.5792	-0.7896	0.8946	0.8003	2
0.34719		1.0220	1.0220	0.0	0.0	1
0.37099		0.5609	0.0561	0.7787	5.4569	10
0.50249		2.0442	2.0442	0.0	0.0	1
0.53922		0.5718	0.1906	1.5870	5.0371	3
0.59975		-1.4515	-0.1210	0.7014	5.4120	12
0.67772		0.2321	0.2321	0.0	0.0	1
0.70745		-0.3460	-0.3460	0.0	0.0	1
0.73126		-0.5824	-0.1456	0.2444	0.1793	4
0.76799		-1.6138	-0.8069	0.4712	0.2220	2
0.82352		-1.3234	-0.1103	0.8497	7.9416	12
0.96002		0.6122	0.0765	0.6673	3.1175	8
0.99676		4.8719	1.6240	0.8949	1.6017	3
1.02055		-1.0931	-1.0931	0.0	0.0	1
1.18879		-0.4944	-0.0706	1.1448	7.8630	7
1.24932		-0.9194	-0.9194	0.0	0.0	1
1.32029		0.7205	0.7205	0.0	0.0	1
1.35702		-1.8854	-1.8854	0.0	0.0	1
1.41755		0.2681	0.0447	1.4761	10.8940	6
1.54906		0.1388	0.1388	0.0	0.0	1
1.64632		0.0617	0.0617	0.0	0.0	1
1.77793		-1.1498	-0.5749	0.1576	0.0248	2
2.00659		1.8842	0.9421	0.6726	0.4524	2
2.06712		0.2926	0.0975	0.7331	1.0749	3
2.17432		-1.1379	-1.1379	0.0	0.0	1
2.19062		-0.3253	-0.3253	0.0	0.0	1
2.49836		0.0175	0.0175	0.0	0.0	1
2.82439		0.1362	0.1362	0.0	0.0	1
3.30572		1.2449	1.2448	0.0	0.0	1
3.87096		2.5103	2.5103	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0003	0.0000	0.9576	169.6543	247

Table 30. Summary statistics for finger factor 7 by paternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.87911		-0.2225	-0.2225	0.0	0.0	1
-1.84661		-1.0349	-1.0349	0.0	0.0	1
-1.73293		3.8353	3.8353	0.0	0.0	1
-1.58655		-2.6601	-0.2956	0.2369	0.4490	9
-1.33544		0.6386	0.6386	0.0	0.0	1
-1.22166		0.7636	0.1909	1.2653	4.8032	4
-1.14037		-1.8294	-0.6098	0.5367	0.5760	3
-1.10798		-0.2892	-0.0193	0.9919	13.7754	15
-0.99410		-6.9067	-0.2763	0.3325	2.6539	25
-0.97054		-0.1429	-0.1429	0.0	0.0	1
-0.88925		-0.3397	-0.3397	0.0	0.0	1
-0.85675		-1.0022	-1.0022	0.0	0.0	1
-0.74298		-0.3250	-0.1625	0.1143	0.0131	2
-0.62920		-0.7098	-0.0710	0.7375	4.8948	10
-0.51542		-2.4673	-0.2056	0.8453	7.8606	12
-0.48292		-1.3820	-1.3820	0.0	0.0	1
-0.40163		-3.5268	-0.2939	0.5013	2.7643	12
-0.37833		-0.2426	-0.2426	0.0	0.0	1
-0.36914		-3.5186	-0.2346	0.7916	8.7723	15
-0.26430		-0.9805	-0.2451	0.2047	0.1257	4
-0.15352		-1.0107	-0.1263	0.3197	0.7152	3
-0.11802		-0.2735	-0.2735	0.0	0.0	1
-0.03674		-2.2995	-0.3285	0.4251	1.0845	7
-0.00424		-2.9724	-0.4246	0.3100	0.5765	7
0.07736		2.1606	0.3601	1.1408	6.5070	6
0.10954		0.9768	0.0698	1.2266	19.5588	14
0.19093		-0.0726	-0.0726	0.0	0.0	1
0.21439		-0.2493	-0.2493	0.0	0.0	1
0.22332		6.8296	0.6209	1.3923	19.3847	11
0.24688		1.5749	0.7875	1.0548	1.1126	2
0.32916		-0.3246	-0.3246	0.0	0.0	1
0.44194		2.2238	1.1119	1.5397	2.3706	2
0.47644		-0.9665	-0.3222	0.2354	0.1109	3
0.55572		-1.6345	-0.8173	0.8270	0.6839	2
0.58822		6.3406	0.7045	1.7114	23.4318	9
0.61178		-0.2263	-0.2263	0.0	0.0	1
0.70200		-0.8203	-0.0820	0.9567	9.2369	10
0.81578		6.2605	1.2521	1.7537	12.3015	5
0.84828		1.0148	0.2030	1.7917	12.8413	5
0.95312		-0.2279	-0.2279	0.0	0.0	1
1.06690		6.0427	3.0214	0.5582	0.3115	2
1.14819		-0.6753	-0.6753	0.0	0.0	1
1.17176		-0.1164	-0.1164	0.0	0.0	1
1.18068		-0.3948	-0.1316	0.2136	0.0912	3
1.29446		-0.6707	-0.3354	0.3055	0.0933	2
1.32696		-0.1648	-0.1648	0.0	0.0	1
1.40824		-0.5158	-0.1719	0.4241	0.3596	3
1.43130		0.2055	0.2055	0.0	0.0	1
1.44074		-1.0459	-0.5229	0.2731	0.1392	2
1.77314		-0.4689	-0.4689	0.0	0.0	1
1.82554		-0.3671	-0.1835	0.5690	0.3237	2
1.85442		-0.3804	-0.3804	0.0	0.0	1
1.91942		-0.3277	-0.3277	0.0	0.0	1
2.03320		-0.5078	-0.5078	0.0	0.0	1
2.28432		1.5726	1.5726	0.0	0.0	1
2.34560		-0.0107	-0.0107	0.0	0.0	1
2.39810		-0.7696	-0.7696	0.0	0.0	1
2.51188		-1.2052	-1.2052	0.0	0.0	1
2.62566		2.6151	2.6151	0.0	0.0	1
2.79056		1.6489	1.6489	0.0	0.0	1
3.13684		1.7427	1.7427	0.0	0.0	1
3.84308		-0.2881	-0.2881	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	0.9237	156.8299	247

Table 31. Summary statistics for palm factor 3 by paternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.87911		1.4913	1.4913	0.0	0.0	1
-1.84661		-0.4949	-0.4949	0.0	0.0	1
-1.73293		0.6221	0.6221	0.0	0.0	1
-1.58655		-0.1905	-0.0201	1.2444	12.3885	9
-1.33544		0.1026	0.1026	0.0	0.0	1
-1.22166		0.9472	0.2368	0.7684	1.7714	4
-1.14037		-1.7409	-0.5803	0.6237	0.7781	3
-1.13798		-2.4115	-0.1608	1.2442	21.6732	15
-0.99410		-0.9269	-0.0371	1.1416	31.2779	25
-0.97054		1.4360	1.4360	0.0	0.0	1
-0.89925		0.2199	0.2199	0.0	0.0	1
-0.85676		0.0181	0.0181	0.0	0.0	1
-0.74298		-1.0007	-0.5004	1.4209	2.0190	2
-0.62920		5.3976	0.5398	1.1999	12.9572	10
-0.51542		-1.9791	-0.1649	1.0221	11.4918	12
-0.48292		0.0861	0.0861	0.0	0.0	1
-0.40163		2.9480	0.2457	0.7937	6.9302	12
-0.37878		2.0146	2.0146	0.0	0.0	1
-0.36914		-3.0231	-0.2015	0.9321	12.1623	15
-0.26433		1.0155	0.2539	0.5802	1.0098	4
-0.15052		1.1774	0.1472	0.5890	2.4288	8
-0.11302		-1.3844	-1.3844	0.0	0.0	1
-0.03674		1.3701	0.1957	0.6533	2.5610	7
-0.00424		5.5773	0.7968	0.5005	1.5028	7
0.07734		0.9954	0.1659	1.4419	10.3960	6
0.10994		6.7442	0.4817	0.6292	5.1462	14
0.19083		-1.0647	-1.0647	0.0	0.0	1
0.21438		0.8749	0.8749	0.0	0.0	1
0.22332		-0.3942	-0.0358	0.7418	5.5021	11
0.24688		1.7443	0.8722	0.4289	0.1840	2
0.32816		0.7750	0.7750	0.0	0.0	1
0.44194		1.2354	0.6177	1.1442	1.3093	2
0.47444		1.5464	0.5155	0.2659	0.1414	3
0.55572		-0.2624	-0.1312	0.0004	0.0000	2
0.58822		0.4035	0.0448	0.5170	2.1383	9
0.61178		0.0736	0.0736	0.0	0.0	1
0.70207		-4.0488	-0.4049	1.3229	15.7500	10
0.81578		-2.3265	-0.4653	1.2013	5.7726	5
0.84829		-1.6927	-0.3385	0.4852	0.9418	5
0.95312		-0.8671	-0.8671	0.0	0.0	1
1.06690		-0.1601	-0.0801	1.0755	1.1567	2
1.14813		-0.1291	-0.1291	0.0	0.0	1
1.17174		-1.6868	-1.6868	0.0	0.0	1
1.19068		0.7024	0.2341	0.3468	0.2405	3
1.29446		0.1453	0.0726	0.1473	0.0217	2
1.32696		-1.4094	-1.4094	0.0	0.0	1
1.40824		-3.0091	-1.0030	2.9512	17.4188	3
1.43180		-0.8562	-0.8562	0.0	0.0	1
1.44074		-0.1841	-0.0920	0.6775	0.4590	2
1.77314		-0.1604	-0.1604	0.0	0.0	1
1.80564		-2.0762	-1.0381	0.5635	0.3175	2
1.85442		-2.5025	-2.5025	0.0	0.0	1
1.91942		-1.1034	-1.1034	0.0	0.0	1
2.03320		-0.1276	-0.1276	0.0	0.0	1
2.28432		-0.2889	-0.2889	0.0	0.0	1
2.36560		-1.1726	-1.1726	0.0	0.0	1
2.39810		-0.7292	-0.7292	0.0	0.0	1
2.51193		0.0698	0.0698	0.0	0.0	1
2.62566		0.0451	0.0451	0.0	0.0	1
2.99056		-0.0501	-0.0501	0.0	0.0	1
3.13684		0.7457	0.7457	0.0	0.0	1
3.84308		-1.0836	-1.0836	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0001	0.0000	1.0077	187.8478	247

Table 32. Summary statistics for finger factor 1 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		-1.0386	-1.0586	0.0	0.0	1
-1.56839		-1.7157	-1.7157	0.0	0.0	1
-1.46508		0.3257	0.1086	1.2091	2.9240	3
-1.42805		-1.0006	-1.0006	0.0	0.0	1
-1.36177		-1.1065	-1.1045	0.0	0.0	1
-1.25877		0.3320	0.3320	0.0	0.0	1
-1.15545		0.5495	0.1399	1.0565	4.4648	5
-1.05214		2.1676	0.1806	1.0688	12.5661	12
-0.94914		1.3033	0.6517	0.3027	0.0916	2
-0.84583		-1.8715	-0.1701	0.9956	9.9130	11
-0.74252		7.8018	0.3121	1.0386	25.8863	25
-0.70583		0.3656	0.3656	0.0	0.0	1
-0.63952		2.2180	0.4436	1.7687	12.5131	5
-0.60252		-1.6801	-0.8400	0.2112	0.0446	2
-0.53621		3.3654	0.2244	0.8091	9.1639	15
-0.49952		-0.2010	-0.2010	0.0	0.0	1
-0.49921		-0.1103	-0.0184	1.0590	5.6069	6
-0.43289		1.2257	0.1362	1.1612	10.7863	9
-0.39621		-0.7609	-0.7609	0.0	0.0	1
-0.39590		1.1980	0.3993	0.6261	0.7840	3
-0.35921		-1.9668	-1.9668	0.0	0.0	1
-0.29290		1.1034	0.1103	0.9689	8.4490	10
-0.25590		0.2175	0.2175	0.0	0.0	1
-0.18958		5.1308	0.4276	0.9063	9.0348	12
-0.15290		-0.2080	-0.2080	0.0	0.0	1
-0.08659		-1.5374	-1.5374	0.0	0.0	1
-0.08627		0.4605	0.4605	0.0	0.0	1
-0.04959		1.1007	1.1007	0.0	0.0	1
0.01673		2.3333	0.1667	0.8652	9.7317	14
0.05372		2.8778	1.4389	1.6609	2.7586	2
0.12074		-2.6849	-0.1790	1.2429	21.6277	15
0.15672		-0.3073	-0.3073	0.0	0.0	1
0.26004		0.9827	0.3276	0.9052	1.6388	3
0.26335		-0.8714	-0.8714	0.0	0.0	1
0.32635		0.3311	0.3311	0.0	0.0	1
0.35335		-4.6845	-0.6692	1.0253	6.3041	7
0.46635		0.1247	0.0624	0.7592	0.5763	2
0.56966		2.0412	0.2269	0.8055	5.1909	9
0.67297		-2.2363	-0.2236	0.7862	5.5625	10
0.77529		0.3658	0.3658	0.0	0.0	1
0.87928		-2.6757	-0.3822	1.0472	6.5802	7
0.91628		0.1903	0.0952	0.7530	0.5670	2
0.99260		-2.1596	-0.5399	1.1927	4.2673	4
1.01928		-0.4751	-0.4751	0.0	0.0	1
1.12259		-0.8856	-0.4428	0.5844	0.3415	2
1.22590		-1.0945	-0.1368	0.6958	3.3891	8
1.43222		-0.6604	-0.2201	1.5081	4.5485	3
1.53553		-0.0020	-0.0010	0.9927	0.9855	2
1.74184		-0.8231	-0.8231	0.0	0.0	1
1.77884		-0.1264	-0.1264	0.0	0.0	1
1.84515		-0.1601	-0.1601	0.0	0.0	1
1.88215		1.0243	1.0243	0.0	0.0	1
1.99515		-0.3854	-0.3854	0.0	0.0	1
2.08846		-1.3046	-0.3261	1.3930	5.8210	4
2.39809		0.5102	0.5102	0.0	0.0	1
2.53808		-1.3624	-1.3624	0.0	0.0	1
2.64140		-2.2984	-2.2984	0.0	0.0	1
2.95102		-0.0979	-0.0979	0.0	0.0	1
3.15733		-0.5271	-0.2635	1.7634	3.1095	2
3.26065		0.7083	0.7083	0.0	0.0	1
3.74727		-1.2495	-1.2495	0.0	0.0	1
4.57283		-0.0353	-0.0353	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0001	0.0000	1.0273	195.2288	247

Table 33. Summary statistics for finger factor 2 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		-0.1504	-0.1504	0.0	0.0	1
-1.56839		-0.3403	-0.3403	0.0	0.0	1
-1.46508		-1.9234	-0.6411	0.7402	1.0958	3
-1.42808		-0.4207	-0.4207	0.0	0.0	1
-1.36177		-0.3465	-0.3465	0.0	0.0	1
-1.25977		1.4081	1.4081	0.0	0.0	1
-1.15545		3.2302	0.6460	1.1998	5.7580	5
-1.05214		-1.1433	-0.0953	1.0044	11.0969	12
-0.94916		0.0192	0.0096	0.2507	0.0629	2
-0.84583		0.7903	0.0718	0.7023	4.9329	11
-0.74252		5.5676	0.2227	1.1714	32.9335	25
-0.70533		0.4846	0.4846	0.0	0.0	1
-0.63952		-0.1644	-0.0329	1.1432	5.2272	5
-0.60252		-0.9557	-0.4778	0.5346	0.2858	2
-0.53621		-0.7464	-0.0498	1.3453	25.3393	15
-0.49952		0.6593	0.6593	0.0	0.0	1
-0.49921		-3.0750	-0.5125	0.6603	2.1798	6
-0.43239		-4.9568	-0.5508	0.7014	3.9352	9
-0.39621		-0.1224	-0.1224	0.0	0.0	1
-0.39590		-0.7532	-0.2511	1.2186	2.9698	3
-0.35921		-0.7683	-0.7683	0.0	0.0	1
-0.29290		0.1618	0.0162	1.2061	13.0921	10
-0.25590		-0.4968	-0.4968	0.0	0.0	1
-0.19958		0.0877	0.0073	1.3112	18.9130	12
-0.15290		-0.1520	-0.1520	0.0	0.0	1
-0.08659		-0.0457	-0.0457	0.0	0.0	1
-0.08627		-1.0452	-1.0452	0.0	0.0	1
-0.04959		0.3618	0.3618	0.0	0.0	1
0.01673		-0.6253	-0.0447	1.2324	19.7430	14
0.05372		-0.0858	-0.0429	1.1622	1.3507	2
0.12004		5.7288	0.3819	0.9985	13.9573	15
0.15672		1.0009	1.0009	0.0	0.0	1
0.26004		-2.6117	-0.3705	0.5267	0.5548	3
0.26035		0.6598	0.6598	0.0	0.0	1
0.32635		1.0028	1.0028	0.0	0.0	1
0.36335		2.2499	0.3214	1.0044	6.0533	7
0.46635		0.8099	0.4049	1.5757	2.4827	2
0.56966		-0.0998	-0.0100	0.9879	7.8076	9
0.67297		2.8267	0.2827	0.8004	5.7653	10
0.77629		-0.4519	-0.4519	0.0	0.0	1
0.87929		-0.3440	-0.0491	1.2786	9.8094	7
0.91628		-0.2618	-0.1309	0.5693	0.3241	2
0.98260		1.4302	0.3576	0.5109	0.7830	4
1.01929		1.6713	1.6713	0.0	0.0	1
1.12259		1.4686	0.7343	0.6048	0.3658	2
1.22590		-0.0145	-0.0018	1.1550	9.3388	8
1.43222		1.0808	0.3603	0.9439	1.7820	3
1.53553		-1.4149	-0.7075	0.3164	0.1001	2
1.74184		-0.1313	-0.1813	0.0	0.0	1
1.77884		-0.6803	-0.6803	0.0	0.0	1
1.84515		-0.5523	-0.5523	0.0	0.0	1
1.98215		-0.7581	-0.7581	0.0	0.0	1
1.98515		-0.0393	-0.0393	0.0	0.0	1
2.05846		-2.3332	-0.5825	0.6149	1.1343	4
2.39809		-0.2038	-0.2038	0.0	0.0	1
2.53808		-0.3100	-0.3100	0.0	0.0	1
2.64140		0.0928	0.0928	0.0	0.0	1
2.95102		-0.4711	-0.4711	0.0	0.0	1
3.15723		-1.2771	-0.6385	0.9095	0.8272	2
3.26065		-1.0406	-1.0406	0.0	0.0	1
3.74727		-0.3796	-0.3796	0.0	0.0	1
4.57293		-1.0635	-1.0635	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	1.0694	210.0016	247

Table 34. Summary statistics for finger factor 3 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		-0.6873	-0.6873	0.0	0.0	1
-1.56839		-0.7439	-0.7439	0.0	0.0	1
-1.46508		-2.0129	-0.6710	0.0753	0.0113	3
-1.42309		-0.5997	-0.5957	0.0	0.0	1
-1.36177		-0.5941	-0.3941	0.0	0.0	1
-1.25877		-0.3691	-0.3691	0.0	0.0	1
-1.15545		-0.8479	-0.1696	0.6797	1.8480	5
-1.05214		-2.7920	-0.2327	0.9460	9.8432	12
-0.94914		-0.5450	-0.2725	0.0059	0.0000	2
-0.84583		-6.7639	-0.6149	0.3496	1.2223	11
-0.74252		-7.6381	-0.3055	0.7988	15.3133	25
-0.70583		0.3876	0.3876	0.0	0.0	1
-0.63952		-0.0703	-0.0141	1.0778	4.6464	5
-0.61252		-1.1000	-0.5500	0.0720	0.0052	2
-0.53621		-1.9603	-0.1307	0.8841	10.9417	15
-0.49952		-1.0882	-1.0882	0.0	0.0	1
-0.49921		0.2847	0.0475	1.2020	7.2237	6
-0.43289		3.8642	0.4294	1.1095	9.8475	9
-0.39621		-0.5443	-0.5443	0.0	0.0	1
-0.39590		2.7233	0.9078	1.4362	4.1252	3
-0.35921		0.8362	0.8362	0.0	0.0	1
-0.29290		-3.7078	-0.3708	0.8953	7.2140	10
-0.25590		-0.7347	-0.7347	0.0	0.0	1
-0.18958		5.4921	0.4577	0.9517	9.9638	12
-0.15290		0.5205	0.5205	0.0	0.0	1
-0.08659		-0.2458	-0.2458	0.0	0.0	1
-0.08627		-0.9578	-0.9578	0.0	0.0	1
-0.04959		0.3037	0.3037	0.0	0.0	1
0.01673		3.5102	0.2507	1.2152	19.1972	14
0.05372		-1.4132	-0.7066	0.2048	0.0419	2
0.12004		2.4977	0.1665	1.0305	14.8661	15
0.15672		1.0579	1.0579	0.0	0.0	1
0.26004		-0.3361	-0.1120	1.2263	3.0074	3
0.26035		-0.3754	-0.3754	0.0	0.0	1
0.32635		2.1390	2.1390	0.0	0.0	1
0.36335		2.0439	0.2920	1.3869	11.4410	7
0.46635		-0.7165	-0.3583	0.9962	0.9925	2
0.56966		6.1736	0.6860	1.0533	8.8759	9
0.67297		7.3345	0.7334	1.1537	11.9783	10
0.77629		-0.2388	-0.2388	0.0	0.0	1
0.87929		1.9619	0.2803	1.2572	9.4827	7
0.91628		-0.2834	-0.1417	0.7451	0.5551	2
0.98260		1.1542	0.2885	1.2804	4.9181	4
1.01928		0.0623	0.0623	0.0	0.0	1
1.12259		1.0728	0.5364	1.5005	2.2514	2
1.22590		-2.1640	-0.2705	0.9581	6.4261	8
1.43222		-2.2831	-0.7610	0.1216	0.0296	3
1.53553		1.3792	0.6896	1.8711	3.5010	2
1.74184		-0.9792	-0.9792	0.0	0.0	1
1.77584		-1.1969	-1.1969	0.0	0.0	1
1.84515		-0.4143	-0.4143	0.0	0.0	1
1.88215		-0.3580	-0.3580	0.0	0.0	1
1.98515		-0.9096	-0.9096	0.0	0.0	1
2.08846		3.1269	0.7817	1.6133	7.8079	4
2.29839		-1.1632	-1.1632	0.0	0.0	1
2.53938		-0.5826	-0.5826	0.0	0.0	1
2.64140		-0.4130	-0.4130	0.0	0.0	1
2.95102		-0.8030	-0.8030	0.0	0.0	1
3.15733		0.5871	0.2936	1.0737	1.1529	2
3.26065		0.8222	0.8222	0.0	0.0	1
3.74727		0.0996	0.0996	0.0	0.0	1
4.57283		-0.3363	-0.3367	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	1.0100	188.7308	247

Table 35. Summary statistics for palm factor 1 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67173		0.1115	0.1115	0.0	0.0	1
-1.56839		1.0220	1.0220	0.0	0.0	1
-1.46509		4.8719	1.6240	0.8949	1.6017	3
-1.42808		2.5103	2.5103	0.0	0.0	1
-1.36177		0.0617	0.0617	0.0	0.0	1
-1.25877		-0.0206	-0.0206	0.0	0.0	1
-1.15545		-2.1420	-0.4284	1.0035	4.0284	5
-1.05214		-1.3234	-0.1103	0.8497	7.9416	12
-0.94914		-1.7376	-0.8688	0.9837	0.9676	2
-0.84583		-1.0362	-0.0942	1.0781	11.6233	11
-0.74252		2.7354	0.1092	0.8607	17.7795	25
-0.70583		-0.3359	-0.3359	0.0	0.0	1
-0.63952		-1.9738	-0.3948	0.8439	2.8484	5
-0.60252		-1.6138	-0.8069	0.4712	0.2220	2
-0.53621		5.1259	0.3417	1.2583	22.1653	15
-0.49952		-0.6979	-0.6979	0.0	0.0	1
-0.49921		0.2681	0.0447	1.4761	10.8940	6
-0.43289		2.6096	0.2900	0.8295	5.5045	9
-0.39621		-0.8254	-0.8254	0.0	0.0	1
-0.39590		0.2926	0.0975	0.7331	1.0749	3
-0.35921		-1.1379	-1.1379	0.0	0.0	1
-0.29290		0.2700	0.0270	0.8034	5.8088	10
-0.25590		0.1362	0.1362	0.0	0.0	1
-0.19959		-1.4515	-0.1210	0.7014	5.4120	12
-0.15290		-0.3460	-0.3460	0.0	0.0	1
-0.09659		0.2603	0.2603	0.0	0.0	1
-0.08627		-0.9194	-0.9194	0.0	0.0	1
-0.04959		-1.3854	-1.3854	0.0	0.0	1
0.01673		-0.8408	-0.0601	1.4443	27.1177	14
0.05372		1.8842	0.9421	0.6726	0.4524	2
0.12004		-0.0158	-0.0011	0.8198	9.4093	15
0.15672		0.7287	0.7287	0.0	0.0	1
0.26004		0.5718	0.1906	1.5870	5.0371	3
0.26035		1.2448	1.2448	0.0	0.0	1
0.32635		0.5390	0.5390	0.0	0.0	1
0.36335		-0.4944	-0.0706	1.1448	7.8630	7
0.46635		0.0077	0.0039	0.5514	0.3040	2
0.56966		-3.6888	-0.4099	0.6535	3.4161	9
0.67297		0.5609	0.0561	0.7787	5.4569	10
0.77629		-1.0931	-1.0931	0.0	0.0	1
0.87929		1.7433	0.2490	0.5235	1.6444	7
0.91629		-1.1498	-0.5749	0.1576	0.0248	2
0.98260		-2.1769	-0.5442	0.9165	2.5201	4
1.01928		1.4249	1.4249	0.0	0.0	1
1.12259		-1.5792	-0.7896	0.8946	0.8003	2
1.22590		0.6122	0.0765	0.6673	3.1175	8
1.43222		-2.2602	-0.7534	1.1642	2.7107	3
1.53553		-0.9431	-0.4715	0.9049	0.8188	2
1.74194		0.9365	0.9365	0.0	0.0	1
1.77894		0.1398	0.1398	0.0	0.0	1
1.84515		0.0926	0.0926	0.0	0.0	1
1.88215		-0.3253	-0.3253	0.0	0.0	1
1.98515		-2.9742	-2.9742	0.0	0.0	1
2.08846		-0.5824	-0.1456	0.2444	0.1793	4
2.39909		-1.6256	-1.6256	0.0	0.0	1
2.53808		0.2321	0.2321	0.0	0.0	1
2.64140		0.7205	0.7205	0.0	0.0	1
2.95102		2.0442	2.0442	0.0	0.0	1
3.15733		0.4111	0.2055	0.9537	0.9095	2
3.26065		-0.6295	-0.6295	0.0	0.0	1
3.74727		0.0175	0.0175	0.0	0.0	1
4.57283		3.6697	3.6697	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0003	0.0000	0.9576	169.6563	247

Table 36. Summary statistics for palm factor 3 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		-1.0836	-1.0836	0.0	0.0	1
-1.54939		0.0451	0.0451	0.0	0.0	1
-1.46508		-3.0091	-1.0030	2.9512	17.4188	3
-1.42809		-2.5025	-2.5025	0.0	0.0	1
-1.36177		-1.0647	-1.0647	0.0	0.0	1
-1.25877		-0.1276	-0.1276	0.0	0.0	1
-1.15545		-2.3265	-0.4653	1.2013	5.7726	5
-1.05214		2.9480	0.2457	0.7937	6.9302	12
-0.94914		-0.1841	-0.0920	0.6775	0.4590	2
-0.84583		-0.3942	-0.0358	0.7418	5.5021	11
-0.74252		-0.9269	-0.0371	1.1416	31.2779	25
-0.70583		0.0698	0.0698	0.0	0.0	1
-0.63952		-1.6927	-0.3385	0.4852	0.9418	5
-0.60252		0.1433	0.0726	0.1473	0.0217	2
-0.53621		-3.0231	-0.2015	0.9321	12.1623	15
-0.49952		0.7457	0.7457	0.0	0.0	1
-0.49921		0.9954	0.1659	1.4419	10.3960	6
-0.43299		-0.1305	-0.0201	1.2444	12.3885	9
-0.39621		-1.1004	-1.1004	0.0	0.0	1
-0.39590		-1.7409	-0.5803	0.6237	0.7781	3
-0.35921		-1.1726	-1.1726	0.0	0.0	1
-0.29290		-4.0488	-0.4049	1.3229	15.7500	10
-0.25590		-0.1291	-0.1291	0.0	0.0	1
-0.13958		-1.9791	-0.1649	1.0221	11.4918	12
-0.15290		-0.0501	-0.0501	0.0	0.0	1
-0.08659		-1.4094	-1.4094	0.0	0.0	1
-0.08627		0.6221	0.6221	0.0	0.0	1
-0.04959		-0.1604	-0.1604	0.0	0.0	1
0.01673		6.7442	0.4817	0.6292	5.1462	14
0.05372		-0.2624	-0.1312	0.0004	0.0000	2
0.12004		-2.4115	-0.1608	1.2442	21.6732	15
0.15672		-0.7292	-0.7292	0.0	0.0	1
0.26004		0.7024	0.2341	0.3468	0.2405	3
0.26335		1.4913	1.4913	0.0	0.0	1
0.32635		0.0861	0.0861	0.0	0.0	1
0.36335		1.3701	0.1957	0.6533	2.5610	7
0.46635		-2.0762	-1.0381	0.5635	0.3175	2
0.56966		0.4035	0.0448	0.5170	2.1383	9
0.67297		5.3976	0.5398	1.1959	12.9572	10
0.77529		-0.4949	-0.4949	0.0	0.0	1
0.87929		5.5773	0.7968	0.5005	1.5029	7
0.91628		1.2354	0.6177	1.1442	1.3093	2
0.98260		0.9472	0.2368	0.7684	1.7714	4
1.01929		-0.2989	-0.2989	0.0	0.0	1
1.12259		-0.1601	-0.0801	1.0755	1.1567	2
1.22590		1.1774	0.1472	0.5890	2.4288	8
1.43222		1.5464	0.5155	0.2659	0.1414	3
1.53553		-1.0007	-0.5004	1.4209	2.0190	2
1.74194		-1.3844	-1.3844	0.0	0.0	1
1.77994		0.7790	0.7750	0.0	0.0	1
1.84515		0.1026	0.1026	0.0	0.0	1
1.88215		0.2199	0.2199	0.0	0.0	1
1.93515		-0.8671	-0.8671	0.0	0.0	1
2.08846		1.0155	0.2539	0.5802	1.0098	4
2.39309		0.0181	0.0181	0.0	0.0	1
2.53808		-0.9562	-0.3562	0.0	0.0	1
2.64140		0.8749	0.8749	0.0	0.0	1
2.95132		2.0146	2.0146	0.0	0.0	1
3.15733		1.7443	0.8722	0.4289	0.1840	2
3.26065		1.4363	1.4363	0.0	0.0	1
3.74727		-1.6868	-1.6868	0.0	0.0	1
4.57293		0.0736	0.0736	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0001	0.0000	1.0077	187.8478	247

Table 37. Summary statistics for palm factor 4 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		0.3402	0.3402	0.0	0.0	1
-1.56839		2.9284	2.9284	0.0	0.0	1
-1.46508		-0.7833	-0.2611	0.6512	0.8481	3
-1.42938		-0.0931	-0.0931	0.0	0.0	1
-1.36177		-0.1156	-0.1156	0.0	0.0	1
-1.25877		-0.1212	-0.1212	0.0	0.0	1
-1.15545		-1.6508	-0.3302	0.5414	1.1724	5
-1.05214		-1.9955	-0.1663	0.7990	7.0221	12
-0.94914		-0.6903	-0.3451	0.3622	0.0039	2
-0.84583		-4.2354	-0.3850	0.3609	1.3023	11
-0.74252		6.8436	0.2737	0.8948	19.2156	25
-0.70583		-0.2513	-0.2513	0.0	0.0	1
-0.63952		-1.5532	-0.3106	0.2699	0.2913	5
-0.60252		0.4037	0.2018	0.5369	0.2882	2
-0.53621		-3.3115	-0.2208	0.3886	2.1143	15
-0.49952		-0.3452	-0.3452	0.0	0.0	1
-0.49921		-0.0842	-0.0140	1.2975	8.4174	6
-0.43289		5.5967	0.6219	1.8768	28.1795	9
-0.39621		-0.1975	-0.1975	0.0	0.0	1
-0.39590		0.5030	0.1677	0.8774	1.5398	3
-0.35921		-0.2236	-0.2236	0.0	0.0	1
-0.29290		3.3606	0.3361	1.1151	11.1915	10
-0.25590		-0.8722	-0.8722	0.0	0.0	1
-0.18959		5.9251	0.4938	1.1676	14.9968	12
-0.15290		-0.5840	-0.5840	0.0	0.0	1
-0.10659		-0.9210	-0.9210	0.0	0.0	1
-0.08627		-0.8249	-0.8249	0.0	0.0	1
-0.04959		0.0642	0.0642	0.0	0.0	1
0.01673		2.5287	0.1806	1.0013	13.0325	14
0.05372		1.9095	0.9548	2.0374	4.1512	2
0.12004		-2.2933	-0.1529	0.7977	8.9096	15
0.15672		-0.6258	-0.6258	0.0	0.0	1
0.26004		-1.5010	-0.5003	0.2411	0.1162	3
0.26035		-0.5970	-0.5970	0.0	0.0	1
0.32635		-1.3092	-1.3092	0.0	0.0	1
0.36335		-2.4843	-0.3549	0.2106	0.2662	7
0.46635		-0.0308	-0.0154	0.3684	0.1357	2
0.56966		1.6548	0.1839	1.4965	17.9159	9
0.67297		4.0360	0.4036	1.4224	18.2091	10
0.77629		-0.5006	-0.5006	0.0	0.0	1
0.87929		-4.9446	-0.7064	0.3511	0.7394	7
0.91629		-1.0346	-0.5173	0.6535	0.4271	2
0.98260		-2.4062	-0.6016	0.1811	0.0984	4
1.01929		0.4320	0.4320	0.0	0.0	1
1.12259		0.8015	0.4007	1.7420	3.0345	2
1.22590		1.0146	0.1268	1.0825	8.2024	8
1.43222		-1.2766	-0.4255	0.2254	0.1016	3
1.53553		-0.5208	-0.2604	0.6175	0.3813	2
1.74184		-0.0125	-0.0125	0.0	0.0	1
1.77884		-0.5685	-0.5685	0.0	0.0	1
1.84515		-0.1054	-0.1054	0.0	0.0	1
1.88215		0.9963	0.9963	0.0	0.0	1
1.98515		-0.0536	-0.0536	0.0	0.0	1
2.08846		-1.9694	-0.4924	0.3892	0.4544	4
2.39809		-0.0737	-0.0737	0.0	0.0	1
2.53808		-0.6028	-0.6028	0.0	0.0	1
2.64140		0.1475	0.1475	0.0	0.0	1
2.95132		-1.6293	-1.6293	0.0	0.0	1
3.15733		1.2240	0.6120	2.4433	5.9699	2
3.26065		-1.5628	-1.5628	0.0	0.0	1
3.74727		0.0433	0.0433	0.0	0.0	1
4.57283		6.2029	6.2029	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	0.9829	178.7292	247

Table 38. Summary statistics for palm factor 9 by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		-0.6603	-0.6603	0.0	0.0	1
-1.56839		1.7315	1.7315	0.0	0.0	1
-1.44538		1.6697	0.5566	1.0428	2.1749	3
-1.42808		0.3046	0.3046	0.0	0.0	1
-1.36177		-0.1485	-0.1485	0.0	0.0	1
-1.25877		-0.4098	-0.4098	0.0	0.0	1
-1.15545		1.4324	0.2865	1.0342	4.2786	5
-1.05214		-2.5954	-0.2163	0.6958	5.3261	12
-0.94914		-0.0822	-0.0411	0.0014	0.0000	2
-0.84583		2.2381	0.2035	0.8888	7.9002	11
-0.74252		-9.3618	-0.3745	0.7857	14.8170	25
-0.70593		-0.9671	-0.9671	0.0	0.0	1
-0.63752		-0.3878	-0.0776	0.2303	0.2121	5
-0.60252		-2.0492	-1.0246	0.9827	0.9656	2
-0.53621		-3.0466	-0.2031	0.5425	4.1210	15
-0.49952		-0.1215	-0.1215	0.0	0.0	1
-0.45921		1.2826	0.2138	1.3769	9.4797	6
-0.43299		3.4301	0.3811	1.0019	8.0299	9
-0.39621		-0.9124	-0.9124	0.0	0.0	1
-0.39590		-1.2282	-0.4094	0.3833	0.2938	3
-0.35921		-0.7041	-0.7041	0.0	0.0	1
-0.29290		-2.2488	-0.2249	0.4342	1.6968	10
-0.25590		0.2038	0.2038	0.0	0.0	1
-0.18958		-2.5448	-0.2121	1.2292	16.6209	12
-0.15290		1.8538	1.8538	0.0	0.0	1
-0.09659		0.6004	0.6004	0.0	0.0	1
-0.08627		1.2613	1.2613	0.0	0.0	1
-0.06959		-0.2312	-0.2312	0.0	0.0	1
0.01673		-4.5215	-0.3230	1.3792	24.7268	14
0.05372		-1.2801	-0.6401	0.1124	0.0126	2
0.12004		1.7429	0.1162	0.9029	11.4123	15
0.15672		-0.0274	-0.0274	0.0	0.0	1
0.26004		-0.2015	-0.0672	0.4701	0.4419	3
0.26035		-1.2627	-1.2627	0.0	0.0	1
0.32635		2.4592	2.4592	0.0	0.0	1
0.36335		-0.9871	-0.1410	0.4298	1.1084	7
0.46635		-0.2180	-0.1090	0.0376	0.0014	2
0.56966		11.2566	1.2507	1.2899	13.3106	9
0.67297		-0.9338	-0.0934	1.1047	10.9832	10
0.77629		-0.2769	-0.2769	0.0	0.0	1
0.87929		0.9032	0.1290	0.6655	2.6571	7
0.91629		-0.0904	-0.0452	0.3510	0.1232	2
0.98260		1.1046	0.2761	0.3360	0.3386	4
1.01928		-1.6577	-1.6577	0.0	0.0	1
1.12259		0.7199	0.3600	0.3468	0.1202	2
1.22590		-7.0102	-0.8763	0.9599	6.4503	8
1.43222		0.4278	0.1426	1.2635	3.1926	3
1.53553		-0.1023	-0.0511	0.1646	0.0271	2
1.74134		-0.2086	-0.2086	0.0	0.0	1
1.77884		1.8115	1.8115	0.0	0.0	1
1.84515		-0.2690	-0.2690	0.0	0.0	1
1.93215		0.7779	0.7779	0.0	0.0	1
1.98515		-0.1890	-0.1890	0.0	0.0	1
2.08946		0.6714	0.1679	1.4570	6.3682	4
2.35909		1.1598	1.1598	0.0	0.0	1
2.53828		0.5015	0.5015	0.0	0.0	1
2.64140		-1.9316	-1.9316	0.0	0.0	1
2.95102		3.2907	3.2907	0.0	0.0	1
3.15733		2.2033	1.1017	1.3544	1.8345	2
3.26065		2.0962	2.0962	0.0	0.0	1
3.74727		0.1762	0.1762	0.0	0.0	1
4.97293		1.5662	1.5662	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	0.9271	159.0259	247

Table 39. Summary statistics for finger factor 1 by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		-2.2857	-2.2857	0.0	0.0	1
-2.81631		-2.0838	-2.0838	0.0	0.0	1
-2.33495		-1.0862	-1.0862	0.0	0.0	1
-2.10621		-0.5307	-0.5307	0.0	0.0	1
-1.80548		0.1686	0.1686	0.0	0.0	1
-1.68541		0.7292	0.2431	0.1607	0.0516	3
-1.51718		1.8715	0.9357	0.7726	0.5969	2
-1.45665		-7.2538	-0.6594	1.2555	16.0141	11
-1.28841		0.3486	0.1743	1.1692	1.3671	2
-1.26461		-1.0321	-1.0321	0.0	0.0	1
-1.09639		-1.3318	-0.4439	1.1675	2.7261	3
-1.02541		-0.6458	-0.6458	0.0	0.0	1
-0.98868		0.5892	0.5892	0.0	0.0	1
-0.92814		-0.0197	-0.0197	0.0	0.0	1
-0.86761		-1.1467	-0.0819	1.1597	17.4852	14
-0.80708		-3.0027	-0.6005	1.1946	5.7089	5
-0.72611		-0.1924	-0.1924	0.0	0.0	1
-0.69438		0.3278	0.1639	1.0624	1.1287	2
-0.67559		0.4308	0.2154	0.2955	0.0873	2
-0.63885		2.9022	0.1814	1.0745	17.3190	16
-0.50734		2.4533	0.6133	0.3934	0.4643	4
-0.47061		-0.7415	-0.7415	0.0	0.0	1
-0.44081		1.4056	0.7028	1.0530	1.1088	2
-0.33911		-0.0479	-0.0479	0.0	0.0	1
-0.27855		2.6714	0.3816	1.0412	6.5046	7
-0.21805		2.0331	0.1564	0.7865	7.4225	13
-0.11034		0.5880	0.5880	0.0	0.0	1
-0.04981		-4.4875	-0.4080	1.5994	25.5819	11
0.01072		3.1285	0.1738	0.7818	10.3909	18
0.02116		-0.6099	-0.6099	0.0	0.0	1
0.08169		0.1462	0.0731	0.1696	0.0287	2
0.14222		0.6137	0.6137	0.0	0.0	1
0.17895		-0.7886	-0.1314	0.7948	3.1583	6
0.24992		0.5787	0.5787	0.0	0.0	1
0.27372		-1.4289	-1.4289	0.0	0.0	1
0.37399		-0.9007	-0.1001	0.9321	6.9512	9
0.40522		-0.1259	-0.1259	0.0	0.0	1
0.53922		-0.3829	-0.1914	0.5581	0.3115	2
0.59975		7.0680	0.5049	0.6920	6.2261	14
0.73125		0.4824	0.2412	0.8801	0.7746	2
0.76799		-1.6255	-0.5418	1.5166	4.6004	3
0.82852		1.9366	0.1937	0.7930	5.6602	10
0.89949		0.5063	0.5063	0.0	0.0	1
0.96032		-0.1999	-0.1999	0.0	0.0	1
0.99676		1.9295	0.9647	0.7262	0.5274	2
1.12826		-0.3560	-0.3560	0.0	0.0	1
1.18879		-0.2556	-0.0426	1.2002	7.2027	6
1.24932		-1.3650	-1.3650	0.0	0.0	1
1.41755		2.3501	0.4700	1.1619	5.3996	5
1.58579		2.2384	1.1192	0.4392	0.1929	2
1.71729		-1.9170	-1.9170	0.0	0.0	1
1.77782		0.4148	0.4148	0.0	0.0	1
1.81455		-0.1603	-0.1603	0.0	0.0	1
1.83836		-0.7860	-0.7860	0.0	0.0	1
2.00659		-2.1680	-2.1680	0.0	0.0	1
2.06712		0.1681	0.1681	0.0	0.0	1
2.23535		0.2383	0.1191	0.0659	0.0043	2
2.29559		-0.6396	-0.6396	0.0	0.0	1
2.46412		0.2812	0.2812	0.0	0.0	1
2.59562		0.9042	0.9042	0.0	0.0	1
2.63236		-0.3785	-0.3785	0.0	0.0	1
2.82439		0.4721	0.4721	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0000	0.0000	1.0131	154.9955	213

Table 40. Summary statistics for finger factor 9 by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		-0.2605	-0.2605	0.0	0.0	1
-2.81631		-0.3486	-0.3486	0.0	0.0	1
-2.33499		-0.3301	-0.3301	0.0	0.0	1
-2.10621		-0.3711	-0.3711	0.0	0.0	1
-1.80648		-0.3991	-0.3591	0.0	0.0	1
-1.68541		-0.5494	-0.1831	0.2981	0.1778	3
-1.51718		-0.6692	-0.3346	0.3161	0.0999	2
-1.45665		0.1138	0.0103	0.9410	8.8548	11
-1.28841		-1.0528	-0.5264	0.0985	0.0097	2
-1.26461		-0.3357	-0.3357	0.0	0.0	1
-1.09638		0.8396	0.2799	0.2613	0.1365	3
-1.02541		-0.6281	-0.6281	0.0	0.0	1
-0.98868		2.3595	2.3595	0.0	0.0	1
-0.92814		-0.2085	-0.2085	0.0	0.0	1
-0.86761		-4.5969	-0.3283	0.4079	2.1635	14
-0.80738		0.5499	0.1100	0.4977	0.9907	5
-0.73611		-0.4182	-0.4182	0.0	0.0	1
-0.69938		-0.9502	-0.4751	0.3508	0.1230	2
-0.67558		-0.9298	-0.4649	0.5615	0.3153	2
-0.63885		4.2231	0.2638	1.0922	17.8945	16
-0.50734		-1.5206	-0.3802	0.4910	0.7233	4
-0.47061		-0.1815	-0.1815	0.0	0.0	1
-0.44631		0.7484	0.3742	0.7991	0.6385	2
-0.33911		1.1039	1.1039	0.0	0.0	1
-0.27958		-3.5994	-0.5142	0.4642	1.2929	7
-0.21805		-0.3140	-0.0242	0.7833	7.3627	13
-0.11034		-0.2127	-0.2127	0.0	0.0	1
-0.04981		-2.3676	-0.2152	0.8273	6.8444	11
0.01072		-2.1567	-0.1198	1.1249	21.5121	18
0.02116		-0.7819	-0.7819	0.0	0.0	1
0.08169		-1.0596	-0.5298	0.0628	0.0039	2
0.14222		-0.6525	-0.6525	0.0	0.0	1
0.17895		1.0411	0.1735	1.1400	6.4979	6
0.24992		0.2428	0.2428	0.0	0.0	1
0.27372		-0.7085	-0.7085	0.0	0.0	1
0.37099		-4.0147	-0.4461	0.6110	2.9868	9
0.40522		0.0001	0.0001	0.0	0.0	1
0.53922		1.2622	0.6311	1.5624	2.4411	2
0.59975		-1.4645	-0.1046	0.9762	12.3883	14
0.73126		-0.3284	-0.1642	0.1276	0.0163	2
0.75799		0.0891	0.0297	0.7087	1.0046	3
0.82852		6.8932	0.6893	1.7197	26.6166	10
0.89949		0.1786	0.1786	0.0	0.0	1
0.96002		-0.3502	-0.3502	0.0	0.0	1
0.99676		2.1446	1.0723	3.0508	9.3077	2
1.12826		1.1616	1.1616	0.0	0.0	1
1.18879		-1.5641	-0.2607	0.3791	0.7186	6
1.24932		-0.1149	-0.1149	0.0	0.0	1
1.41755		-1.2220	-0.2444	1.0899	4.7512	5
1.58579		1.4082	0.7041	1.3033	1.6987	2
1.71729		-0.1422	-0.1422	0.0	0.0	1
1.77792		5.0735	5.0735	0.0	0.0	1
1.81455		1.3672	1.3672	0.0	0.0	1
1.83836		0.4164	0.4164	0.0	0.0	1
2.00659		0.5468	0.5468	0.0	0.0	1
2.16712		-0.3736	-0.3736	0.0	0.0	1
2.23535		3.5319	1.7660	2.7924	7.7977	2
2.29589		-0.4603	-0.4603	0.0	0.0	1
2.46412		0.4483	0.4483	0.0	0.0	1
2.59562		0.1004	0.1004	0.0	0.0	1
2.63236		-0.3116	-0.3116	0.0	0.0	1
2.82439		-0.1918	-0.1918	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	0.9812	145.3690	213

Table 41. Summary statistics for palm factor 7 by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		-0.7130	-0.7130	0.0	0.0	1
-2.81631		2.0335	2.0335	0.0	0.0	1
-2.33499		-0.4403	-0.4403	0.0	0.0	1
-2.10521		-0.2681	-0.2681	0.0	0.0	1
-1.80643		2.2623	2.2623	0.0	0.0	1
-1.69541		-0.1172	-0.0391	0.3999	0.3198	3
-1.51719		1.3595	0.6797	1.9184	3.6801	2
-1.45665		0.8030	0.0730	0.7384	5.4525	11
-1.29841		1.6896	0.8448	0.2261	0.0511	2
-1.26461		1.5307	1.5307	0.0	0.0	1
-1.19638		0.5067	0.1689	1.2519	3.1345	3
-1.02541		-0.5156	-0.5156	0.0	0.0	1
-0.98868		-0.5695	-0.5695	0.0	0.0	1
-0.92814		0.0513	0.0513	0.0	0.0	1
-0.86761		3.7558	0.2683	1.3291	22.9641	14
-0.80708		4.0636	0.8127	1.6626	11.0576	5
-0.73611		-0.4092	-0.4092	0.0	0.0	1
-0.69938		3.1815	1.5908	2.5757	6.6340	2
-0.67558		-0.9920	-0.4960	0.1580	0.0250	2
-0.63985		-2.1553	-0.1347	0.9970	14.9105	16
-0.50734		-0.2389	-0.0597	0.8551	2.1937	4
-0.47061		-0.7106	-0.7106	0.0	0.0	1
-0.44681		2.3755	1.1878	2.0805	4.3286	2
-0.32911		-0.5897	-0.5897	0.0	0.0	1
-0.27858		-1.5397	-0.2200	1.0462	6.5675	7
-0.21805		-2.4337	-0.1872	0.4630	2.5723	13
-0.11034		-0.4749	-0.4749	0.0	0.0	1
-0.04981		1.2707	0.1155	0.9959	9.9184	11
0.01072		-5.2538	-0.2919	0.4803	3.9216	18
0.02116		-0.2779	-0.2779	0.0	0.0	1
0.08169		-2.0025	-1.0013	0.9224	0.8508	2
0.14222		0.6486	0.6486	0.0	0.0	1
0.17895		-0.3064	-0.0511	1.1638	6.7723	6
0.24992		-0.4076	-0.4076	0.0	0.0	1
0.27372		1.4752	1.4752	0.0	0.0	1
0.37099		-2.3443	-0.2605	0.5015	2.0118	9
0.40522		-0.4325	-0.4325	0.0	0.0	1
0.53922		0.0279	0.0139	0.6660	0.4435	2
0.59975		-4.7132	-0.3367	0.6456	5.4192	14
0.73125		-1.0355	-0.5177	0.2326	0.0541	2
0.76799		-2.3291	-0.7764	1.1172	2.4962	3
0.82852		1.7258	0.1726	1.0332	9.6080	10
0.89949		-2.6851	-2.6851	0.0	0.0	1
0.96002		-0.5017	-0.5017	0.0	0.0	1
0.99676		1.2819	0.6410	1.2119	1.4687	2
1.12826		-0.5059	-0.5059	0.0	0.0	1
1.19879		-1.8476	-0.3079	0.7462	2.7841	6
1.24932		-0.2573	-0.2573	0.0	0.0	1
1.41755		-0.9657	-0.1931	0.8955	3.2077	5
1.58579		4.5201	2.2601	1.8459	3.4073	2
1.71729		-0.4830	-0.4830	0.0	0.0	1
1.77782		-0.2565	-0.2565	0.0	0.0	1
1.81455		-0.2770	-0.2770	0.0	0.0	1
1.83835		-0.1612	-0.1612	0.0	0.0	1
2.00659		-0.0921	-0.0921	0.0	0.0	1
2.06712		0.2663	0.2663	0.0	0.0	1
2.23535		3.3569	1.6784	1.1968	1.4323	2
2.29589		-0.6580	-0.6580	0.0	0.0	1
2.46412		0.8630	0.8630	0.0	0.0	1
2.59562		-0.5543	-0.5543	0.0	0.0	1
2.63236		-0.6841	-0.6841	0.0	0.0	1
2.82439		2.1478	2.1478	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0001	-0.0000	0.9549	137.6872	213

Table 42. Summary statistics for finger factor 3 by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		-0.4122	-0.4122	0.0	0.0	1
-1.73293		-0.3388	-0.3388	0.0	0.0	1
-1.58655		-2.4257	-0.4851	0.2108	0.1778	5
-1.33544		-1.1870	-0.5935	0.2456	0.0603	2
-1.25415		-0.5228	-0.5228	0.0	0.0	1
-1.22166		-0.2519	-0.1259	0.1648	0.0272	2
-1.14037		-0.4350	-0.4350	0.0	0.0	1
-1.10788		-4.8977	-0.3767	0.7339	6.4627	13
-1.02659		-0.6206	-0.6206	0.0	0.0	1
-0.99410		-0.4179	-0.0232	1.0159	17.5447	18
-0.74295		-0.5225	-0.5225	0.0	0.0	1
-0.62920		-0.7603	-0.0845	1.0422	8.6886	9
-0.51542		5.4715	0.3908	1.3213	22.6972	14
-0.49196		-0.5966	-0.5966	0.0	0.0	1
-0.48292		4.4216	1.4739	0.9964	1.9856	3
-0.40163		2.5574	0.2557	1.0816	10.5285	10
-0.36914		-2.0198	-0.1836	0.5767	3.3260	11
-0.26430		3.9434	1.9717	0.5487	0.3011	2
-0.24074		-0.8150	-0.8150	0.0	0.0	1
-0.15052		2.9340	2.9340	0.0	0.0	1
-0.03874		-1.1554	-0.1926	0.6548	2.1439	6
-0.00424		-0.7394	-0.2465	0.2755	0.1518	3
0.07704		0.4899	0.0980	1.2176	5.9303	5
0.10954		4.0715	0.2908	1.3747	24.5660	14
0.22332		-7.5981	-0.4749	0.7722	8.9448	16
0.36086		-0.5922	-0.5922	0.0	0.0	1
0.44194		1.4377	1.4377	0.0	0.0	1
0.47444		0.9309	0.2327	1.2713	4.8487	4
0.55572		-0.1341	-0.1341	0.0	0.0	1
0.58822		2.2429	0.3204	1.1954	8.5741	7
0.66951		-0.4062	-0.2031	0.3379	0.1142	2
0.70200		4.0027	0.3639	1.1802	13.9296	11
0.73450		-0.8942	-0.8942	0.0	0.0	1
0.78329		-0.4676	-0.4676	0.0	0.0	1
0.81578		0.5139	0.0857	0.9648	4.6538	6
0.84828		-0.1347	-0.1347	0.0	0.0	1
0.95312		-0.3733	-0.1866	0.3747	0.1404	2
1.03440		-0.8161	-0.8161	0.0	0.0	1
1.14818		-0.7042	-0.7042	0.0	0.0	1
1.18068		0.5124	0.2562	0.0450	0.0020	2
1.29446		3.1141	1.0380	1.6005	5.1234	3
1.32696		1.1468	0.5734	2.2491	5.0583	2
1.40824		-0.7623	-0.3812	0.3550	0.1260	2
1.44074		-1.0670	-0.5335	0.0112	0.0001	2
1.54558		-0.5280	-0.5280	0.0	0.0	1
1.65936		-0.9783	-0.9783	0.0	0.0	1
1.80564		-0.7379	-0.7379	0.0	0.0	1
1.88692		1.4789	0.7394	0.3348	0.1121	2
1.91942		0.0650	0.0325	0.0194	0.0004	2
1.94298		0.0314	0.0314	0.0	0.0	1
1.95191		0.0984	0.0984	0.0	0.0	1
2.00070		-0.5453	-0.5453	0.0	0.0	1
2.03320		-0.2294	-0.2294	0.0	0.0	1
2.13804		-0.2002	-0.2002	0.0	0.0	1
2.28432		-1.0671	-1.0671	0.0	0.0	1
2.39810		-0.3993	-0.3993	0.0	0.0	1
2.59316		-0.4879	-0.4879	0.0	0.0	1
2.64922		-0.6214	-0.6214	0.0	0.0	1
2.76300		-0.5606	-0.5606	0.0	0.0	1
2.90927		-0.6752	-0.6752	0.0	0.0	1
3.50174		0.0163	0.0163	0.0	0.0	1
3.76179		-0.3822	-0.3822	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0002	-0.0000	1.0171	156.2195	213

Table 43. Summary statistics for palm factor 1 by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		1.3898	1.3898	0.0	0.0	1
-1.73283		-2.1834	-2.1834	0.0	0.0	1
-1.58655		-2.0311	-0.4062	1.3441	7.2259	5
-1.33544		-0.2125	-0.1062	0.8207	0.6736	2
-1.25415		-0.9404	-0.9404	0.0	0.0	1
-1.22166		-0.9111	-0.4556	0.3712	0.1378	2
-1.14037		-0.5565	-0.5565	0.0	0.0	1
-1.10788		-2.6513	-0.2039	1.0759	13.8902	13
-1.02659		1.1198	1.1198	0.0	0.0	1
-0.99410		0.7919	0.0440	1.0736	19.5943	18
-0.74298		0.2784	0.2784	0.0	0.0	1
-0.62920		-8.0148	-0.8905	1.5981	20.4318	9
-0.51542		3.6087	0.2578	0.5019	3.2747	14
-0.49186		-0.1961	-0.1961	0.0	0.0	1
-0.48292		-1.4403	-0.4801	0.6622	0.8769	3
-0.40163		0.0829	0.0083	1.2421	13.8858	10
-0.36914		-5.2778	-0.4798	1.4925	22.2747	11
-0.26430		0.7751	0.3875	1.2006	1.4414	2
-0.24074		0.6091	0.6091	0.0	0.0	1
-0.15052		0.7669	0.7669	0.0	0.0	1
-0.03674		1.7123	0.2854	1.0701	5.7251	6
-0.00424		0.1998	0.0666	0.5207	0.5423	3
0.07704		0.5568	0.1114	0.7407	2.1945	5
0.10954		0.8014	0.0572	1.2620	20.7028	14
0.22332		0.3016	0.0189	0.9652	13.9731	16
0.36366		0.5748	0.5748	0.0	0.0	1
0.44194		1.7076	1.7076	0.0	0.0	1
0.47444		1.3809	0.3452	0.5299	0.8425	4
0.55572		-0.3315	-0.3315	0.0	0.0	1
0.58822		1.7494	0.2499	0.8450	4.2845	7
0.66951		-0.7722	-0.3861	0.3578	0.1280	2
0.70200		-1.5769	-0.1434	0.7691	5.9154	11
0.73450		1.8589	1.8589	0.0	0.0	1
0.78329		0.2547	0.2547	0.0	0.0	1
0.81578		2.0480	0.3413	0.2524	0.3187	6
0.84828		-1.6850	-1.6850	0.0	0.0	1
0.95312		0.2896	0.1448	1.0956	1.2004	2
1.03440		-0.5745	-0.5745	0.0	0.0	1
1.14818		0.2115	0.2115	0.0	0.0	1
1.18068		0.6561	0.3280	0.2311	0.0534	2
1.29446		0.5759	0.1920	0.2436	0.1187	3
1.32696		0.6390	0.3195	1.1350	1.2882	2
1.40824		0.3810	0.1905	0.3924	0.1540	2
1.44074		-0.5954	-0.2977	0.2001	0.0400	2
1.54558		0.9642	0.9642	0.0	0.0	1
1.65936		0.2427	0.2427	0.0	0.0	1
1.80564		1.0996	1.0996	0.0	0.0	1
1.88692		1.1402	0.5701	1.7396	3.0262	2
1.91942		1.2713	0.6357	0.6489	0.4211	2
1.94298		-0.3130	-0.8130	0.0	0.0	1
1.95191		-0.7247	-0.7247	0.0	0.0	1
2.00070		0.0713	0.0713	0.0	0.0	1
2.03320		0.3427	0.8427	0.0	0.0	1
2.13804		-0.3919	-0.3919	0.0	0.0	1
2.25433		0.7233	0.7283	0.0	0.0	1
2.39810		-0.3833	-0.3833	0.0	0.0	1
2.59316		0.5741	0.5741	0.0	0.0	1
2.64922		-0.9479	-0.9479	0.0	0.0	1
2.76300		-0.6932	-0.6902	0.0	0.0	1
2.90927		-0.2798	-0.2798	0.0	0.0	1
3.50174		1.0845	1.0845	0.0	0.0	1
3.76179		0.8448	0.8448	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0000	0.0000	1.0442	164.8358	213

Table 44. Summary statistics for palm factor 3 by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		-0.8123	-0.8123	0.0	0.0	1
-1.73283		-0.8445	-0.8445	0.0	0.0	1
-1.58655		-1.8842	-0.3768	1.2129	5.8844	5
-1.33544		-0.2067	-0.1034	0.4609	0.2125	2
-1.25415		0.2250	0.2250	0.0	0.0	1
-1.22166		-0.5975	-0.2987	1.0683	1.1413	2
-1.14037		-0.5232	-0.5232	0.0	0.0	1
-1.10738		-1.1488	-0.0884	1.2008	17.3021	13
-1.02659		-0.2390	-0.2390	0.0	0.0	1
-0.99410		-0.3097	-0.0172	0.9931	16.7675	18
-0.74298		0.3689	0.3689	0.0	0.0	1
-0.62920		-0.0223	-0.0025	1.2913	13.3401	9
-0.51542		1.0779	0.0770	0.8416	9.2087	14
-0.49186		0.1999	0.1999	0.0	0.0	1
-0.48292		2.9250	0.9750	0.7180	1.0310	3
-0.40163		-0.6595	-0.0659	0.9909	8.8376	10
-0.36914		-0.3494	-0.0318	0.7854	6.1687	11
-0.26430		0.9082	0.4541	0.1990	0.0396	2
-0.24074		-0.2235	-0.2235	0.0	0.0	1
-0.15052		-0.2362	-0.2362	0.0	0.0	1
-0.03674		3.8242	0.6374	0.8905	3.9647	6
-0.00424		3.6142	1.2047	2.4199	11.7115	3
0.07704		2.4019	0.4804	1.0921	4.7708	5
0.10954		1.7783	0.1270	0.8916	10.3355	14
0.22332		5.5515	0.3470	0.7187	7.7477	16
0.36066		-0.7803	-0.7803	0.0	0.0	1
0.44194		0.0690	0.0690	0.0	0.0	1
0.47444		1.4865	0.3716	1.2599	4.7618	4
0.55572		1.1475	1.1475	0.0	0.0	1
0.58822		3.3926	0.4847	0.7167	3.0822	7
0.66951		-2.3355	-1.1677	0.2674	0.0715	2
0.70200		0.9168	0.0833	0.6795	4.6176	11
0.73450		0.0416	0.0416	0.0	0.0	1
0.78329		-0.7136	-0.7136	0.0	0.0	1
0.81578		-0.8350	-0.1392	0.7525	2.8316	6
0.84823		-0.6831	-0.6831	0.0	0.0	1
0.95312		-0.2823	-0.1412	0.3803	0.1446	2
1.03440		1.7025	1.7025	0.0	0.0	1
1.14818		-0.4602	-0.4602	0.0	0.0	1
1.18068		-1.2090	-0.6045	0.1228	0.0151	2
1.29446		-5.6563	-1.8854	1.1536	2.6617	3
1.32696		-1.1387	-0.5693	0.5761	0.3319	2
1.40824		-2.5893	-1.2947	0.6347	0.4028	2
1.44074		1.1958	0.5979	0.1684	0.0284	2
1.54558		-1.4635	-1.4635	0.0	0.0	1
1.65936		-1.1303	-1.1303	0.0	0.0	1
1.80564		-0.5703	-0.5703	0.0	0.0	1
1.88692		0.4443	0.2221	2.5982	6.7509	2
1.91942		-0.3776	-0.1888	1.4122	1.9943	2
1.94298		0.5199	0.5199	0.0	0.0	1
1.95191		0.1393	0.1393	0.0	0.0	1
2.00070		-1.4522	-1.4522	0.0	0.0	1
2.03329		-0.3928	-0.3928	0.0	0.0	1
2.13804		0.2980	0.2980	0.0	0.0	1
2.28432		2.1529	2.1529	0.0	0.0	1
2.39310		-0.8927	-0.8927	0.0	0.0	1
2.59316		0.7744	0.7744	0.0	0.0	1
2.64922		-1.4799	-1.4799	0.0	0.0	1
2.76300		-0.9437	-0.9437	0.0	0.0	1
2.90927		-2.1683	-2.1683	0.0	0.0	1
3.50174		-0.3017	-0.3017	0.0	0.0	1
3.76179		-1.2426	-1.2426	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0002	0.0000	0.9838	146.1979	213

Table 45. Summary statistics for palm factor 8 by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		-0.2089	-0.2089	0.0	0.0	1
-1.73293		0.1144	0.1144	0.0	0.0	1
-1.58655		-1.5279	-0.3056	0.1447	0.0837	5
-1.33544		-0.5697	-0.2848	0.0166	0.0003	2
-1.25415		-0.2341	-0.2341	0.0	0.0	1
-1.22166		-0.4417	-0.2209	0.1807	0.0327	2
-1.14037		-0.1816	-0.1816	0.0	0.0	1
-1.10788		2.4750	0.1904	1.0309	12.7525	13
-1.02659		4.4943	4.4943	0.0	0.0	1
-0.99410		0.6173	0.0343	1.4015	33.3918	18
-0.74298		-0.2031	-0.2031	0.0	0.0	1
-0.62920		-0.9129	-0.1014	0.1565	0.1959	9
-0.51542		-3.2053	-0.2290	0.2313	0.6984	14
-0.49186		-0.1692	-0.1692	0.0	0.0	1
-0.48292		-0.9290	-0.3097	0.2230	0.0995	3
-0.40163		1.2878	0.1288	1.0337	9.6177	10
-0.36914		-1.7779	-0.1616	0.1279	0.1637	11
-0.28430		-0.8471	-0.4236	0.2832	0.0802	2
-0.24074		-0.2632	-0.2632	0.0	0.0	1
-0.15052		-0.1975	-0.1975	0.0	0.0	1
-0.03674		-2.3884	-0.3981	0.1060	0.0562	6
-0.00424		-0.6483	-0.2161	0.2386	0.1139	3
0.07704		-1.5625	-0.3125	0.0879	0.0309	5
0.10954		-4.0685	-0.2906	0.1748	0.3974	14
0.22332		3.3148	0.2072	1.3658	27.9818	16
0.36066		-0.1850	-0.1850	0.0	0.0	1
0.44194		-0.3470	-0.3470	0.0	0.0	1
0.47444		1.7909	0.4477	1.3525	5.4875	4
0.55572		-0.2832	-0.2832	0.0	0.0	1
0.58822		2.4177	0.3454	1.6419	16.1747	7
0.66951		-0.2782	-0.1391	0.1512	0.0228	2
0.70200		-1.9061	-0.1733	0.1634	0.2671	11
0.73450		-0.2495	-0.2495	0.0	0.0	1
0.78329		-0.1458	-0.1458	0.0	0.0	1
0.81578		-1.4294	-0.2382	0.1189	0.0706	6
0.84829		-0.0468	-0.0468	0.0	0.0	1
0.95312		-1.4157	-0.7079	0.0622	0.0039	2
1.03440		-0.1806	-0.1806	0.0	0.0	1
1.14818		-0.1827	-0.1827	0.0	0.0	1
1.18068		-0.4871	-0.2435	0.2177	0.0474	2
1.29446		2.3572	0.7857	1.2468	3.1091	3
1.32696		-0.3907	-0.1954	0.0122	0.0001	2
1.40824		2.7519	1.3760	2.1307	4.5399	2
1.44074		-0.3678	-0.1839	0.0116	0.0001	2
1.54558		-0.5465	-0.5465	0.0	0.0	1
1.65936		-0.1912	-0.1912	0.0	0.0	1
1.80564		-0.2838	-0.2838	0.0	0.0	1
1.88692		5.2394	2.6197	3.8738	15.0066	2
1.91942		-0.6867	-0.3433	0.1115	0.0124	2
1.94298		-0.1640	-0.1640	0.0	0.0	1
1.95191		0.3424	0.3424	0.0	0.0	1
2.00070		-0.3923	-0.3923	0.0	0.0	1
2.03320		-0.2905	-0.2905	0.0	0.0	1
2.13834		-0.6420	-0.6420	0.0	0.0	1
2.28432		-0.2919	-0.2919	0.0	0.0	1
2.39810		-0.1306	-0.1306	0.0	0.0	1
2.59316		-0.2925	-0.2925	0.0	0.0	1
2.64922		0.1051	0.1051	0.0	0.0	1
2.76300		-0.3282	-0.3282	0.0	0.0	1
2.90927		-0.0481	-0.0481	0.0	0.0	1
3.50174		5.4122	5.4122	0.0	0.0	1
3.76175		-0.1998	-0.1998	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0000	-0.0000	0.9294	130.4389	213

Table 46. Summary statistics for palm factor 4 by birth order factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.09433		-0.1345	-0.1345	0.0	0.0	1
-1.77473		1.2019	1.2019	0.0	0.0	1
-1.67139		-1.5771	-1.5771	0.0	0.0	1
-1.46508		-0.7012	-0.3506	1.2487	1.5592	2
-1.25877		0.1405	0.1405	0.0	0.0	1
-1.22945		-1.7209	-1.7209	0.0	0.0	1
-1.15545		-2.6397	-0.6400	0.7139	2.5483	6
-1.05214		4.9187	0.4919	0.8062	5.8500	10
-0.94914		2.4898	1.2449	0.7711	0.5945	2
-0.91215		-1.0656	-0.5323	1.7953	3.2233	2
-0.84583		3.9858	0.2491	1.0708	17.2000	16
-0.80883		-2.5849	-1.2924	0.7373	0.5437	2
-0.74252		-5.5493	-0.3083	0.8816	13.2115	18
-0.63952		-1.0882	-1.0882	0.0	0.0	1
-0.60252		1.1120	0.3707	0.1176	0.0277	3
-0.53621		-4.1080	-0.3735	1.4546	21.1579	11
-0.49921		-0.1424	-0.0285	0.2823	0.3189	5
-0.43289		-1.0375	-0.2075	1.0251	4.2033	5
-0.39621		-1.1131	-0.5566	0.3861	0.1491	2
-0.39590		0.7828	0.7828	0.0	0.0	1
-0.29321		0.2811	0.2811	0.0	0.0	1
-0.29290		-0.1265	-0.0115	1.0158	10.3191	11
-0.25590		-1.1902	-1.1902	0.0	0.0	1
-0.18958		3.6640	0.2617	1.0348	13.9207	14
-0.08659		0.5264	0.2632	1.1223	1.2595	2
-0.08627		1.0135	1.0135	0.0	0.0	1
0.01673		-5.8532	-0.4181	0.8023	8.3686	14
0.05972		3.6349	3.6349	0.0	0.0	1
0.11972		-0.6262	-0.6262	0.0	0.0	1
0.12004		2.4393	0.1876	0.7644	7.0116	13
0.15672		-0.2582	-0.2582	0.0	0.0	1
0.22304		2.6443	2.6443	0.0	0.0	1
0.26004		2.2855	1.1428	0.4879	0.2380	2
0.32635		2.6912	0.8971	0.6352	0.8071	3
0.36335		0.8354	0.1392	0.6560	2.1516	6
0.46635		-1.2861	-1.2861	0.0	0.0	1
0.46666		0.2916	0.2916	0.0	0.0	1
0.56966		0.3073	0.0439	0.9807	5.7704	7
0.60666		-0.9465	-0.9465	0.0	0.0	1
0.67297		1.3582	0.1509	0.9355	7.0014	9
0.81297		-0.8551	-0.8551	0.0	0.0	1
0.87929		-0.0070	-0.0023	0.7288	1.0624	3
0.91597		-0.0900	-0.0900	0.0	0.0	1
0.91628		-0.8714	-0.8714	0.0	0.0	1
0.98260		1.0634	0.5317	0.0719	0.0052	2
1.01928		-1.1714	-1.1714	0.0	0.0	1
1.22559		0.6052	0.6052	0.0	0.0	1
1.22590		1.3370	1.3370	0.0	0.0	1
1.29222		0.7068	0.7068	0.0	0.0	1
1.36590		-1.1471	-1.1471	0.0	0.0	1
1.43222		2.6559	0.6640	0.4081	0.4996	4
1.53553		-0.0921	-0.0921	0.0	0.0	1
1.57221		0.3770	0.3770	0.0	0.0	1
1.67553		0.7743	0.7743	0.0	0.0	1
1.84515		-0.4466	-0.2233	0.8069	0.6511	2
1.99519		-0.9378	-0.4689	0.9972	0.9944	2
2.08846		-3.1032	-1.5516	0.7015	0.4921	2
2.29478		-0.0443	-0.0443	0.0	0.0	1
2.43477		0.7149	0.7149	0.0	0.0	1
3.60696		-0.7993	-0.7993	0.0	0.0	1
3.81358		0.4710	0.4710	0.0	0.0	1
6.09163		-1.9949	-1.9949	0.0	0.0	1
WITHIN GROUPS TOTAL		0.0001	0.0000	0.9319	131.1399	213

Table 47. Summary statistics for palm factor 11 by birth order factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.08433		-0.0308	-0.0308	0.0	0.0	1
-1.77470		-0.5300	-0.5300	0.0	0.0	1
-1.67139		-0.1376	-0.1376	0.0	0.0	1
-1.46538		-0.5388	-0.2694	0.2734	0.0747	2
-1.25977		-0.0744	-0.0744	0.0	0.0	1
-1.25845		-0.1612	-0.1612	0.0	0.0	1
-1.15545		-0.6710	-0.1118	0.1716	0.1472	6
-1.05214		-2.9898	-0.2990	0.2816	0.7135	10
-0.94914		-0.4863	-0.2431	0.1399	0.0196	2
-0.91215		-0.2033	-0.1017	0.0717	0.0051	2
-0.34583		-1.1332	-0.0708	0.5085	3.8780	16
-0.80833		-0.2933	-0.1466	0.1316	0.0173	2
-0.74252		-3.7199	-0.2067	0.1343	0.3064	18
-0.63952		-0.2827	-0.2827	0.0	0.0	1
-0.60252		-0.6015	-0.2005	0.0442	0.0039	3
-0.53621		-2.3602	-0.2146	0.1245	0.1550	11
-0.49921		-0.4044	-0.0809	0.0815	0.0266	5
-0.43289		1.8223	0.3645	0.9828	3.8639	5
-0.39621		-0.1534	-0.0767	0.2385	0.0569	2
-0.39590		-0.3014	-0.3014	0.0	0.0	1
-0.29321		-0.0411	-0.0411	0.0	0.0	1
-0.29290		-1.5308	-0.1392	0.1494	0.2231	11
-0.25590		-0.0922	-0.0922	0.0	0.0	1
-0.18958		-2.6076	-0.1863	0.1420	0.2621	14
-0.08659		-0.0990	-0.0495	0.0954	0.0091	2
-0.08627		-0.2844	-0.2844	0.0	0.0	1
0.01673		2.8592	0.2042	0.8911	10.3217	14
0.05372		-0.7995	-0.7995	0.0	0.0	1
0.11972		0.0939	0.0939	0.0	0.0	1
0.12004		3.2244	0.2480	0.9852	11.6471	13
0.15672		-0.0870	-0.0870	0.0	0.0	1
0.22304		-0.5049	-0.5049	0.0	0.0	1
0.26004		-0.6680	-0.3340	0.1145	0.0131	2
0.32635		-0.5289	-0.1763	0.1637	0.0536	3
0.36335		-0.7833	-0.1305	0.1350	0.0912	6
0.46635		-0.0974	-0.0974	0.0	0.0	1
0.46666		-0.3875	-0.3875	0.0	0.0	1
0.56966		-1.2750	-0.1821	0.1481	0.1315	7
0.60666		-0.0878	-0.0878	0.0	0.0	1
0.67297		-1.3607	-0.1512	0.1058	0.0896	9
0.81297		-0.1703	-0.1703	0.0	0.0	1
0.87928		1.0231	0.3410	0.6584	0.8671	3
0.91597		-0.0936	-0.0936	0.0	0.0	1
0.91628		-0.0668	-0.0668	0.0	0.0	1
0.98260		-0.4574	-0.2287	0.1355	0.0184	2
1.01928		-0.1875	-0.1875	0.0	0.0	1
1.22559		-0.1824	-0.1824	0.0	0.0	1
1.22590		-0.3039	-0.3039	0.0	0.0	1
1.29222		-0.0548	-0.0548	0.0	0.0	1
1.36590		-0.1526	-0.1526	0.0	0.0	[illegible]
1.43222		17.6566	4.4141	5.2976	84.1925	4
1.53553		0.0174	0.0174	0.0	0.0	1
1.57221		-0.3191	-0.3191	0.0	0.0	1
1.67553		-0.3658	-0.3668	0.0	0.0	1
1.84515		-0.3706	-0.1853	0.1786	0.0319	2
1.98515		3.8157	1.9078	0.3557	0.1265	2
2.08846		-0.3269	-0.1634	0.0607	0.0037	2
2.29478		-0.3116	-0.3116	0.0	0.0	1
2.43677		-0.2680	-0.2680	0.0	0.0	1
3.60696		-0.1150	-0.1150	0.0	0.0	1
3.81358		-0.1581	-0.1581	0.0	0.0	1
6.09163		-0.2992	-0.2992	0.0	0.0	1
WITHIN GROUPS TOTAL		-0.0000	-0.0000	0.8816	117.3503	213

Table 48. Summary statistics for ridge width by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		0.5647	0.5647	0.0	0.0	1
-1.56839		0.5052	0.5052	0.0	0.0	1
-1.46508		1.3838	0.4613	0.0206	0.0008	3
-1.42808		0.4571	0.4571	0.0	0.0	1
-1.36177		0.5057	0.5057	0.0	0.0	1
-1.25877		0.5172	0.5172	0.0	0.0	1
-1.15545		2.6645	0.5329	0.0343	0.0047	5
-1.05214		6.0171	0.5014	0.0576	0.0365	12
-0.94914		1.0694	0.5347	0.0491	0.0024	2
-0.84583		5.5222	0.5020	0.0344	0.0118	11
-0.74252		12.7263	0.5091	0.0438	0.0461	25
-0.70583		0.4881	0.4881	0.0	0.0	1
-0.63952		2.5857	0.5171	0.0393	0.0062	5
-0.60252		1.0625	0.5313	0.0442	0.0020	2
-0.53621		7.9699	0.5313	0.0598	0.0501	15
-0.49952		0.4512	0.4512	0.0	0.0	1
-0.49921		3.1402	0.5234	0.0724	0.0262	6
-0.43289		4.6825	0.5203	0.0560	0.0250	9
-0.39621		0.5789	0.5789	0.0	0.0	1
-0.39590		1.6685	0.5562	0.0456	0.0042	3
-0.35921		0.6486	0.6486	0.0	0.0	1
-0.29290		5.2377	0.5238	0.0315	0.0089	10
-0.25590		0.4943	0.4943	0.0	0.0	1
-0.18958		6.3436	0.5286	0.0331	0.0120	12
-0.15290		0.5375	0.5375	0.0	0.0	1
-0.08659		0.5444	0.5444	0.0	0.0	1
-0.08627		0.5600	0.5600	0.0	0.0	1
-0.04959		0.5484	0.5484	0.0	0.0	1
0.01673		7.1791	0.5125	0.0467	0.0283	14
0.05372		1.0094	0.5047	0.0144	0.0002	2
0.12004		8.0166	0.5344	0.0530	0.0393	15
0.15672		0.4839	0.4839	0.0	0.0	1
0.26004		1.4991	0.4997	0.0874	0.0153	3
0.26035		0.5196	0.5196	0.0	0.0	1
0.32635		0.5213	0.5213	0.0	0.0	1
0.36335		3.4665	0.4952	0.0216	0.0028	7
0.46635		1.0453	0.5227	0.0235	0.0006	2
0.56965		4.6812	0.5201	0.0378	0.0114	9
0.67297		5.2080	0.5208	0.0449	0.0182	10
0.77529		0.5676	0.5676	0.0	0.0	1
0.87929		3.6680	0.5240	0.0297	0.0053	7
0.91629		1.1163	0.5581	0.0115	0.0001	2
0.98260		2.0784	0.5196	0.0206	0.0013	4
1.01928		0.5490	0.5490	0.0	0.0	1
1.12259		1.0545	0.5272	0.0221	0.0005	2
1.22590		4.2929	0.5366	0.0434	0.0132	8
1.43222		1.5860	0.5287	0.0558	0.0062	3
1.53593		1.0797	0.5399	0.0564	0.0032	2
1.74184		0.5000	0.5000	0.0	0.0	1
1.77584		0.4828	0.4828	0.0	0.0	1
1.84515		0.5632	0.5632	0.0	0.0	1
1.88215		0.4878	0.4878	0.0	0.0	1
1.98915		0.6296	0.6296	0.0	0.0	1
2.08846		2.1326	0.5331	0.0423	0.0054	4
2.39809		0.5507	0.5507	0.0	0.0	1
2.53808		0.4773	0.4773	0.0	0.0	1
2.64140		0.4894	0.4894	0.0	0.0	1
2.95102		0.4732	0.4732	0.0	0.0	1
3.15733		0.9914	0.4957	0.0234	0.0005	2
3.26065		0.5062	0.5062	0.0	0.0	1
3.74727		0.5663	0.5663	0.0	0.0	1
4.57283		0.5039	0.5039	0.0	0.0	1
WITHIN GROUPS TOTAL		128.4480	0.5200	0.0458	0.3888	247

Table 49. Summary statistics for ridge width by birth order factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.38433		0.6333	0.6333	0.0	0.0	1
-1.77470		0.5833	0.5833	0.0	0.0	1
-1.67139		0.5375	0.5375	0.0	0.0	1
-1.46508		1.2688	0.6344	0.0158	0.0003	2
-1.25977		0.5802	0.5802	0.0	0.0	1
-1.25845		0.5111	0.5111	0.0	0.0	1
-1.15545		3.3826	0.5638	0.0277	0.0038	6
-1.05214		5.7637	0.5764	0.0427	0.0164	10
-0.94914		1.1215	0.5608	0.0217	0.0005	2
-0.91215		1.0939	0.5470	0.0168	0.0003	2
-0.84583		9.3502	0.5844	0.0631	0.0598	16
-0.80883		1.2516	0.6258	0.0132	0.0002	2
-0.74292		10.5317	0.5851	0.0705	0.0846	18
-0.63952		0.7143	0.7143	0.0	0.0	1
-0.60252		1.8519	0.6173	0.0302	0.0018	3
-0.53621		6.1058	0.5551	0.0327	0.0107	11
-0.49921		2.8528	0.5706	0.0642	0.0165	5
-0.43289		2.8471	0.5694	0.0552	0.0122	5
-0.39621		1.0749	0.5374	0.0235	0.0006	2
-0.39590		0.5443	0.5443	0.0	0.0	1
-0.29321		0.6111	0.6111	0.0	0.0	1
-0.29290		6.6416	0.6038	0.0457	0.0209	11
-0.25590		0.5542	0.5542	0.0	0.0	1
-0.18959		7.8332	0.5595	0.0342	0.0152	14
-0.08559		1.2920	0.6460	0.0231	0.0005	2
-0.08627		0.5890	0.5890	0.0	0.0	1
0.01673		8.0372	0.5741	0.0371	0.0179	14
0.05372		0.5208	0.5208	0.0	0.0	1
0.11972		0.6585	0.6585	0.0	0.0	1
0.12004		7.7226	0.5940	0.0587	0.0414	13
0.15672		0.6486	0.6486	0.0	0.0	1
0.22304		0.5455	0.5455	0.0	0.0	1
0.26004		1.1715	0.5858	0.0096	0.0001	2
0.32635		1.7432	0.5811	0.0410	0.0034	3
0.36335		3.2999	0.5500	0.0200	0.0020	6
0.46635		0.6049	0.6049	0.0	0.0	1
0.46666		0.5181	0.5181	0.0	0.0	1
0.56946		4.1342	0.5906	0.0387	0.0090	7
0.60666		0.5918	0.5918	0.0	0.0	1
0.67297		5.7296	0.6366	0.0450	0.0162	9
0.81297		0.6216	0.6216	0.0	0.0	1
0.87928		1.8276	0.6092	0.1114	0.0248	3
0.91597		0.6353	0.6353	0.0	0.0	1
0.91628		0.5862	0.5862	0.0	0.0	1
0.98260		1.2689	0.6345	0.0455	0.0021	2
1.01928		0.5505	0.5505	0.0	0.0	1
1.22559		0.6066	0.6066	0.0	0.0	1
1.22590		0.5976	0.5976	0.0	0.0	1
1.29222		0.5641	0.5641	0.0	0.0	1
1.36590		0.5843	0.5843	0.0	0.0	1
1.43222		2.2419	0.5605	0.0441	0.0058	4
1.53553		0.5465	0.5465	0.0	0.0	1
1.57221		0.5867	0.5867	0.0	0.0	1
1.67553		0.5921	0.5921	0.0	0.0	1
1.84515		1.2379	0.6189	0.0231	0.0005	2
1.98515		1.1514	0.5757	0.0588	0.0035	2
2.08846		1.0220	0.5110	0.0877	0.0077	2
2.29478		0.6835	0.6835	0.0	0.0	1
2.43477		0.6769	0.6769	0.0	0.0	1
3.60696		0.5568	0.5568	0.0	0.0	1
3.81358		0.5233	0.5233	0.0	0.0	1
6.09163		0.5227	0.5227	0.0	0.0	1
WITHIN GROUPS TOTAL		124.2327	0.5833	0.0501	0.3785	213

Table 50. Summary statistics for 2-Ulnar asymmetry by maternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.10621		23.0000	4.6000	4.6690	87.2000	5
-1.68541		2.0000	2.0000	0.0	0.0	1
-1.51718		0.0	0.0	0.0	0.0	1
-1.45665		36.0000	2.4000	4.6414	301.6000	15
-1.34894		5.0000	5.0000	0.0	0.0	1
-1.32514		0.0	0.0	0.0	0.0	1
-1.28841		7.0000	3.5000	0.7071	0.5000	2
-1.09638		24.0000	3.4286	3.4087	69.7143	7
-0.96488		5.0000	2.5000	3.5355	12.5000	2
-0.92514		7.0000	3.5000	2.1213	4.5000	2
-0.86761		69.0000	4.9286	7.5597	742.9286	14
-0.80708		26.0000	2.8889	7.2361	418.8889	9
-0.69938		0.0	0.0	0.0	0.0	1
-0.67558		0.0	0.0	0.0	0.0	1
-0.63895		87.0000	7.9091	6.3159	398.9091	11
-0.60461		0.0	0.0	0.0	0.0	1
-0.50734		29.0000	9.6667	8.5049	144.6667	3
-0.47061		2.0000	2.0000	0.0	0.0	1
-0.44681		19.0000	4.7500	7.5443	170.7500	4
-0.33911		1.0000	1.0000	0.0	0.0	1
-0.31531		1.0000	1.0000	0.0	0.0	1
-0.30238		0.0	0.0	0.0	0.0	1
-0.27958		45.0000	5.0000	6.8007	370.0000	9
-0.21805		78.0000	5.2000	5.5058	424.4000	15
-0.11034		4.0000	4.0000	0.0	0.0	1
-0.08654		14.0000	14.0000	0.0	0.0	1
-0.04981		19.0000	1.9000	2.4698	54.9000	10
0.01072		157.0000	6.2800	7.1561	1229.0400	25
0.08169		11.0000	11.0000	0.0	0.0	1
0.11942		1.0000	1.0000	0.0	0.0	1
0.14222		2.0000	1.0000	1.4142	2.0000	2
0.17895		24.0000	4.8000	6.3403	160.8000	5
0.31046		4.0000	2.0000	1.4142	2.0000	2
0.34719		10.0000	10.0000	0.0	0.0	1
0.37099		59.0000	5.9000	3.8137	130.9000	10
0.50249		0.0	0.0	0.0	0.0	1
0.53922		0.0	0.0	0.0	0.0	3
0.59975		72.0000	6.0000	6.7689	504.0000	12
0.67072		0.0	0.0	0.0	0.0	1
0.70765		11.0000	11.0000	0.0	0.0	1
0.73126		0.0	0.0	0.0	0.0	4
0.76799		1.0000	0.5000	0.7071	0.5000	2
0.82952		49.0000	4.0833	7.1409	560.9167	12
0.96002		37.0000	4.6250	6.4794	293.8750	8
0.99576		19.0000	6.3333	9.2916	172.6667	3
1.02055		12.0000	12.0000	0.0	0.0	1
1.19879		20.0000	2.8571	2.9114	50.8571	7
1.24932		3.0000	3.0000	0.0	0.0	1
1.32029		0.0	0.0	0.0	0.0	1
1.35702		17.0000	17.0000	0.0	0.0	1
1.41755		17.0000	2.8333	4.4907	100.8333	6
1.54906		0.0	0.0	0.0	0.0	1
1.64632		0.0	0.0	0.0	0.0	1
1.77782		18.0000	9.0000	9.8995	98.0000	2
2.00659		1.0000	0.5000	0.7071	0.5000	2
2.06712		4.0000	1.3333	2.3094	10.6667	3
2.17442		0.0	0.0	0.0	0.0	1
2.19962		0.0	0.0	0.0	0.0	1
2.49836		0.0	0.0	0.0	0.0	1
2.82439		0.0	0.0	0.0	0.0	1
3.30572		1.0000	1.0000	0.0	0.0	1
3.87096		0.0	0.0	0.0	0.0	1
WITHIN GROUPS TOTAL		1053.0000	4.2632	5.9362	6519.0130	247

Table 51. Summary statistics for 1-Radial asymmetry by paternal age factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.87911		1.0000	1.0000	0.0	0.0	1
-1.84661		1.0000	1.0000	0.0	0.0	1
-1.73293		3.0000	3.0000	0.0	0.0	1
-1.58655		62.0000	6.8889	5.7542	264.8889	9
-1.33544		1.0000	1.0000	0.0	0.0	1
-1.22166		15.0000	3.7500	2.6300	20.7500	4
-1.14037		7.0000	2.3333	2.3094	10.6667	3
-1.13798		66.0000	4.4000	4.0143	225.6000	15
-0.99410		111.0000	4.4400	3.1501	238.1600	25
-0.97054		3.0000	3.0000	0.0	0.0	1
-0.88925		3.0000	3.0000	0.0	0.0	1
-0.85676		14.0000	14.0000	0.0	0.0	1
-0.74298		11.0000	5.5000	3.5355	12.5000	2
-0.62920		39.0000	3.9000	1.9120	32.9000	10
-0.51542		55.0000	4.5833	4.2095	194.9167	12
-0.48292		10.0000	10.0000	0.0	0.0	1
-0.40163		32.0000	2.6667	2.2293	54.6667	12
-0.37808		4.0000	4.0000	0.0	0.0	1
-0.36914		52.0000	3.4667	2.0656	59.7333	15
-0.26430		32.0000	8.0000	7.3030	160.0000	4
-0.15052		27.0000	3.3750	3.4615	83.8750	8
-0.11902		4.0000	4.0000	0.0	0.0	1
-0.03674		27.0000	3.8571	3.0237	54.8571	7
-0.00424		29.0000	4.1429	3.2878	64.8571	7
0.07704		26.0000	4.3333	2.4221	29.3333	6
0.10954		47.0000	3.3571	2.3732	73.2143	14
0.19083		0.0	0.0	0.0	0.0	1
0.21438		14.0000	14.0000	0.0	0.0	1
0.22332		43.0000	3.9091	3.0807	94.9091	11
0.24688		9.0000	4.5000	3.5355	12.5000	2
0.32816		3.0000	3.0000	0.0	0.0	1
0.44194		6.0000	3.0000	2.8284	8.0000	2
0.47444		7.0000	2.3333	1.5275	4.6667	3
0.55572		7.0000	3.5000	3.5355	12.5000	2
0.58922		25.0000	2.7778	2.2791	41.5556	9
0.61179		1.0000	1.0000	0.0	0.0	1
0.70200		36.0000	3.6000	2.2211	44.4000	10
0.81579		12.0000	2.4000	2.3022	21.2000	5
0.84828		20.0000	4.0000	0.7071	2.0000	5
0.95312		7.0000	7.0000	0.0	0.0	1
1.06690		5.0000	2.5000	3.5355	12.5000	2
1.14818		2.0000	2.0000	0.0	0.0	1
1.17174		1.0000	1.0000	0.0	0.0	1
1.18968		12.0000	4.0000	1.7321	6.0000	3
1.29446		17.0000	8.5000	0.7071	0.5000	2
1.32696		4.0000	4.0000	0.0	0.0	1
1.40824		7.0000	2.3333	2.3094	10.6667	3
1.43180		2.0000	2.0000	0.0	0.0	1
1.44074		3.0000	1.5000	0.7071	0.5000	2
1.77314		1.0000	1.0000	0.0	0.0	1
1.80564		4.0000	2.0000	1.4142	2.0000	2
1.85442		1.0000	1.0000	0.0	0.0	1
1.91942		9.0000	9.0000	0.0	0.0	1
2.03320		4.0000	4.0000	0.0	0.0	1
2.28432		2.0000	2.0000	0.0	0.0	1
2.36560		3.0000	3.0000	0.0	0.0	1
2.39910		1.0000	1.0000	0.0	0.0	1
2.51188		6.0000	6.0000	0.0	0.0	1
2.62566		6.0000	6.0000	0.0	0.0	1
2.99056		2.0000	2.0000	0.0	0.0	1
3.13684		1.0000	1.0000	0.0	0.0	1
3.84308		4.0000	4.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		969.0000	3.9231	3.1664	1854.8171	247

Table 52. Summary statistics for c-d asymmetry by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		6.0000	6.0000	0.0	0.0	1
-1.56839		11.0000	11.0000	0.0	0.0	1
-1.46509		14.0000	4.6667	2.0817	8.6667	3
-1.42808		9.0000	9.0000	0.0	0.0	1
-1.36177		0.0	0.0	0.0	0.0	1
-1.25877		0.0	0.0	0.0	0.0	1
-1.15545		31.0000	6.2000	11.0995	492.8000	5
-1.05214		64.0000	5.3333	6.7195	496.6667	12
-0.94916		10.0000	5.0000	0.0	0.0	2
-0.84583		45.0000	4.0909	3.8847	150.9091	11
-0.74252		100.0000	4.0000	2.9439	208.0000	25
-0.70593		3.0000	3.0000	0.0	0.0	1
-0.63952		18.0000	3.6000	2.4083	23.2000	5
-0.60252		18.0000	9.0000	4.2426	18.0000	2
-0.53621		88.0000	5.8667	3.8334	205.7333	15
-0.49952		6.0000	6.0000	0.0	0.0	1
-0.49921		13.0000	2.1667	1.9408	18.8333	6
-0.43259		63.0000	7.0000	6.8191	372.0000	9
-0.39621		2.0000	2.0000	0.0	0.0	1
-0.39590		24.0000	8.0000	1.7321	6.0000	3
-0.35921		5.0000	5.0000	0.0	0.0	1
-0.29290		76.0000	7.6000	8.5271	654.4000	10
-0.25590		3.0000	3.0000	0.0	0.0	1
-0.18959		55.0000	4.5833	4.2310	196.9167	12
-0.15290		9.0000	9.0000	0.0	0.0	1
-0.08659		2.0000	2.0000	0.0	0.0	1
-0.08627		5.0000	5.0000	0.0	0.0	1
-0.04959		6.0000	6.0000	0.0	0.0	1
0.01673		52.0000	3.7143	3.2682	138.8571	14
0.05372		4.0000	2.0000	2.8284	8.0000	2
0.12034		84.0000	5.6000	7.4046	767.6000	15
0.15672		2.0000	2.0000	0.0	0.0	1
0.26004		20.0000	6.6667	4.5092	40.6667	3
0.26035		2.0000	2.0000	0.0	0.0	1
0.32635		4.0000	4.0000	0.0	0.0	1
0.38335		21.0000	3.0000	2.0817	26.0000	7
0.46635		3.0000	1.5000	0.7071	0.5000	2
0.56966		21.0000	2.3333	2.1794	38.0000	9
0.67297		30.0000	3.0000	1.3333	16.0000	10
0.77629		3.0000	3.0000	0.0	0.0	1
0.87929		22.0000	3.1429	2.9681	52.8571	7
0.91629		9.0000	4.5000	0.7071	0.5000	2
0.98260		10.0000	2.5000	1.7321	9.0000	4
1.01929		0.0	0.0	0.0	0.0	1
1.12259		5.0000	2.5000	3.5355	12.5000	2
1.22590		22.0000	2.7500	1.9821	27.5000	8
1.43222		5.0000	1.6667	1.1547	2.6667	3
1.53553		8.0000	4.0000	5.6569	32.0000	2
1.74184		0.0	0.0	0.0	0.0	1
1.77884		6.0000	6.0000	0.0	0.0	1
1.84515		4.0000	4.0000	0.0	0.0	1
1.88215		3.0000	3.0000	0.0	0.0	1
1.98515		2.0000	2.0000	0.0	0.0	1
2.08846		13.0000	3.2500	2.5000	18.7500	4
2.39809		3.0000	3.0000	0.0	0.0	1
2.53808		3.0000	3.0000	0.0	0.0	1
2.64140		14.0000	14.0000	0.0	0.0	1
2.95102		2.0000	2.0000	0.0	0.0	1
3.15733		8.0000	4.0000	2.8284	8.0000	2
3.26065		2.0000	2.0000	0.0	0.0	1
3.74727		4.0000	4.0000	0.0	0.0	1
4.57283		4.0000	4.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		1081.0000	4.3765	4.6798	4051.5234	247

Table 53. Summary statistics for C-Radial asymmetry by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		0.0	0.0	0.0	0.0	1
-1.56039		0.0	0.0	0.0	0.0	1
-1.46508		7.0000	2.3333	2.0817	8.6667	3
-1.42908		0.0	0.0	0.0	0.0	1
-1.36177		0.0	0.0	0.0	0.0	1
-1.25877		0.0	0.0	0.0	0.0	1
-1.15545		6.0000	1.2000	2.6833	28.8000	5
-1.05214		55.0000	4.5833	4.0104	176.9167	12
-0.94914		8.0000	4.0000	2.8284	8.0000	2
-0.84583		34.0000	3.0909	5.0686	256.9091	11
-0.74252		58.0000	2.3200	4.3178	447.4400	25
-0.70583		10.0000	10.0000	0.0	0.0	1
-0.63952		31.0000	6.2000	3.7683	56.8000	5
-0.60252		6.0000	3.0000	4.2426	18.0000	2
-0.53621		53.0000	3.5333	5.1805	375.7333	15
-0.49952		8.0000	8.0000	0.0	0.0	1
-0.49921		6.0000	1.0000	1.5492	12.0000	6
-0.43289		27.0000	3.0000	4.3589	152.0000	9
-0.39621		0.0	0.0	0.0	0.0	1
-0.39590		2.0000	0.6667	1.1547	2.6667	3
-0.35921		8.0000	8.0000	0.0	0.0	1
-0.29290		30.0000	3.0000	3.0185	82.0000	10
-0.25590		12.0000	12.0000	0.0	0.0	1
-0.18958		30.0000	2.5000	3.2333	115.0000	12
-0.15290		0.0	0.0	0.0	0.0	1
-0.08659		0.0	0.0	0.0	0.0	1
-0.08627		10.0000	10.0000	0.0	0.0	1
-0.04959		4.0000	4.0000	0.0	0.0	1
0.01673		24.0000	1.7143	3.5394	162.8571	14
0.05372		0.0	0.0	0.0	0.0	2
0.12004		45.0000	3.0000	3.2514	148.0000	15
0.15672		10.0000	10.0000	0.0	0.0	1
0.26004		13.0000	4.3333	4.0415	32.6667	3
0.26035		0.0	0.0	0.0	0.0	1
0.32635		0.0	0.0	0.0	0.0	1
0.36335		36.0000	5.1429	3.2878	64.8571	7
0.46435		7.0000	3.5000	4.9497	24.5000	2
0.56966		29.0000	3.2222	5.0936	207.5556	9
0.67297		42.0000	4.2000	5.7697	299.6000	10
0.77629		10.0000	10.0000	0.0	0.0	1
0.87929		50.0000	7.1429	6.6940	268.8571	7
0.91628		19.0000	9.5000	0.7071	0.5000	2
0.98260		15.0000	3.7500	4.3493	56.7500	4
1.01928		0.0	0.0	0.0	0.0	1
1.12259		10.0000	5.0000	7.0711	50.0000	2
1.22590		42.0000	5.2500	5.3117	197.5000	8
1.43222		15.0000	5.0000	2.0000	8.0000	3
1.53553		10.0000	5.0000	0.0	0.0	2
1.74184		0.0	0.0	0.0	0.0	1
1.77584		0.0	0.0	0.0	0.0	1
1.84515		2.0000	2.0000	0.0	0.0	1
1.88215		6.0000	6.0000	0.0	0.0	1
1.98515		4.0000	4.0000	0.0	0.0	1
2.08546		25.0000	6.2500	4.2720	54.7500	4
2.39809		0.0	0.0	0.0	0.0	1
2.53808		6.0000	6.0000	0.0	0.0	1
2.64140		0.0	0.0	0.0	0.0	1
2.99102		0.0	0.0	0.0	0.0	1
3.15733		12.0000	6.0000	8.4853	72.0000	2
3.26065		16.0000	16.0000	0.0	0.0	1
3.74727		0.0	0.0	0.0	0.0	1
4.57283		12.0000	12.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		865.0000	3.5020	4.2803	3389.3261	247

Table 54. Summary statistics for D-Radial asymmetry by birth order factor codes (females).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.67170		0.0	0.0	0.0	0.0	1
-1.56839		2.0000	2.0000	0.0	0.0	1
-1.46509		12.0000	4.0000	6.9282	96.0000	3
-1.42809		0.0	0.0	0.0	0.0	1
-1.36177		0.0	0.0	0.0	0.0	1
-1.25877		0.0	0.0	0.0	0.0	1
-1.15545		21.0000	4.2000	3.3466	44.8000	5
-1.05214		13.0000	1.3833	2.9375	94.9167	12
-0.94914		0.0	0.0	0.0	0.0	2
-0.34583		31.0000	2.8182	6.4625	417.6364	11
-0.74252		43.0000	1.7200	3.7585	339.0400	25
-0.70583		0.0	0.0	0.0	0.0	1
-0.63952		0.0	0.0	0.0	0.0	5
-0.60252		0.0	0.0	0.0	0.0	2
-0.53621		14.0000	0.9333	1.9445	52.9333	15
-0.49952		0.0	0.0	0.0	0.0	1
-0.49921		20.0000	3.3333	5.7504	165.3333	6
-0.43289		45.0000	5.0000	7.4330	442.0000	9
-0.39621		0.0	0.0	0.0	0.0	1
-0.39590		8.0000	2.6667	4.6188	42.6667	3
-0.35921		0.0	0.0	0.0	0.0	1
-0.29290		41.0000	4.1000	6.9514	434.9000	10
-0.25590		0.0	0.0	0.0	0.0	1
-0.19958		33.0000	2.7500	4.3927	212.2500	12
-0.15290		14.0000	14.3000	0.0	0.0	1
-0.05659		0.0	0.0	0.0	0.0	1
-0.08627		10.0000	10.0000	0.0	0.0	1
-0.04959		0.0	0.0	0.0	0.0	1
0.01673		43.0000	3.0714	6.2322	504.9286	14
0.05372		15.0000	7.5000	10.6066	112.5000	2
0.12004		34.0000	2.2667	5.8611	480.9333	15
0.15672		0.0	0.0	0.0	0.0	1
0.25004		0.0	0.0	0.0	0.0	3
0.26035		0.0	0.0	0.0	0.0	1
0.32635		15.0000	15.0000	0.0	0.0	1
0.36335		0.0	0.0	0.0	0.0	7
0.46635		0.0	0.0	0.0	0.0	2
0.56966		70.0000	7.7778	7.1024	403.5556	9
0.67797		13.0000	1.3000	2.2136	44.1000	10
0.77629		0.0	0.0	0.0	0.0	1
0.87928		9.0000	1.2857	2.9841	53.4286	7
0.91628		11.0000	5.5000	7.7782	60.5000	2
0.98260		8.0000	2.0000	2.4495	18.0000	4
1.01928		0.0	0.0	0.0	0.0	1
1.12259		5.0000	2.5000	3.5355	12.5000	2
1.22590		16.0000	2.0000	5.6569	224.0000	8
1.43222		12.0000	4.0000	6.9282	96.0000	3
1.53553		0.0	0.0	0.0	0.0	2
1.74184		0.0	0.0	0.0	0.0	1
1.77584		13.0000	13.0000	0.0	0.0	1
1.84515		0.0	0.0	0.0	0.0	1
1.83215		2.0000	2.0000	0.0	0.0	1
1.98515		0.0	0.0	0.0	0.0	1
2.05844		17.0000	4.2500	8.5000	216.7500	4
2.39809		9.0000	9.3000	0.0	0.0	1
2.53808		0.0	0.0	0.0	0.0	1
2.64140		0.0	0.0	0.0	0.0	1
2.95102		22.0000	22.0000	0.0	0.0	1
3.15733		25.0000	12.5000	4.9497	24.5000	2
3.26065		14.0000	14.0000	0.0	0.0	1
3.74727		0.0	0.0	0.0	0.0	1
4.57283		5.0000	5.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		665.0000	2.6923	4.9833	4594.1724	247

Table 55. Summary statistics for 5-Ulnar asymmetry by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		0.0	0.0	0.0	0.0	1
-2.81631		0.0	0.0	0.0	0.0	1
-2.33498		0.0	0.0	0.0	0.0	1
-2.10621		0.0	0.0	0.0	0.0	1
-1.90648		10.0000	10.0000	0.0	0.0	1
-1.68541		0.0	0.0	0.0	0.0	3
-1.51718		0.0	0.0	0.0	0.0	2
-1.45665		13.0000	1.1818	3.9196	153.6364	11
-1.28841		0.0	0.0	0.0	0.0	2
-1.26461		0.0	0.0	0.0	0.0	1
-1.09638		0.0	0.0	0.0	0.0	3
-1.02541		0.0	0.0	0.0	0.0	1
-0.98868		9.0000	9.0000	0.0	0.0	1
-0.92814		0.0	0.0	0.0	0.0	1
-0.86761		5.0000	0.3571	1.3363	23.2143	14
-0.80708		7.0000	1.4000	3.1305	39.2000	5
-0.73611		0.0	0.0	0.0	0.0	1
-0.69938		0.0	0.0	0.0	0.0	2
-0.67558		0.0	0.0	0.0	0.0	2
-0.63995		33.0000	2.0625	5.0526	382.9375	16
-0.50734		0.0	0.0	0.0	0.0	4
-0.47081		0.0	0.0	0.0	0.0	1
-0.44681		0.0	0.0	0.0	0.0	2
-0.33911		2.0000	2.0000	0.0	0.0	1
-0.27858		0.0	0.0	0.0	0.0	7
-0.21805		15.0000	1.1538	2.3397	65.6923	13
-0.11034		0.0	0.0	0.0	0.0	1
-0.08981		8.0000	0.7273	1.6787	28.1818	11
0.01072		29.0000	1.6111	5.3483	486.2778	18
0.02116		0.0	0.0	0.0	0.0	1
0.08169		0.0	0.0	0.0	0.0	2
0.14222		0.0	0.0	0.0	0.0	1
0.17995		2.0000	0.3333	0.8165	3.3333	6
0.24992		0.0	0.0	0.0	0.0	1
0.27372		0.0	0.0	0.0	0.0	1
0.37099		9.0000	1.0000	2.6458	56.0000	9
0.40522		0.0	0.0	0.0	0.0	1
0.53922		10.0000	5.0000	7.0711	50.0000	2
0.59975		27.0000	1.9286	4.0849	216.9286	14
0.73126		0.0	0.0	0.0	0.0	2
0.76799		1.0000	0.3333	0.5774	0.6667	3
0.82852		46.0000	4.6000	6.7198	406.4000	10
0.89949		4.0000	4.0000	0.0	0.0	1
0.96002		0.0	0.0	0.0	0.0	1
0.99676		22.0000	11.0000	15.5563	242.0000	2
1.12826		8.0000	8.0000	0.0	0.0	1
1.18879		0.0	0.0	0.0	0.0	6
1.24932		0.0	0.0	0.0	0.0	1
1.41755		28.0000	5.6000	9.7636	307.2000	5
1.58579		12.0000	6.0000	8.4853	72.0000	2
1.71729		0.0	0.0	0.0	0.0	1
1.77782		21.0000	21.0000	0.0	0.0	1
1.81455		4.0000	4.0000	0.0	0.0	1
1.83836		0.0	0.0	0.0	0.0	1
2.00659		0.0	0.0	0.0	0.0	1
2.06712		0.0	0.0	0.0	0.0	1
2.23535		23.0000	11.5000	16.2635	264.5000	2
2.29589		0.0	0.0	0.0	0.0	1
2.46412		0.0	0.0	0.0	0.0	1
2.59562		0.0	0.0	0.0	0.0	1
2.63236		0.0	0.0	0.0	0.0	1
2.82439		0.0	0.0	0.0	0.0	1
WITHIN GROUPS TOTAL		348.0000	1.6338	4.3048	2798.1686	213

Table 56. Summary statistics for summed ulnar asymmetry on fingers by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		3.0000	3.0000	0.0	0.0	1
-2.91631		13.0000	13.0000	0.0	0.0	1
-2.33499		10.0000	10.0000	0.0	0.0	1
-2.10621		5.0000	5.0000	0.0	0.0	1
-1.80548		24.0000	24.0000	0.0	0.0	1
-1.68541		77.0000	25.6667	13.2035	348.6667	3
-1.51718		34.0000	17.0000	1.4142	2.0000	2
-1.45665		173.0000	15.7273	16.0255	2568.1818	11
-1.28841		0.0	0.0	0.0	0.0	2
-1.26461		0.0	0.0	0.0	0.0	1
-1.09635		37.0000	12.3333	6.3509	80.6667	3
-1.02541		13.0000	13.0000	0.0	0.0	1
-0.98868		23.0000	23.0000	0.0	0.0	1
-0.92814		8.0000	8.0000	0.0	0.0	1
-0.96751		148.0000	10.5714	8.6444	971.4286	14
-0.90708		22.0000	4.4000	4.6152	85.2000	5
-0.73611		2.0000	2.0000	0.0	0.0	1
-0.69938		23.0000	11.5000	16.2635	264.5000	2
-0.67558		2.0000	1.0000	1.4142	2.0000	2
-0.63885		265.0000	16.5625	17.2471	4461.9375	16
-0.50734		100.0000	25.0000	14.8324	660.0000	4
-0.47061		7.0000	7.0000	0.0	0.0	1
-0.44681		33.0000	16.5000	23.3345	544.5000	2
-0.33911		6.0000	6.0000	0.0	0.0	1
-0.27858		91.0000	13.0000	12.0692	874.0000	7
-0.21805		157.0000	12.0769	12.1892	1782.9231	13
-0.11034		31.0000	31.0000	0.0	0.0	1
-0.04981		179.0000	16.2727	20.3573	4144.1818	11
0.01072		297.0000	16.5000	15.8012	4244.5000	18
0.02116		35.0000	35.0000	0.0	0.0	1
0.03169		84.0000	42.0000	11.3137	128.0000	2
0.14222		4.0000	4.0000	0.0	0.0	1
0.17995		86.0000	14.3333	10.5348	555.3333	6
0.24992		5.0000	5.0000	0.0	0.0	1
0.27372		1.0000	1.0000	0.0	0.0	1
0.37099		160.0000	17.7778	16.5210	2133.5556	9
0.40522		12.0000	12.0000	0.0	0.0	1
0.53922		40.0000	20.0000	1.4142	2.0000	2
0.59975		204.0000	14.5714	7.7431	779.4286	14
0.73126		21.0000	10.5000	0.7071	0.5000	2
0.76799		90.0000	30.0000	7.5498	114.0000	3
0.82852		245.0000	24.5000	14.2146	1818.5000	10
0.89949		37.0000	37.0000	0.0	0.0	1
0.96002		15.0000	15.0000	0.0	0.0	1
0.99676		84.0000	42.0000	36.7696	1352.0000	2
1.12826		17.0000	17.0000	0.0	0.0	1
1.18879		137.0000	22.8333	15.6130	1218.8333	6
1.24932		0.0	0.0	0.0	0.0	1
1.41755		99.0000	19.8000	19.3781	1500.8000	5
1.58579		72.0000	36.0000	19.7990	392.0000	2
1.71729		3.0000	3.0000	0.0	0.0	1
1.77787		64.0000	64.0000	0.0	0.0	1
1.81455		12.0000	12.0000	0.0	0.0	1
1.83836		0.0	0.0	0.0	0.0	1
2.00659		0.0	0.0	0.0	0.0	1
2.06712		11.0000	11.0000	0.0	0.0	1
2.23535		35.0000	17.5000	24.7487	612.5000	2
2.29589		0.0	0.0	0.0	0.0	1
2.46412		0.0	0.0	0.0	0.0	1
2.59562		14.0000	14.0000	0.0	0.0	1
2.63236		0.0	0.0	0.0	0.0	1
2.82439		46.0000	46.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		3416.0000	16.0376	14.4873	31692.1369	213

Table 57. Summary statistics for total asymmetry on fingers by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		12.0000	12.0000	0.0	0.0	1
-2.81631		36.0000	36.0000	0.0	0.0	1
-2.33495		33.0000	33.0000	0.0	0.0	1
-2.10621		11.0000	11.0000	0.0	0.0	1
-1.80648		38.0000	38.0000	0.0	0.0	1
-1.68541		136.0000	45.3333	19.8578	788.6667	3
-1.51718		79.0000	39.5000	10.6066	112.5000	2
-1.45665		325.0000	29.5455	19.4749	3792.7273	11
-1.28841		36.0000	18.0000	2.8284	8.0000	2
-1.26461		16.0000	16.0000	0.0	0.0	1
-1.09638		75.0000	25.0000	8.5440	146.0000	3
-1.02541		31.0000	31.0000	0.0	0.0	1
-0.98868		74.0000	74.0000	0.0	0.0	1
-0.92814		25.0000	25.0000	0.0	0.0	1
-0.86761		391.0000	27.9286	12.8210	2136.9286	14
-0.80708		83.0000	16.6000	9.0167	325.2000	5
-0.73611		14.0000	14.0000	0.0	0.0	1
-0.69939		83.0000	41.5000	10.6066	112.5000	2
-0.67559		18.0000	9.0000	8.4853	72.0000	2
-0.63885		549.0000	34.3125	19.9791	5987.4375	16
-0.50734		167.0000	41.7500	16.0078	768.7500	4
-0.47061		23.0000	23.0000	0.0	0.0	1
-0.44681		72.0000	36.0000	26.8701	722.0000	2
-0.33911		17.0000	17.0000	0.0	0.0	1
-0.27858		209.0000	29.8571	12.9413	1004.8571	7
-0.21805		370.0000	28.4615	14.7344	2605.2308	13
-0.11034		43.0000	43.0000	0.0	0.0	1
-0.04981		406.0000	36.9091	22.2416	4946.9091	11
0.01077		634.0000	35.2222	20.4179	7087.1111	18
0.02116		58.0000	58.0000	0.0	0.0	1
0.08169		111.0000	55.5000	4.9497	24.5000	2
0.14222		19.0000	19.0000	0.0	0.0	1
0.17895		204.0000	34.0000	14.9533	1118.0000	6
0.24992		23.0000	23.0000	0.0	0.0	1
0.27372		27.0000	27.0000	0.0	0.0	1
0.37099		302.0000	33.5556	17.6572	2494.2222	9
0.40522		16.0000	16.0000	0.0	0.0	1
0.53922		63.0000	31.5000	7.7782	60.5000	2
0.59975		477.0000	34.0714	12.4435	2012.9286	14
0.73126		52.0000	26.0000	5.6569	32.0000	2
0.76799		146.0000	48.6667	8.0829	130.6667	3
0.82952		401.0000	40.1000	19.6607	3478.9000	10
0.89949		47.0000	47.0000	0.0	0.0	1
0.96002		20.0000	20.0000	0.0	0.0	1
0.99676		131.0000	65.5000	36.0624	1300.5000	2
1.12826		26.0000	26.0000	0.0	0.0	1
1.18979		244.0000	40.6667	16.5731	1373.3333	6
1.24932		11.0000	11.0000	0.0	0.0	1
1.41755		251.0000	50.2000	20.8974	1746.8000	5
1.58579		124.0000	62.0000	18.3848	338.0000	2
1.71729		19.0000	19.0000	0.0	0.0	1
1.77782		114.0000	114.0000	0.0	0.0	1
1.81455		28.0000	28.0000	0.0	0.0	1
1.83836		14.0000	14.0000	0.0	0.0	1
2.00659		11.0000	11.0000	0.0	0.0	1
2.06712		23.0000	23.0000	0.0	0.0	1
2.23539		83.0000	41.5000	40.3051	1624.5000	2
2.29989		21.0000	21.0000	0.0	0.0	1
2.46412		25.0000	25.0000	0.0	0.0	1
2.59562		29.0000	29.0000	0.0	0.0	1
2.63236		14.0000	14.0000	0.0	0.0	1
2.82439		54.0000	54.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		7194.0000	33.7746	17.5204	46351.6689	213

Table 58. Summary statistics for C-Ulnar asymmetry by maternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.98455		0.0	0.0	0.0	0.0	1
-2.61631		12.0000	12.0000	0.0	0.0	1
-2.33498		0.0	0.0	0.0	0.0	1
-2.10621		10.0000	10.0000	0.0	0.0	1
-1.30648		12.0000	12.0000	0.0	0.0	1
-1.68541		8.0000	2.6667	2.5166	12.6667	3
-1.51718		12.0000	6.0000	8.4853	72.0000	2
-1.45665		95.0000	8.6364	8.0408	646.5455	11
-1.28841		12.0000	6.0000	1.4142	2.0000	2
-1.26461		10.0000	10.0000	0.0	0.0	1
-1.09638		2.0000	0.6667	1.1547	2.6667	3
-1.02541		5.0000	5.0000	0.0	0.0	1
-0.98568		0.0	0.0	0.0	0.0	1
-0.92814		5.0000	5.0000	0.0	0.0	1
-0.86761		54.0000	3.8571	5.3184	367.7143	14
-0.80708		20.0000	4.0000	4.4159	78.0000	5
-0.73611		7.0000	7.0000	0.0	0.0	1
-0.69938		12.0000	6.0000	8.4853	72.0000	2
-0.67558		2.0000	1.0000	1.4142	2.0000	2
-0.63885		38.0000	2.3750	4.4102	291.7500	16
-0.50734		7.0000	1.7500	3.5000	36.7500	4
-0.47061		0.0	0.0	0.0	0.0	1
-0.44481		14.0000	7.0000	9.8995	98.0000	2
-0.33911		16.0000	16.0000	0.0	0.0	1
-0.27958		15.0000	2.1429	5.6695	192.8571	7
-0.21905		17.0000	1.3077	1.9315	44.7692	13
-0.11034		0.0	0.0	0.0	0.0	1
-0.04981		51.0000	4.6364	6.0212	362.5455	11
0.01072		82.0000	4.5556	5.9431	600.4444	18
0.02116		0.0	0.0	0.0	0.0	1
0.08169		0.0	0.0	0.0	0.0	2
0.14222		6.0000	6.0000	0.0	0.0	1
0.17895		26.0000	4.3333	7.4207	275.3333	6
0.24992		0.0	0.0	0.0	0.0	1
0.27372		6.0000	6.0000	0.0	0.0	1
0.37099		17.0000	1.8889	3.7565	112.8889	9
0.40522		20.0000	20.0000	0.0	0.0	1
0.53922		4.0000	2.0000	2.8284	8.0000	2
0.59975		45.0000	3.2143	5.2795	362.3571	14
0.73126		22.0000	11.0000	5.6569	32.0000	2
0.76799		3.0000	1.0000	1.7321	6.0000	3
0.82952		28.0000	2.8000	4.6380	193.6000	10
0.89949		0.0	0.0	0.0	0.0	1
0.96002		0.0	0.0	0.0	0.0	1
0.99676		2.0000	1.0000	1.4142	2.0000	2
1.12826		7.0000	7.0000	0.0	0.0	1
1.18879		13.0000	2.1667	3.7103	68.8333	6
1.24932		0.0	0.0	0.0	0.0	1
1.41755		9.0000	1.8000	4.0249	64.8000	5
1.58579		31.0000	15.5000	3.5355	12.5000	2
1.71729		0.0	0.0	0.0	0.0	1
1.77782		3.0000	3.0000	0.0	0.0	1
1.81455		0.0	0.0	0.0	0.0	1
1.83836		0.0	0.0	0.0	0.0	1
2.00659		0.0	0.0	0.0	0.0	1
2.06712		3.0000	3.0000	0.0	0.0	1
2.23535		22.0000	11.0000	2.8284	8.0000	2
2.29589		16.0000	16.0000	0.0	0.0	1
2.46412		6.0000	6.0000	0.0	0.0	1
2.59562		7.0000	7.0000	0.0	0.0	1
2.63236		0.0	0.0	0.0	0.0	1
2.82439		2.0000	2.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		816.0000	3.8310	5.1655	4029.0220	213

Table 59. Summary statistics for 1-Ulnar asymmetry by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		0.0	0.0	0.0	0.0	1
-1.73253		0.0	0.0	0.0	0.0	1
-1.58655		0.0	0.0	0.0	0.0	5
-1.33544		0.0	0.0	0.0	0.0	2
-1.29415		0.0	0.0	0.0	0.0	1
-1.22156		14.0000	7.0000	9.8995	98.0000	2
-1.14037		0.0	0.0	0.0	0.0	1
-1.10798		22.0000	1.6923	4.1710	208.7692	13
-1.02659		0.0	0.0	0.0	0.0	1
-0.99410		103.0000	5.7222	8.3300	1179.6111	18
-0.76299		0.0	0.0	0.0	0.0	1
-0.62920		44.0000	4.8889	7.3560	432.8889	9
-0.51542		56.0000	4.0000	5.1739	348.0000	14
-0.49186		0.0	0.0	0.0	0.0	1
-0.48292		35.0000	11.6667	5.5076	60.6667	3
-0.40163		69.0000	6.9000	7.5785	516.9000	10
-0.36914		45.0000	4.0909	6.0408	364.9091	11
-0.25430		4.0000	2.0000	1.4142	2.0000	2
-0.24074		0.0	0.0	0.0	0.0	1
-0.15052		1.0000	1.0000	0.0	0.0	1
-0.03676		30.0000	5.0000	5.7271	164.0000	6
-0.00424		13.0000	4.3333	7.5056	112.6667	3
0.07704		31.0000	6.2000	7.7589	240.8000	5
0.10994		59.0000	4.2143	6.3389	522.3571	14
0.22332		60.0000	3.7500	5.9386	529.0000	16
0.36066		0.0	0.0	0.0	0.0	1
0.44196		14.0000	14.0000	0.0	0.0	1
0.47444		54.0000	13.5000	8.1035	197.0000	4
0.55572		0.0	0.0	0.0	0.0	1
0.58822		20.0000	2.8571	5.9000	208.8571	7
0.66951		0.0	0.0	0.0	0.0	2
0.70200		49.0000	4.4545	7.2988	532.7273	11
0.73450		0.0	0.0	0.0	0.0	1
0.78329		0.0	0.0	0.0	0.0	1
0.81578		38.0000	6.3333	8.1158	329.3333	6
0.84829		2.0000	2.0000	0.0	0.0	1
0.95312		31.0000	15.5000	3.5355	12.5000	2
1.03440		0.0	0.0	0.0	0.0	1
1.14818		14.0000	14.0000	0.0	0.0	1
1.18068		25.0000	12.5000	9.1924	84.5000	2
1.29446		40.0000	13.3333	10.2632	210.6667	3
1.32696		3.0000	1.5000	2.1213	4.5000	2
1.40824		12.0000	6.0000	8.4853	72.0000	2
1.44074		0.0	0.0	0.0	0.0	2
1.54558		14.0000	14.0000	0.0	0.0	1
1.69936		0.0	0.0	0.0	0.0	1
1.80566		0.0	0.0	0.0	0.0	1
1.88692		22.0000	11.0000	0.0	0.0	2
1.91942		14.0000	7.0000	9.8995	98.0000	2
1.94299		0.0	0.0	0.0	0.0	1
1.95191		0.0	0.0	0.0	0.0	1
2.00070		0.0	0.0	0.0	0.0	1
2.03320		0.0	0.0	0.0	0.0	1
2.13904		0.0	0.0	0.0	0.0	1
2.29432		0.0	0.0	0.0	0.0	1
2.39810		19.0000	19.0000	0.0	0.0	1
2.59316		0.0	0.0	0.0	0.0	1
2.64922		12.0000	12.0000	0.0	0.0	1
2.74300		0.0	0.0	0.0	0.0	1
2.90927		0.0	0.0	0.0	0.0	1
3.50174		0.0	0.0	0.0	0.0	1
3.76179		0.0	0.0	0.0	0.0	1
WITHIN GROUPS TOTAL		969.0000	4.5493	6.5764	6530.6532	213

Table 60. Summary statistics for 2-Ulnar asymmetry by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.31412		0.0	0.0	0.0	0.0	1
-1.73293		0.0	0.0	0.0	0.0	1
-1.59655		5.0000	1.0000	2.2361	20.0000	5
-1.33544		1.0000	0.5000	0.7071	0.5000	2
-1.25415		0.0	0.0	0.0	0.0	1
-1.22166		0.0	0.0	0.0	0.0	2
-1.14037		0.0	0.0	0.0	0.0	1
-1.10738		58.0000	4.4615	6.9716	583.2308	13
-1.02659		0.0	0.0	0.0	0.0	1
-0.99419		71.0000	3.9444	4.7338	380.9444	18
-0.74298		4.0000	4.0000	0.0	0.0	1
-0.62920		59.0000	6.5556	7.4012	438.2222	9
-0.51542		50.0000	3.5714	4.7347	291.4286	14
-0.49186		0.0	0.0	0.0	0.0	1
-0.48292		8.0000	2.6667	2.5166	12.6667	3
-0.40163		40.0000	4.0000	5.1854	242.0000	10
-0.36914		29.0000	2.6364	3.7489	140.5455	11
-0.25430		17.0000	8.5000	2.1213	4.5000	2
-0.24074		12.0000	12.0000	0.0	0.0	1
-0.15052		14.0000	14.0000	0.0	0.0	1
-0.03674		63.0000	10.5000	4.2308	89.5000	6
-0.00424		14.0000	4.6667	1.5275	4.6667	3
0.07704		4.0000	0.8000	1.7889	12.8000	5
0.10996		22.0000	1.5714	3.0562	121.4286	14
0.22332		75.0000	4.6875	6.9447	723.4375	16
0.36066		2.0000	2.0000	0.0	0.0	1
0.44194		17.0000	17.0000	0.0	0.0	1
0.47446		36.0000	9.0000	7.7029	178.0000	4
0.55572		0.0	0.0	0.0	0.0	1
0.58822		33.0000	4.7143	3.9036	91.4286	7
0.66951		12.0000	6.0000	8.4853	72.0000	2
0.70200		42.0000	3.8182	5.4188	293.6364	11
0.73493		10.0000	10.0000	0.0	0.0	1
0.78329		0.0	0.0	0.0	0.0	1
0.81979		40.0000	6.6667	5.8878	173.3333	6
0.84829		3.0000	3.0000	0.0	0.0	1
0.95312		19.0000	9.5000	6.3640	40.5000	2
1.03440		1.0000	1.0000	0.0	0.0	1
1.14818		17.0000	17.0000	0.0	0.0	1
1.18069		1.0000	0.5000	0.7071	0.5000	2
1.29446		10.0000	3.3333	3.5119	24.6667	3
1.32696		24.0000	12.0000	5.6569	32.0000	2
1.40824		25.0000	12.5000	10.6066	112.5000	2
1.44074		0.0	0.0	0.0	0.0	2
1.54558		7.0000	7.0000	0.0	0.0	1
1.65936		2.0000	2.0000	0.0	0.0	1
1.80564		1.0000	1.0000	0.0	0.0	1
1.88692		13.0000	6.5000	2.1213	4.5000	2
1.91942		0.0	0.0	0.0	0.0	2
1.94798		13.0000	13.0000	0.0	0.0	1
1.95191		3.0000	3.0000	0.0	0.0	1
2.00070		6.0000	6.0000	0.0	0.0	1
2.03320		7.0000	7.0000	0.0	0.0	1
2.13904		3.0000	3.0000	0.0	0.0	1
2.29432		1.0000	1.0000	0.0	0.0	1
2.39910		6.0000	6.0000	0.0	0.0	1
2.59316		0.0	0.0	0.0	0.0	1
2.64922		4.0000	4.0000	0.0	0.0	1
2.76300		2.0000	2.0000	0.0	0.0	1
2.99927		0.0	0.0	0.0	0.0	1
3.50174		4.0000	4.0000	0.0	0.0	1
3.76179		2.0000	2.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		912.0000	4.2817	5.2038	4088.9358	213

Table 61. Summary statistics for 4-Radial asymmetry by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		2.0000	2.0000	0.0	0.0	1
-1.73233		2.0000	2.0000	0.0	0.0	1
-1.53655		17.0000	3.4000	3.1305	39.2000	5
-1.33544		3.0000	1.5000	0.7071	0.5000	2
-1.25415		0.0	0.0	0.0	0.0	1
-1.22146		6.0000	3.0000	1.4142	2.0000	2
-1.14037		2.0000	2.0000	0.0	0.0	1
-1.10799		29.0000	2.2308	1.9215	44.3077	13
-1.02659		3.0000	3.0000	0.0	0.0	1
-0.99410		67.0000	3.7222	4.7873	389.6111	18
-0.74298		2.0000	2.0000	0.0	0.0	1
-0.62920		27.0000	3.0000	2.1213	36.0000	9
-0.51542		34.0000	2.4286	2.5635	85.4286	14
-0.49186		0.0	0.0	0.0	0.0	1
-0.48292		8.0000	2.6667	3.0551	18.6667	3
-0.40163		41.0000	4.1000	4.0125	144.9000	10
-0.36914		44.0000	4.0000	2.6833	72.0000	11
-0.26430		7.0000	3.5000	0.7071	0.5000	2
-0.24074		1.0000	1.0000	0.0	0.0	1
-0.15052		1.0000	1.0000	0.0	0.0	1
-0.03674		21.0000	3.5000	3.8341	73.5000	6
-0.00424		12.0000	4.0000	4.3589	38.0000	3
0.07704		24.0000	4.8000	5.0695	102.8000	5
0.10954		40.0000	2.8571	2.1432	59.7143	14
0.22332		50.0000	3.1250	2.5265	95.7500	16
0.36056		1.0000	1.0000	0.0	0.0	1
0.44194		10.0000	10.0000	0.0	0.0	1
0.47444		10.0000	2.5000	1.7321	9.0000	4
0.55572		0.0	0.0	0.0	0.0	1
0.58822		18.0000	2.5714	2.3705	33.7143	7
0.66951		6.0000	3.0000	1.4142	2.0000	2
0.72200		21.0000	1.9091	2.1659	46.9091	11
0.73450		0.0	0.0	0.0	0.0	1
0.78329		9.0000	9.0000	0.0	0.0	1
0.81578		10.0000	1.6667	1.3663	9.3333	6
0.84828		0.0	0.0	0.0	0.0	1
0.99312		7.0000	3.5000	3.5355	12.5000	2
1.03440		2.0000	2.0000	0.0	0.0	1
1.14819		3.0000	3.0000	0.0	0.0	1
1.19068		3.0000	1.5000	0.7071	0.5000	2
1.29446		18.0000	6.0000	7.9373	126.0000	3
1.32696		2.0000	1.0000	1.4142	2.0000	2
1.40824		13.0000	6.5000	0.7071	0.5000	2
1.44074		8.0000	4.0000	1.4142	2.0000	2
1.54558		3.0000	3.0000	0.0	0.0	1
1.65936		0.0	0.0	0.0	0.0	1
1.80564		3.0000	3.0000	0.0	0.0	1
1.88692		9.0000	4.5000	3.5355	12.5000	2
1.91942		18.0000	9.0000	2.8284	8.0000	2
1.94298		4.0000	4.0000	0.0	0.0	1
1.95191		2.0000	2.0000	0.0	0.0	1
2.00079		1.0000	1.0000	0.0	0.0	1
2.03320		6.0000	6.0000	0.0	0.0	1
2.13804		1.0000	1.0000	0.0	0.0	1
2.28432		2.0000	2.0000	0.0	0.0	1
2.39810		3.0000	3.0000	0.0	0.0	1
2.59316		1.0000	1.0000	0.0	0.0	1
2.64922		5.0000	5.0000	0.0	0.0	1
2.75300		13.0000	13.0000	0.0	0.0	1
2.90927		1.0000	1.0000	0.0	0.0	1
3.50174		17.0000	17.0000	0.0	0.0	1
3.76179		2.0000	2.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		675.0000	3.1690	3.1178	1467.8350	213

Table 62. Summary statistics for summed radial asymmetry on fingers by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.91412		16.0000	16.0000	0.0	0.0	1
-1.73283		11.0000	11.0000	0.0	0.0	1
-1.58655		61.0000	12.2000	5.8702	188.8000	5
-1.33944		16.0000	8.0000	7.0711	50.0000	2
-1.25415		14.0000	14.0000	0.0	0.0	1
-1.22166		39.0000	19.5000	3.5355	12.5000	2
-1.14037		12.0000	12.0000	0.0	0.0	1
-1.10788		213.0000	16.3846	5.7813	401.0769	13
-1.02659		21.0000	21.0000	0.0	0.0	1
-0.89410		337.0000	18.7222	9.2406	1451.6111	18
-0.74298		15.0000	15.0000	0.0	0.0	1
-0.62920		142.0000	15.7778	6.0369	291.5556	9
-0.51542		273.0000	19.5000	6.9365	625.5000	14
-0.49186		26.0000	26.0000	0.0	0.0	1
-0.48292		59.0000	19.6667	6.6583	88.6667	3
-0.40163		156.0000	15.6000	9.5940	828.4000	10
-0.36914		152.0000	13.8182	7.4137	549.6364	11
-0.26430		31.0000	15.5000	4.9497	24.5000	2
-0.24074		4.0000	4.0000	0.0	0.0	1
-0.15052		5.0000	5.0000	0.0	0.0	1
-0.03674		107.0000	17.8333	5.1543	132.8333	6
-0.00424		38.0000	12.6667	5.0332	50.6667	3
0.07704		152.0000	30.4000	5.0299	101.2000	5
0.10954		243.0000	17.3571	7.2918	691.2143	14
0.22332		284.0000	17.7500	9.1761	1263.0000	16
0.36066		12.0000	12.0000	0.0	0.0	1
0.44194		50.0000	50.0000	0.0	0.0	1
0.47464		67.0000	16.7500	7.2744	158.7500	4
0.55572		11.0000	11.0000	0.0	0.0	1
0.58922		118.0000	16.8571	8.0297	386.8571	7
0.66951		48.0000	24.0000	15.5563	242.0000	2
0.70200		227.0000	20.6364	8.7324	762.5455	11
0.73450		23.0000	23.0000	0.0	0.0	1
0.78329		25.0000	25.0000	0.0	0.0	1
0.81579		118.0000	19.6667	7.5807	287.3333	6
0.94828		6.0000	6.0000	0.0	0.0	1
0.95312		27.0000	13.5000	6.3640	40.5000	2
1.03440		15.0000	15.0000	0.0	0.0	1
1.14818		8.0000	8.0000	0.0	0.0	1
1.19068		23.0000	11.5000	6.3640	40.5000	2
1.29446		56.0000	18.6667	15.3080	468.6667	3
1.32696		45.0000	22.5000	12.0208	144.5000	2
1.40824		47.0000	23.5000	0.7071	0.5000	2
1.44074		36.0000	18.0000	2.8284	8.0000	2
1.54958		10.0000	10.0000	0.0	0.0	1
1.65936		9.0000	9.0000	0.0	0.0	1
1.80464		17.0000	17.0000	0.0	0.0	1
1.88692		52.0000	26.0000	1.4142	2.0000	2
1.91942		60.0000	30.0000	5.6569	32.0000	2
1.94298		18.0000	18.0000	0.0	0.0	1
1.95191		9.0000	9.0000	0.0	0.0	1
2.00070		16.0000	16.0000	0.0	0.0	1
2.03320		16.0000	16.0000	0.0	0.0	1
2.13804		16.0000	16.0000	0.0	0.0	1
2.20432		11.0000	11.0000	0.0	0.0	1
2.39810		12.0000	12.0000	0.0	0.0	1
2.59316		14.0000	14.0000	0.0	0.0	1
2.64922		23.0000	23.0000	0.0	0.0	1
2.76330		18.0000	18.0000	0.0	0.0	1
2.90927		14.0000	14.0000	0.0	0.0	1
3.50176		51.0000	51.0000	0.0	0.0	1
3.76179		23.0000	23.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		3778.0000	17.7371	7.8586	9325.3135	213

Table 63. Summary statistics for summed ulnar asymmetry on fingers by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		0.0	0.0	0.0	0.0	1
-1.73283		0.0	0.0	0.0	0.0	1
-1.58655		22.0000	4.4000	4.6152	85.2000	5
-1.33544		2.0000	1.0000	1.4142	2.0000	2
-1.25415		0.0	0.0	0.0	0.0	1
-1.22166		33.0000	16.5000	23.3345	544.5000	2
-1.14037		11.0000	11.0000	0.0	0.0	1
-1.10798		157.0000	12.0769	12.1892	1782.9231	13
-1.02659		0.0	0.0	0.0	0.0	1
-0.99410		297.0000	16.5000	15.8012	4244.5000	18
-0.74299		4.0000	4.0000	0.0	0.0	1
-0.62920		160.0000	17.7778	14.5210	2183.5556	9
-0.51542		204.0000	14.5714	7.7431	779.4286	14
-0.49184		1.0000	1.0000	0.0	0.0	1
-0.48292		77.0000	25.6667	13.2035	348.6667	3
-0.40163		245.0000	24.5000	14.2146	1818.5000	10
-0.36914		173.0000	15.7273	16.0255	2568.1818	11
-0.26430		21.0000	10.5000	0.7071	0.5000	2
-0.24074		12.0000	12.0000	0.0	0.0	1
-0.15052		15.0000	15.0000	0.0	0.0	1
-0.03674		137.0000	22.8333	15.6130	1218.8333	6
-0.00424		37.0000	12.3333	6.3509	80.6667	3
0.07704		99.0000	19.8000	19.3701	1500.8000	5
0.10954		148.0000	10.5714	8.6444	971.4286	14
0.22332		265.0000	16.5625	17.2471	4461.9375	16
0.36066		2.0000	2.0000	0.0	0.0	1
0.44194		64.0000	64.0000	0.0	0.0	1
0.47444		100.0000	25.0000	14.8324	660.0000	4
0.55572		0.0	0.0	0.0	0.0	1
0.58922		91.0000	13.0000	12.0692	874.0000	7
0.66951		35.0000	17.5000	24.7487	612.5000	2
0.70200		179.0000	16.2727	20.3573	4144.1818	11
0.73450		10.0000	10.0000	0.0	0.0	1
0.78329		0.0	0.0	0.0	0.0	1
0.81578		86.0000	14.3333	10.5388	555.3333	6
0.84828		5.0000	5.0000	0.0	0.0	1
0.95312		84.0000	42.0000	11.3137	128.0000	2
1.03440		14.0000	14.0000	0.0	0.0	1
1.14818		46.0000	46.0000	0.0	0.0	1
1.18068		40.0000	20.0000	1.4142	2.0000	2
1.29446		90.0000	30.0000	7.5498	114.0000	3
1.32696		34.0000	17.0000	1.4142	2.0000	2
1.40824		84.0000	42.0000	36.7696	1352.0000	2
1.44074		0.0	0.0	0.0	0.0	2
1.54558		37.0000	37.0000	0.0	0.0	1
1.65936		17.0000	17.0000	0.0	0.0	1
1.80564		8.0000	8.0000	0.0	0.0	1
1.88692		72.0000	36.0000	19.7990	392.0000	2
1.91942		23.0000	11.5000	16.2635	264.5000	2
1.94299		13.0000	13.0000	0.0	0.0	1
1.95191		3.0000	3.0000	0.0	0.0	1
2.00070		12.0000	12.0000	0.0	0.0	1
2.03320		7.0000	7.0000	0.0	0.0	1
2.13804		3.0000	3.0000	0.0	0.0	1
2.28432		6.0000	6.0000	0.0	0.0	1
2.39810		31.0000	31.0000	0.0	0.0	1
2.59316		0.0	0.0	0.0	0.0	1
2.64922		35.0000	35.0000	0.0	0.0	1
2.76300		5.0000	5.0000	0.0	0.0	1
2.90927		24.0000	24.0000	0.0	0.0	1
3.50174		23.0000	23.0000	0.0	0.0	1
3.76179		13.0000	13.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		3416.0000	16.0376	14.4873	31692.1369	213

Table 64. Summary statistics for total asymmetry on fingers by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		16.0000	16.0000	0.0	0.0	1
-1.73293		11.0000	11.0000	0.0	0.0	1
-1.59655		83.0000	16.6000	9.0167	325.2000	5
-1.33544		18.0000	9.0000	8.4853	72.0000	2
-1.25415		14.0000	14.0000	0.0	0.0	1
-1.22166		72.0000	36.0000	25.8701	722.0000	2
-1.14037		23.0000	23.0000	0.0	0.0	1
-1.10758		370.0000	28.4615	14.7344	2605.2309	13
-1.02659		21.0000	21.0000	0.0	0.0	1
-0.99410		634.0000	35.2222	20.4179	7087.1111	18
-0.74298		19.0000	19.0000	0.0	0.0	1
-0.62920		302.0000	33.5556	17.6572	2494.2222	9
-0.51542		477.0000	34.0714	12.4435	2012.9286	14
-0.49156		27.0000	27.0000	0.0	0.0	1
-0.48292		136.0000	45.3333	19.8578	788.6667	3
-0.40163		401.0000	40.1000	19.6607	3478.9000	10
-0.36914		325.0000	29.5455	19.4749	3792.7273	11
-0.26430		52.0000	26.0000	5.6569	32.0000	2
-0.24074		16.0000	16.0000	0.0	0.0	1
-0.15952		20.0000	20.0000	0.0	0.0	1
-0.03674		244.0000	40.6667	16.5731	1373.3333	6
-0.00424		75.0000	25.0000	8.5440	146.0000	3
0.07704		251.0000	50.2000	20.8974	1746.8000	5
0.10954		391.0000	27.9286	12.8210	2136.9286	14
0.22332		549.0000	34.3125	19.9791	5987.4375	16
0.36066		14.0000	14.0000	0.0	0.0	1
0.44194		114.0000	114.0000	0.0	0.0	1
0.47444		167.0000	41.7500	16.0078	768.7500	4
0.55572		11.0000	11.0000	0.0	0.0	1
0.58822		209.0000	29.8571	12.9413	1004.8571	7
0.66951		83.0000	41.5000	40.3051	1624.5000	2
0.70200		406.0000	36.9091	22.2416	4946.9091	11
0.73450		33.0000	33.0000	0.0	0.0	1
0.78329		25.0000	25.0000	0.0	0.0	1
0.81579		204.0000	34.0000	14.9533	1118.0000	6
0.84829		11.0000	11.0000	0.0	0.0	1
0.95312		111.0000	55.5000	4.9497	24.5000	2
1.03440		29.0000	29.0000	0.0	0.0	1
1.14819		54.0000	54.0000	0.0	0.0	1
1.18058		63.0000	31.5000	7.7782	60.5000	2
1.29446		146.0000	48.6667	8.0829	130.6667	3
1.32696		79.0000	39.5000	10.6066	112.5000	2
1.40824		131.0000	65.5000	36.0624	1300.5000	2
1.44074		36.0000	18.0000	2.8284	8.0000	2
1.54558		47.0000	47.0000	0.0	0.0	1
1.65936		26.0000	26.0000	0.0	0.0	1
1.80564		25.0000	25.0000	0.0	0.0	1
1.88692		124.0000	62.0000	18.3848	338.0000	2
1.91942		83.0000	41.5000	10.6066	112.5000	2
1.94298		31.0000	31.0000	0.0	0.0	1
1.95191		12.0000	12.0000	0.0	0.0	1
2.00070		28.0000	28.0000	0.0	0.0	1
2.03320		23.0000	23.0000	0.0	0.0	1
2.13804		19.0000	19.0000	0.0	0.0	1
2.28432		17.0000	17.0000	0.0	0.0	1
2.39810		43.0000	43.0000	0.0	0.0	1
2.59316		14.0000	14.0000	0.0	0.0	1
2.64922		58.0000	58.0000	0.0	0.0	1
2.76300		23.0000	23.0000	0.0	0.0	1
2.90927		38.0000	38.0000	0.0	0.0	1
3.50174		74.0000	74.0000	0.0	0.0	1
3.76179		36.0000	36.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		7194.0000	33.7746	17.5204	46351.6689	213

Table 65. Summary statistics for c-d asymmetry by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		10.0000	10.0000	0.0	0.0	1
-1.73283		18.0000	18.0000	0.0	0.0	1
-1.58655		25.0000	5.0000	2.5495	26.0000	5
-1.33544		5.0000	2.5000	3.5355	12.5000	2
-1.25415		17.0000	17.0000	0.0	0.0	1
-1.22166		17.0000	8.5000	4.9497	24.5000	2
-1.14037		7.0000	7.0000	0.0	0.0	1
-1.10788		49.0000	3.7692	1.7394	36.3077	13
-1.02659		2.0000	2.0000	0.0	0.0	1
-0.99410		98.0000	5.4444	5.1930	458.4444	18
-0.74298		1.0000	1.0000	0.0	0.0	1
-0.62920		39.0000	4.3333	4.1833	140.0000	9
-0.51542		46.0000	3.2857	2.8937	108.8571	14
-0.49186		2.0000	2.0000	0.0	0.0	1
-0.48292		11.0000	3.6667	2.8868	16.6667	3
-0.40163		25.0000	2.5000	2.9907	80.5000	10
-0.36914		44.0000	4.0000	4.1231	170.0000	11
-0.26430		2.0000	1.0000	0.0	0.0	2
-0.24074		3.0000	3.0000	0.0	0.0	1
-0.15052		0.0	0.0	0.0	0.0	1
-0.03674		25.0000	4.1667	2.3166	26.8333	6
-0.00424		23.0000	7.6667	6.3509	80.6667	3
0.07704		19.0000	3.8000	1.6432	10.8000	5
0.10954		51.0000	3.6429	3.6921	177.2143	14
0.22332		66.0000	4.1250	2.9183	127.7500	16
0.36066		5.0000	5.0000	0.0	0.0	1
0.44194		4.0000	4.0000	0.0	0.0	1
0.47444		14.0000	3.5000	2.5166	19.0000	4
0.55572		2.0000	2.0000	0.0	0.0	1
0.58822		18.0000	2.5714	2.2991	31.7143	7
0.66951		4.0000	2.0000	0.0	0.0	2
0.70200		46.0000	4.1818	4.0452	163.6364	11
0.73450		1.0000	1.0000	0.0	0.0	1
0.78329		1.0000	1.0000	0.0	0.0	1
0.81578		17.0000	2.8333	3.2506	52.8333	6
0.94828		6.0000	6.0000	0.0	0.0	1
0.95312		6.0000	3.0000	0.0	0.0	2
1.03440		9.0000	9.0000	0.0	0.0	1
1.14819		1.0000	1.0000	0.0	0.0	1
1.18068		4.0000	2.0000	2.8284	8.0000	2
1.29446		21.0000	7.0000	2.6458	14.0000	3
1.32696		18.0000	9.0000	1.4142	2.0000	2
1.40824		2.0000	1.0000	1.4142	2.0000	2
1.44074		4.0000	2.0000	1.4142	2.0000	2
1.54558		2.0000	2.0000	0.0	0.0	1
1.65936		2.0000	2.0000	0.0	0.0	1
1.80964		3.0000	3.0000	0.0	0.0	1
1.88692		8.0000	4.0000	1.4142	2.0000	2
1.91942		4.0000	2.0000	1.4142	2.0000	2
1.94798		2.0000	2.0000	0.0	0.0	1
1.95191		12.0000	12.0000	0.0	0.0	1
2.00070		1.0000	1.0000	0.0	0.0	1
2.03320		9.0000	9.0000	0.0	0.0	1
2.13804		4.0000	4.0000	0.0	0.0	1
2.29432		2.0000	2.0000	0.0	0.0	1
2.39010		13.0000	13.0000	0.0	0.0	1
2.59316		10.0000	10.0000	0.0	0.0	1
2.64922		9.0000	9.0000	0.0	0.0	1
2.76300		3.0000	3.0000	0.0	0.0	1
2.90927		4.0000	4.0000	0.0	0.0	1
3.50174		2.0000	2.0000	0.0	0.0	1
3.76179		2.0000	2.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		876.0000	4.1127	3.4490	1796.2242	213

Table 66. Summary statistics for b-c asymmetry by paternal age factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-1.81412		0.0	0.0	0.0	0.0	1
-1.73293		9.0000	9.0000	0.0	0.0	1
-1.58655		13.0000	2.6000	1.8166	13.2000	5
-1.33544		7.0000	3.5000	2.1213	4.5000	2
-1.25415		0.0	0.0	0.0	0.0	1
-1.22166		14.0000	7.0000	5.6569	32.0000	2
-1.14037		4.0000	4.0000	0.0	0.0	1
-1.10788		50.0000	3.8462	2.4099	69.6923	13
-1.02659		0.0	0.0	0.0	0.0	1
-0.99410		55.0000	3.0556	2.1275	76.9444	18
-0.74298		1.0000	1.0000	0.0	0.0	1
-0.62920		26.0000	2.8889	2.0276	32.8889	9
-0.51542		42.0000	3.0000	1.7541	40.0000	14
-0.49186		2.0000	2.0000	0.0	0.0	1
-0.48292		26.0000	8.6667	11.5470	266.6667	3
-0.40163		22.0000	2.2000	2.4855	55.6000	10
-0.36914		36.0000	3.2727	2.2401	50.1818	11
-0.26430		14.0000	7.0000	2.8284	8.0000	2
-0.24074		1.0000	1.0000	0.0	0.0	1
-0.15052		0.0	0.0	0.0	0.0	1
-0.03674		16.0000	2.6667	1.6330	13.3333	6
-0.00424		2.0000	0.6667	0.5774	0.6667	3
0.07704		18.0000	3.6000	3.0496	37.2000	5
0.10954		41.0000	2.9286	1.7744	40.9286	14
0.22332		60.0000	3.7500	2.2657	77.0000	16
0.36066		2.0000	2.0000	0.0	0.0	1
0.44194		4.0000	4.0000	0.0	0.0	1
0.47444		1.0000	0.2500	0.5000	0.7500	4
0.55572		7.0000	7.0000	0.0	0.0	1
0.58822		12.0000	1.7143	0.7559	3.4286	7
0.66951		9.0000	4.5000	4.9497	24.5000	2
0.70200		27.0000	2.4545	1.9164	36.7273	11
0.73450		6.0000	6.0000	0.0	0.0	1
0.78329		2.0000	2.0000	0.0	0.0	1
0.81578		13.0000	2.1667	1.3292	8.8333	6
0.84828		1.0000	1.0000	0.0	0.0	1
0.95312		8.0000	4.0000	4.2426	18.0000	2
1.03440		5.0000	5.0000	0.0	0.0	1
1.14818		3.0000	3.0000	0.0	0.0	1
1.18068		5.0000	2.5000	3.5355	12.5000	2
1.29446		7.0000	2.3333	1.1547	2.6667	3
1.32696		7.0000	3.5000	0.7071	0.5000	2
1.40824		7.0000	3.5000	0.7071	0.5000	2
1.44074		7.0000	3.5000	2.1213	4.5000	2
1.54558		1.0000	1.0000	0.0	0.0	1
1.65936		2.0000	2.0000	0.0	0.0	1
1.80564		0.0	0.0	0.0	0.0	1
1.88692		4.0000	2.0000	1.4142	2.0000	2
1.91942		4.0000	2.0000	1.4142	2.0000	2
1.94298		0.0	0.0	0.0	0.0	1
1.95191		4.0000	4.0000	0.0	0.0	1
2.00970		3.0000	3.0000	0.0	0.0	1
2.03320		1.0000	1.0000	0.0	0.0	1
2.13904		1.0000	1.0000	0.0	0.0	1
2.28432		0.0	0.0	0.0	0.0	1
2.39810		7.0000	7.0000	0.0	0.0	1
2.59316		1.0000	1.0000	0.0	0.0	1
2.64922		1.0000	1.0000	0.0	0.0	1
2.76300		3.0000	3.0000	0.0	0.0	1
2.90927		5.0000	5.0000	0.0	0.0	1
3.50174		1.0000	1.0000	0.0	0.0	1
3.76179		0.0	0.0	0.0	0.0	1
WITHIN GROUPS TOTAL		630.0000	2.9577	2.4893	935.7085	213

Table 67. Summary statistics for C-Ulnar asymmetry by birth order factor codes (males).

CODE	VALUE LABEL	SUM	MEAN	STD DEV	SUM OF SQ	N
-2.08433		0.0	0.0	0.0	0.0	1
-1.77470		0.0	0.0	0.0	0.0	1
-1.67139		6.0000	6.0000	0.0	0.0	1
-1.46508		2.0000	1.0000	1.4142	2.0000	2
-1.25877		0.0	0.0	0.0	0.0	1
-1.25945		16.0000	16.0000	0.0	0.0	1
-1.15545		26.0000	4.3333	7.4207	275.3333	6
-1.05214		28.0000	2.8000	4.6380	193.6000	10
-0.94914		12.0000	6.0000	1.4142	2.0000	2
-0.91215		31.0000	15.5000	3.5355	12.5000	2
-0.84593		38.0000	2.3750	4.4102	291.7500	16
-0.80983		22.0000	11.0000	2.8284	8.0000	2
-0.74252		82.0000	4.5556	5.9431	600.4444	18
-0.63952		10.0000	10.0000	0.0	0.0	1
-0.60252		3.0000	1.0000	1.7321	6.0000	3
-0.53621		95.0000	8.6364	8.0408	646.5455	11
-0.49921		9.0000	1.8000	4.0249	64.8000	5
-0.43299		20.0000	4.0000	4.4159	78.0000	5
-0.39621		12.0000	6.0000	8.4853	72.0000	2
-0.39590		3.0000	3.0000	0.0	0.0	1
-0.29321		12.0000	12.0000	0.0	0.0	1
-0.29290		51.0000	4.6364	5.0212	362.5455	11
-0.25590		2.0000	2.0000	0.0	0.0	1
-0.18958		45.0000	3.2143	5.2795	362.3571	14
-0.08659		12.0000	6.0000	8.4853	72.0000	2
-0.08627		0.0	0.0	0.0	0.0	1
0.01573		54.0000	3.8571	5.3184	367.7143	14
0.05372		0.0	0.0	0.0	0.0	1
0.11972		0.0	0.0	0.0	0.0	1
0.12004		17.0000	1.3077	1.9315	44.7692	13
0.15672		0.0	0.0	0.0	0.0	1
0.22304		0.0	0.0	0.0	0.0	1
0.26004		4.0000	2.0000	2.8284	8.0000	2
0.32635		8.0000	2.6667	2.5166	12.6667	3
0.36335		13.0000	2.1667	3.7103	68.8333	6
0.40635		5.0000	5.0000	0.0	0.0	1
0.46666		0.0	0.0	0.0	0.0	1
0.54966		15.0000	2.1429	5.6695	192.8571	7
0.60666		7.0000	7.0000	0.0	0.0	1
0.67297		17.0000	1.3889	3.7565	112.8889	9
0.81297		7.0000	7.0000	0.0	0.0	1
0.87929		2.0000	0.6667	1.1547	2.6667	3
0.91597		0.0	0.0	0.0	0.0	1
0.91629		3.0000	3.0000	0.0	0.0	1
0.98260		14.0000	7.0000	9.8995	98.0000	2
1.01929		16.0000	16.0000	0.0	0.0	1
1.22559		12.0000	12.0000	0.0	0.0	1
1.22590		0.0	0.0	0.0	0.0	1
1.29222		10.0000	10.0000	0.0	0.0	1
1.36590		0.0	0.0	0.0	0.0	1
1.43222		7.0000	1.7500	3.5000	36.7500	4
1.53553		6.0000	6.0000	0.0	0.0	1
1.57221		0.0	0.0	0.0	0.0	1
1.67553		0.0	0.0	0.0	0.0	1
1.84515		2.0000	1.0000	1.4142	2.0000	2
1.98515		0.0	0.0	0.0	0.0	2
2.08846		22.0000	11.0000	5.6569	32.0000	2
2.29478		7.0000	7.0000	0.0	0.0	1
2.43677		0.0	0.0	0.0	0.0	1
3.60696		5.0000	5.0000	0.0	0.0	1
3.81358		6.0000	6.0000	0.0	0.0	1
6.09163		20.0000	20.0000	0.0	0.0	1
WITHIN GROUPS TOTAL		816.0000	3.8310	5.1655	4029.0220	213

VITA

Letitia Lowe Oliveira was born on November 17, 1947, in Jackson, Mississippi, where she graduated from Murrah High School in 1965. She attended Agnes Scott College in Decatur, Georgia, and graduated cum laude in June, 1969, with a Bachelor of Arts degree in music. Upon completion of college she was employed as a computer operator and programmer by I.B.M. in Atlanta, Georgia, during which time she also worked as organist and director of three choirs at Rehoboth Presbyterian Church in Decatur, Georgia.

In the fall of 1972 she moved to Knoxville, Tennessee, where she was employed as a computer programmer at The University of Tennessee. She entered the Graduate School at The University of Tennessee in March, 1973, on a part-time basis. In September, 1974, she returned to school on a full-time basis as a University of Tennessee Non-Service Fellow, a position which she was awarded for three consecutive years. She received the Master of Arts degree with a major in anthropology in December, 1975, and the Ph.D. degree with a major in anthropology in August, 1978.

She is a member of Phi Beta Kappa, Phi Kappa Phi, The American Association of Physical Anthropologists, The American Anthropological Association, and The American Dermatoglyphics Association.

She is married to Odacir H. Oliveira, a clinical psychologist and Presbyterian minister from Paraná, Brazil.