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CHANGES IN ANTHROPOMETRIC TRAITS OF HUMANS IN THE PROCESS OF MIGRATION: COMPARATIVE ANALYSIS OF TWO GENERATIONS OF MEXICANS IN MEXICO AND IN THE U.S.A.

ABSTRACT — The morphological status of Mexican immigrants in the U.S.A. and their American-born children, is compared with that of the Mexican sedente population, adults and children. Velocity of growth and development in various anthropometric traits is traced in the children of each group, as well as in the adults in relation to age group. The results indicated a definite tendency for larger size in migrant parents and their children than in sedente parents and children of comparable ages. The patterns of growth, velocity, however, were generally similar in the children of migrants and sedentes. In regard to differences between boys and girls, as expected the latter manifested earlier development in most of the traits considered, in terms of age at maximum increment. The possibility of physical selection in the migrants versus sedentes is considered and found to be of dubious significance in the present instance.

KEY WORDS: Anthropometric traits — Migration — Selection.

Morphological differences between various territorial, social, and professional groups within the same ethnos have been cited in numerous studies (e.g. Bogoslovsky 1937; Bunak, 1932; Garn et al., 1950; Aubenque, 1967; Schreider, 1967; Kobyliansky, 1972; Kobyliansky and Arensburg, 1977). Morphological differences between migrants and the sedente population of which they had been a part, have been found early in, if not at the outset of, the period of migration (e.g., Kobyliansky, 1971). Such differences have been especially noted in the offsprings of even the first generation of migrant parents, for example, average stature increasing 2—3 cms, average body weight increasing 2 kg, changes in cephalic index and pigmentation, etc. (e.g., Boas, 1911; Shapiro, 1939; Lasker, 1946; Kaplan, 1954; Bunak, 1968; Kobyliansky, 1983).

Boas (1911) was the first to demonstrate in migrants to the U.S.A. a measure of plasticity even in the cephalic index which previously had been considered a firm discriminant in racial analysis. Kaplan (1954) and Hulse (1981) have reviewed the studies on the physical plasticity of a population as a result of migration and/or changes in environment. Kaplan noted that many investigators ascribed physical changes in migrant groups to the influence of environment. Yet she also observed that "Neither Boas nor any other investigator interested in the effects of environment upon human physique have claimed that environmental factors affect the individual's genetic make-up. Their major conclusions have been in the nature of hypotheses regarding the response of the individual to varying external conditions" (Kaplan, 1954, p. 781).

Shapiro (1939) found in the Japanese that morphological differences between migrants to Hawaii and the stable or sedente part of this ethnically homogeneous population became stronger in the migrants' descendants, leading to further morphological differentiation from the original group.

Thus, our present purpose is to investigate the relationship between a population's morphology and its potential for morphological change. The assignment therefore includes the determination of the

morphological status of Mexican adults in the U.S.A. and their children, ages 4—70 or two generations, and a comparison of these with like characteristics in the original Mexican population, parents and children.

We here compare the growth of children of Mexican parents in Mexico and in the U.S.A. (Texas), as well as changes in physical traits with age of adults, the parents of the children.

Relatively much has appeared in the published literature on growth and development of Mexican-American children (Paschal and Sullivan, 1925; Manuel, 1934, Whitacre, 1939; Meredith and Goldstein, 1952; McGarity, 1969; Center of Disease Control, 1972; Lloyd-Jones, 1941; Malina and Zavaleta, 1980; Zavaleta and Malina, 1980). Meredith and Goldstein 1952) have considered growth of children in Mexico, the latter comparing growth of children of Mexican parents in Mexico and in the U.S., but only with respect to central tendency. Goldstein (1947) also provided data on growth of Mexican infants during the first year of life.

Likely enough other growth studies of children, of which we are unaware, have appeared in Mexico.

Lasker (1953) has studied the age factor in bodily measurements of adult Mexicans in Mexico.

It should be noted that the parameters considered in almost all of the aforementioned literature are body weight and stature. Growth and development in these traits are here also examined, as well as those of the head, face, ear and hand.

The present paper gives extensive consideration to questions of variability and velocity of growth in addition to mean absolute growth in the children in Mexico and in the U.S. As for changes with age in the adult, following the example of Lasker (1953) we have checked whether comparable changes occurred in the adult Mexicans in the U.S. (migrants) and Mexico (sedentes).

MATERIAL AND METHOD

In 1941 one of the authors (MSG) did a demographic and anthropometric study of Mexican immigrant families, parents and their American-born children, in Texas, and a like study of parents and offsprings in central and northern Mexico from whence most of the immigrants came. (The report, "Demographic and Bodily Changes in Descendants of Mexican Immigrants: With Comparable Data on Parents and Children in Mexico", was published by the Institute of Latin-American Studies, University of Texas, Austin, 1943. Long out of print, the report recently has been made available by University Microfilms International, 300 North Zeeb Road, Ann Arbor, Michigan, 48104, U.S.A.)

The requisites for selection of a family in Texas were that both father and mother had been born and raised in Mexico, and that at least one of the American-born children had to be an adult (girls 18 years or more; boys 20 years or more). In Mexico, at least one of the children had to be an adult, as was the case in the U.S.A.

A total of 305 families were measured, 176 in Texas, mainly in San Antonio, and 129 in Mexico, largely in the cities of Guanajuato, Saltillo and Monterrey, comprising a total of nearly 2,000 individuals. The economic status of both immigrant and sedente families examined was generally poor but not "impoverished".

Estimation of body surface area, according to the nomogram in Montagu (1960, p. 134), and weight--surface area index, here included in the traits considered, were not in the original monograph.

In regard to age, unless otherwise indicated, an avarage of 2-year periods was used (e.g. ages 4 and 5, 6 and 7, etc.), in order to provide a better numerical representation at each age interval, and because incremental growth in some of the traits, on an annual basis, was very slight. *Appendix Table 1* gives the number of children by age at a yearly interval. The tables of absolute growth are also given in appendices.

The data were processed by computer at Tel Aviv University. The following were calculated for each anthropometric trait: arithmetic mean (X_j), standard deviation (S. D.), skewness (X_{j1}), and kurtosis (X_{j2}). The two latter parameters establish the frequency distribution of the given trait. In case of non-normality in a distribution, the values would, of course, increase or decrease sharply, too, the parameters also enable one to relate distributions of the anthropometric traits to Gaussian curves. Indeed, all the traits, except body weight, exhibited normal distributions for each age group; body weight manifested a slight tendency to right asymmetry.

As will be noted subsequently (*Tables 1—2*), age differences in morphological traits of the children, as well as those of their parents, were eliminated by standardization of the measurements for age group, thus: $Y_i = \frac{\bar{X} - X_i}{\text{S. D.}}$, where X_i is the trait measurement, $\bar{X}$ and S. D. the average and standard deviation for the trait measurement of all individuals in a given age class. Standardization was done for each sex at 1 year age intervals to and including 20 years, and at 10 year intervals thereafter to and including 70 years. After standardization, the data were divided by fathers, mothers, sons and daughters, respectively, for the Mexican families in Mexico (sedentes), and for the Mexican families in the U.S. (migrants). Comparisons between sedentes and migrants were based on one-way variance analysis (Anova).

Details of the statistical procedures used herein may be found in the SPSS programs of Nie et al. (1975).

RESULTS

By means of one-way analysis of variance (Anova), differences between sedentes and migrants were estimated for each trait and sex among parents and their children. Differences in bodily measurements between the compared groups are represented in "normalized" values, that is, in divisions of the standard deviation. For comparisons between the child populations in Mexico and the U.S., weighted normalized sibling averages were computed for each trait and sex.

TABLE 1. *Bodily measurements of Mexicans and their children in Mexico and in the U.S.A.; comparison by one-way variance analysis*

Trait	Child Population				Parental Population			
	Males		Females		Males		Females	
	F-ratio	Sign.	F-ratio	Sign.	F-ratio	Sign.	F-ratio	Sign.
Weight	9.67	.00	0.30	.58	4.82	.03	9.42	.00
Stature	17.51	.00	8.54	.00	2.53	.11	0.01	.92
Head Length	6.11	.01	5.14	.02	0.12	.72	3.20	.07
Head Width	11.26	.00	7.72	.01	8.02	.01	0.53	.47
Min. Frontal Diam.	11.27	.00	7.16	.01	5.02	.03	8.46	.00
Menton-Crinion	7.28	.01	0.23	.63	1.93	.17	3.70	.05
Menton-Nasion	11.33	.00	1.21	.27	3.01	.08	0.05	.82
Max. Bizygomatic Diam.	22.57	.00	11.15	.00	6.35	.01	9.43	.00
Bigonial Diam.	23.17	.00	32.94	.00	9.69	.00	15.01	.00
Nose Height	3.19	.08	2.25	.13	0.22	.64	0.02	.88
Nose Width	1.87	.17	8.77	.00	0.25	.61	2.02	.16
Hand Length	17.07	.00	9.71	.00	0.17	.68	0.42	.52
Hand Width	52.39	.00	23.27	.00	11.67	.00	13.64	.00
Ear Height	4.62	.03	7.38	.01	2.03	.15	1.66	.20
Ear Width	0.72	.40	3.61	.06	1.33	.25	1.40	.24
Cephalic Index	0.34	.55	0.02	.90	5.09	.03	0.56	.46
Nose Index	0.05	.83	10.35	.00	0.47	.49	0.96	.33
Ear Index	1.23	.27	0.24	.62	5.21	.02	0.00	.99
Body Surface Area	14.76	.00	1.82	.18	4.98	.03	7.80	.01
Weight/Body Surface Area	3.36	.07	0.26	.61	3.44	.06	9.83	.00

Note: Values analyzed are normalized by age for each sex separately. Normalization was done in one year age intervals to and including age 20, and at 10 year intervals thereafter to age 70.

Table 1 gives the F criteria values and their statistical significance for child and parent populations in Mexico compared with those in the U.S. (sedentes vs migrants). As noted, the F ratio is statistically significant (1—5 percent level) in most of the traits, especially in the children. In *Table 2* are the differences between the means of parents in Mexico and the U.S. for each trait, as well as between the means of the children, in each instance normalized by age for each sex separately. The differences between sedentes and migrants, and those between their children, appear statistically significant (1—5 percent level) in most of the traits considered, usually representing more or less larger dimensions in the latter.

The estimated children to adult ratios in average differences (all traits) between sedentes and migrants (*Table 2*) are 154% (−.278/−.180) for males and 110% (−.212/−.192) for females. Thus it is suggested that the average differences between migrants and sedentes were greater in the second generation of the males. In the females the ratio indicates a more or less constant trend between the generations. Indeed, the male to female ratio of their averages (154%/110%) is 1.40 suggesting greater biological conservatism of the females than in the males for the traits considered.

Table 3 gives the percent of total increase in the anthropometric traits between ages 4—20 of the children of Mexican parents, by place of birth of the children and sex, and generally in descending order of relative increment.

The extent of relative increase of the various traits tends to be similar in the children in Mexico and in the U.S. As might be expected, body weight, body surface area, and stature manifest the largest increase in size with age, and ear width and the di-

TABLE 2. *Differences between the means of Mexican sedentes and migrants and between the means of their children in anthropometric traits*[1]

Trait	Child Population		Parental Population	
	Male	Female	Male	Female
Weight	—.30[2]	—.08	—.30	—.36
Stature	—.42	—.28	—.24	—.14
Head Length	—.26	—.20	—.04	—.14
Head Width	—.32	—.26	—.40	—.12
Min. Frontal Diam.	—.24	—.26	—.30	—.38
Menton-Crinion	—.30	—.08	—.16	.38
Menton-Nasion	—.32	—.16	—.26	—.00
Max. Bizygomatic Diam.	—.48	—.34	—.36	—.50
Bigonial Diam.	—.50	—.62	—.38	—.52
Nose Height	—.18	.10	—.14	—.18
Nose Width	—.10	—.24	—.06	—.12
Hand Length	—.44	—.32	.06	—.22
Hand Width	—.72	—.54	—.52	—.48
Ear Height	—.26	—.32	—.22	—.22
Ear Width	—.18	—.22	.14	—.16
Cephalic Index	—.04	—.02	—.32	.00
Nose Index	.00	—.26	—.12	.02
Ear Index	.02	.04	.32	.04
Body Surface Area	—.34	—.12	—.32	—.38
Weight/Body Surface Area	—.16	.02	—.26	—.34
Average	—.278	—.212	—.180	—.192

[1] *Values in the table are normalized by age for each sex separately. Normalization was done in one year age intervals to and including age 20, end at 10 year intervals thereafter to age 70.*
[2] *A minus sign (—) indicates a lower mean parameter in the fist group than in the second.*

TABLE 3. *Percentage increase/decrease in the cited traits between ages 4—20 in children of Mexican parents, place of birth of children and sex*

Trait	Mexico		U.S.A.	
	Male	Female	Male	Female
Weight	258	221	286	250
Body Surface Area	155	132	152	139
Stature	73	64	69	61
Hand Length	68	55	64	60
Hand Width	60	47	61	52
Weight/Body Surface Area	40	38	40	45
Nose Height	40	40	32	—
Nose Width	37	24	26	—
Menton-Nasion	28	32	28	25
Menton-Crinion	25	22	26	—
Bigonial Diam.	25	26	27	22
Max. Bizygomatic Diam.	23	20	23	20
Ear Height	20	14	16	14
Head Length	12	11	7	10
Min. Frontal	9	10	9	10
Head Width	8	7	9	10
Ear Width	4	5	7	3
Nose Index	—2.2	—10.8	—4.7	—
Cephalic Index	—3.6	—2.9	—	—2.2
Ear Index	—15.9	—13.2	—6.1	—10.1

mensions of the calvarium the least relative increase. Interestingly, the several indices are lower at age 20 than at age 4. (*Tables 4—5*).

Curves comparing absolute growth and velocity of growth for the several anthropometric traits in children of Mexican parents in Mexico and the U.S. are shown in *Figs. 1—3*. Both types of curves refer to annual growth. (The curves were constructed by smoothing of the original data.) All the velocity or percentage increment curves are based on a ratio of the dimension at age 4 as the numerator, e.g. amount of increment in stature between ages 5 and 6 divided by the dimension of stature at age 4. Thus all the ratios of a trait become comparable.

Weight, Stature and Body Surface Area

Weight (*Fig. 1a*). Little difference is noted in the curves of weight between the boys in Mexico and in the U.S. until age 15 or 16, about the pubertal period, when the U.S. boys begin and continue to exceed those in Mexico. Velocity of growth is essentially a normal distribution curve with a peak at age 15 in both Mexico and the U.S. Among the girls, average weight appears to be somewhat greater in Mexico than in the U.S. during early childhood, but less than in the U.S.

TABLE 4. *Observations on average growth between ages 4—20 in children of Mexican parents in Mexico and the U.S.A. as depicted in their growth curves (See Figs. 1—3)*

Trait	Males	Females
Weight	S-shape curves; M and U.S. begin to diverge at ca. age 15, greater in U.S.	S-shape; level off at ca. age 17; much the same in M and U.S.
Stature	Somewhat greater in U.S., especially ages 17—18; level at age 17 in U.S.	Almost same in M and U.S. to ca. age 13 when diverge; level at ca. age 16
Body Surface Area	S-shape; similar in M and U.S.	Much same to ca. age 15 when begin to diverge
Head Length	Definitely greater in U.S., leveling at ca. age 18; M approaches U.S. at age 20	Greater in U.S. M approaches U.S. at age 20
Head Width	Greater in U.S. especially after age 16; flatter curves than length	Somewhat greater in U.S.
Min. Frontal Diam.	Greater in U.S. throughout; levels off at ca. 18 in U.S., age 15 in M	M and U.S. begin to diverge at ca. age 12; greater in U.S.
Max. Bizygomatic	U.S. somewhat greater than M; no leveling off	U.S. levels off at ca. age 15; somewhat greater in U.S. but about same at age 20
Bigonial	Definitely greater in U.S.; still growing at age 20 in M and U.S.	Definitely greater in U.S. but levels off in U.S. at ca. age 15; continued growth in M
Menton-Crinion	About same in M and U.S.; still increasing at age 20	Same in M and U.S., leveling at ca. age 16
Menton-Nasion	Slightly greater in U.S.	Greater in U.S.; leveling at age 15; M and U.S. same at age 20
Nose Height	Slightly greater in U.S.; M and U.S. same at age 20	Except at age 5, much same in M and U.S.; level at age 17
Nose Width	Slightly greater in U.S. until age 20 when M same as U.S.	Slightly greater in U.S.; level off at ca. age 16
Ear Height	Slightly greater in U.S.; level off in M age 18, in U.S. at age 17	S-shape; greater in U.S. but approached by M at ages 19—20; level at age 17 in U.S.
Ear Width	Marked difference between M and U.S.; inverted S-shape in U.S.	Marked difference between M and U.S.
Hand Length	Much same in M and U.S.; level off at ca. age 15	About same in M and U.S.; both level off at age 17
Hand Width	Larger in U.S.; level at age 17 in U.S., ca. age 19 in M	Near same at age 20 in M and U.S.; level off at age 15 in U.S.

Note: M in text refers to Mexico; U.S. refers to children of Mexican parents in U.S.A.

TABLE 5. *Age(s) at maximum percentage increment in traits depicted in graphs of velocity of growth in children of Mexican parents in Mexico and in the U.S.A. (See Fig. 1-3)*

Trait	Male		Female		Comments
	Mexico	U.S.	Mexico	U.S.	
Weight	15	15	13	12—13	Roughly normal distribution curves
Stature	14	14—15	9—10	11—12	Similar to "longitudinal" curves
Body Surface Area	9, 14—15	5, 15, 20	13	12—13	Roughly similar Mexico vs. U.S.
Head Length	—	—	5, 10	5, 11	Curves erratic
Head Width	5, 14	16	15	5, 12	Curves erratic; flatter in length
Min. Frontal	9, 14, 20	8, 16	5, 16	5, 12	Like head width males
Max. Bizygomatic	15, 20	7, 16	9, 14, 20	5, 12, 19	Roughly "normal" distribution curve in males; in females M and U.S. differ
Bigonial	8, 14, 20	7, 15—16, 20	7—8, 12, 19	5, 10	Similar to bizygomatic
Menton-Crinion	8, 14—15, 20	7, 15	7,20	—	
Menton-Nasion	15	15	7, 13, 20	11	Male roughly "normal" distribution; female roughly longitudinal
Nose Height	15	9, 15	7—8	—	
Nose Width	5, 9, 15	8, 15	9	—	
Ear Height	5	9, 15	10—11, 17—18	5—6, 11—12, 19—20	Curves differ, Mexico vs. U.S.
Ear Width	13	6, 20	9, 16—17	5, 9, 17—20	Mexico and U.S. curves differ markedly
Hand Length	14	14	6, 9—10	11—12	Much like stature
Hand Width	15	15	10	5, 12, 20	Male similar to stature
Weight/Body Surface Area	15	10, 15	13, 20	5, 12	Marked differences between M and U.S. in females

[1] *Velocity of growth is here measured by the increment of one year and the following year (e.g. average age 6 minus that at age 5), divided by the average diameter or index at age 4. The obtained ratios, all with the same denominator, thus become comparable.*

beginning at about age 13. It may be noted that the absolute growth curves for boys and girls, in Mexico and the U.S..

In contrast to the similar velocity curves among the boys in Mexico and the U.S., those of the girls differ markedly, especially between ages 10—14 when the relative increment appears to be much greater in the U.S. girls. In both the girls in Mexico and in the U.S., a peak is reached at age 13, a couple of years earlier than in the boys.

Stature. Growth in stature is virtually linear among the children in Mexico and in the U.S. to about age 15 in the boys and a year earlier among the girls. Among the boys, average stature tends to be somewhat greater in the U.S. than in Mexico at all ages, whereas among the girls this tendency begins only at about age 12.

Velocity of growth among the boys is high to age 14 in Mexico, age 15 in the U.S., diminishing continuously thereafter; among girls, relative increment peaks are at about age 10 in Mexico, a couple of years later at age 12, in the U.S.

Changes in body surface area between ages 4 and 20 are similar in the girls in Mexico and in the U.S. The velocity curves, however, appear to be different in the two groups, a more or less longitudinal type of curve in Mexico and sharply kurtotic in the U.S., although the maximum relative increment occurs at about the same ages (12—13 years). In the boys, average surface area is virtually alike in both groups to about 15 when average dimensions begin to be greater in the U.S. boys. Velocity curves in the two groups are roughly similar with maximum relative increment at age 15.

Head (*Length, Breadth, Minimum frontal*) (*Fig. 1b*). Head length growth in males increases in virtually a straight line in Mexico; in the U.S., except for an apparent diminution in size between 4 and 7, perhaps due to the vagaries of sampling in the present instance, growth also proceeds almost in a straight line until age 18 when a leveling begins; by age 20 head length is almost the same in both groups. Velocity of growth appears erratic in Mexico albeit peaking between ages 12—15; in the U.S. group, maximal incremental growth occurs at ages 12—14. Incremental growth ceased about age 19 in the U.S. boys but apparently not until some time after age 20 in Mexico. In the girls, the curves of absolute growth are similar to those in the males except that leveling of the curve in the U.S. begins a year earlier, at age 17. In velocity of growth, the curves in both groups appear to be bimodal peaking at 5 years and 10 years (11 years in the U.S.).

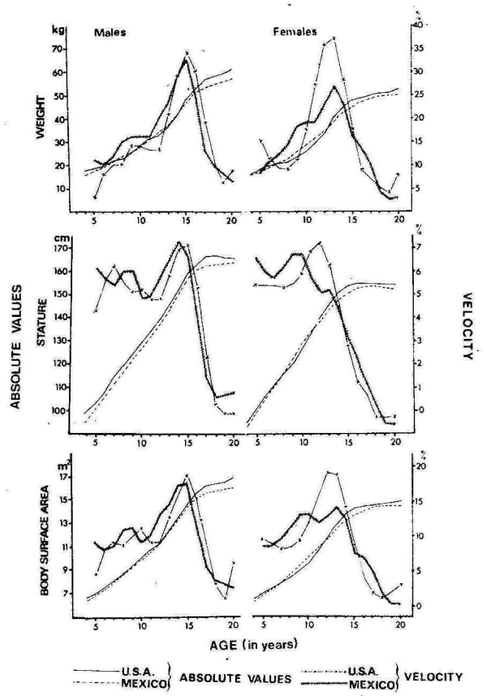


FIGURE 1a *Curves depicting mean annual absolute growth and velocity of growth in children of Mexican sedentes and migrants, ages 4—20, by sex: Weight stature, and body surface area. Velocity is the annual mean increment as a percentage of the mean measurement at age 4.*

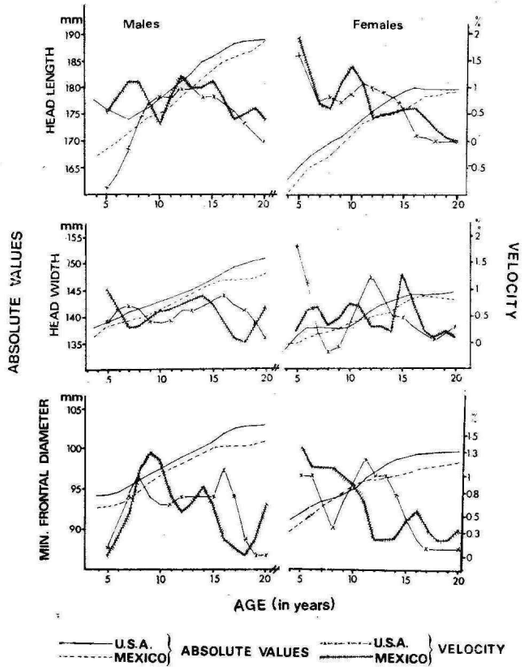


FIGURE 1b *Same: Head length, width, and minimum frontal.*

Incremental growth practically ceased at age 16 in the U.S. girls, somewhat later in Mexico (between 18—19).

Width of head apparently grows at a slower pace than head length. A leveling in absolute growth appears at age 16 in Mexican boys. Velocity of growth in the boys in Mexico appears to be trimodal at ages 5, 14 and 20, whereas in the U.S. a peak occurs only at age 16. In the girls, absolute growth in width of head progresses much the same between 4 and 20 years in Mexico and in the U.S. although the pattern of incremental growth apparently differs in the two groups, namely, a bimodal curve in the U.S. girls, with peaks at ages 5 and 12, and a peak only at age 15 in Mexico.

The growth curves for minimum frontal diameter in the boys are very similar to those for head width albeit differing in the pattern of velocity of growth. The latter appears to be trimodal in Mexico (ages 9, 14 and 20) and bimodal in the U.S. (ages 8 and 16). In the girls, absolute growth appears similar in Mexico and the U.S. until age 11 when the curves diverge, a leveling occurring at that age in Mexico and not until about age 17 in the U.S.

The incremental pattern in Mexico and U.S. girls apparently differs considerably: in the U.S. maximal increment is at ages 5—6 and again at age 11, whilst in Mexico it is at ages 5 and 16.

Face Widths (*Bizygomatic and Bigonial*) (*Fig. 1c*).

Incremental growth in the bizygomatic diameter appears to be bimodal in the boys, both in Mexico and the U.S. but at different age intervals, namely at ages 15 and 20 in Mexico and 7 and 16 in the U.S. In the girls, the velocity of growth pattern differs in the two groups: roughly a longitudinal type of curve in the Mexico girls with a peak at 9 years and a smaller one at age 20, whereas in the U.S. the curve is strongly bimodal with peaks at ages 5 and 11.

The picture of the velocity in bigonial growth is roughly similar in the Mexico and U.S. boys although

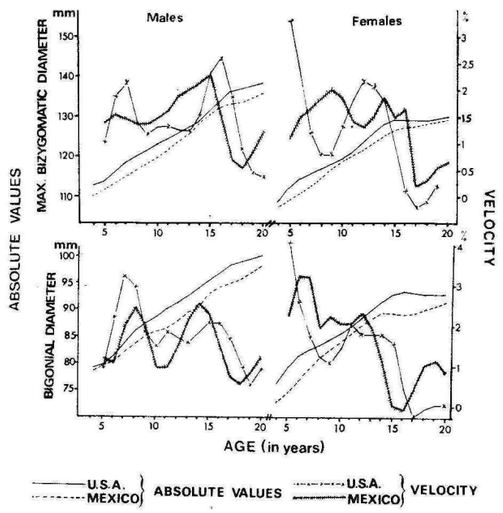


FIGURE 1c *Same: Bizygomatic and bigonial diameters.*

differing in ages at maximum increment, namely 8 and 14 in Mexico and 7 and 15—16 in the U.S. The pattern of incremental growth in the girls of both groups appears to be similar in early childhood, relative maximum growth occurring at ages 6—7 in Mexico and at 5 years in the U.S. Thereafter, however, velocity of growth of the mandible as represented in the bigonial width differs in the two groups, with another peak at age 19 in Mexico and one other at age 11 in the U.S.

Face Lengths (*Menton-crinion and Menton-nasion*) (*Fig. 1d*). The velocity of growth in total face length (menton-crinion) is similar in the boys in Mexico and the U.S., essentially bimodal in each, although the ages at maximum growth differ somewhat, peaking at ages 8 and 14—15 in Mexico and at ages 7 and 15 in the U.S. In the girls the curves of absolute growth are almost identical in Mexico and the U.S. Velocity of growth in the U.S. girls could not be measured since data for age 4 was not available; in Mexico the curve appears as an N shape, with a peak at ages 7 and 20.

Velocity of growth in the menton-nasion in the boys also is quite similar in Mexico and the U.S., with peaks at ages 8 and 15. Some differences, however, occur between the girls in Mexico and the U.S., peaking at ages 7 and 13 in Mexico and 5 and 11 in the U.S.

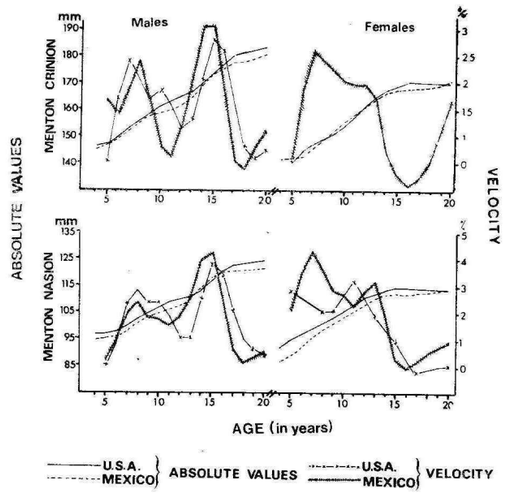


FIGURE 1d *Same: Menton-crinion and menton-nasion.*

Nose Height and Width (*Fig. 1e*). Height of nose peaks at age 15 in the boys, both in Mexico and the U.S.; another, earlier, peak occurs in the U.S. at age 9. In the girls velocity of growth in nose height could be traced in Mexico only since no information for age 4 was available for the U.S. In the Mexico girls, relative incremental growth was greatest at ages 7 and 8.

Nose width incremental growth in the Mexico boys appears trimodal, peaking at ages 5, 9 and 15, and bimodal in the U.S. at ages 5 and 15. The girls

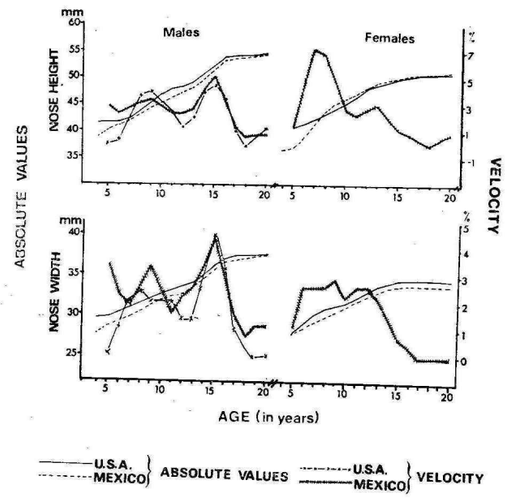


FIGURE 1e *Same: Nose height and width.*

in Mexico manifest a peak at age 6 with more or less of a plateau to age 14, with a steady decline thereafter; nose width information at age 4 was not available for the U.S. girls.

Ear (*Height and Width*) (*Fig. 1f*). Absolute growth of the ear in height progresses roughly parallel in the boys in Mexico and the U.S. The pattern of velocity of growth, however, appears to be distinctly different between them, the curve in Mexico peaking at 5 years, declining to 7 years, thereafter manifesting more or less of a plateau to 17 years, and then a continuous drop to zero increment between 19 and 20 years. In contrast, the U.S. boys manifest a bimodal curve, with maximum relative increments at ages 9 and 15.

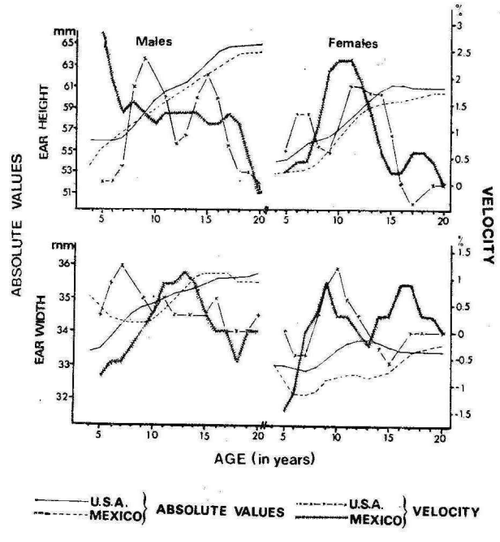


FIGURE 1f *Same: Ear height and width.*

Whether or not the noted differences are valid or an artifact of inadequate sampling, is not clear. In the girls also there are differences in velocity of ear height growth but not as markedly as in the boys. Thus maximal increments occur at ages 10—11, and to a much lesser extent at ages 17—18 in Mexico, and at ages 6—7 and 11—12 in the U.S. Velocity of growth in ear width also differs markedly in the boys in Mexico and the U.S. a peak at age 14 in Mexico, with a cessation of growth at age 16, whereas the peak is at age 7 in the U.S. In the girls there seems to have been little or no growth in ear width, although the velocity curve is bimodal in Mexico with modest relative incremental peaks at ages 9 and 16—17, and at age 10 in the U.S.

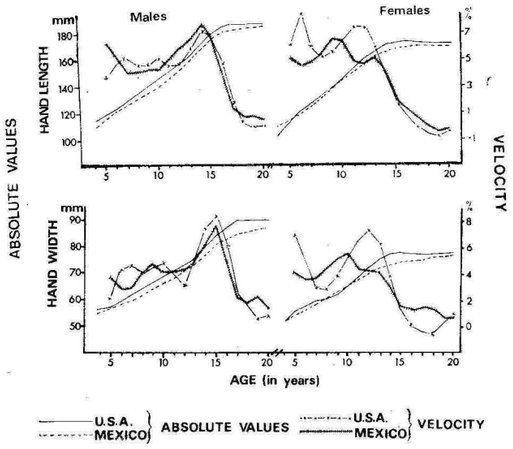


FIGURE 1g *Same: Hand length and width.*

Hand (*Length and Width*) (*Fig. 1g*). Growth of the hand in length follows a similar pattern in the boys in Mexico and the U.S., roughly longitudinal in velocity in Mexico and the U.S., and resembling the pattern noted in stature. In the girls also the velocity curves are roughly longitudinal in shape in Mexico and the U.S. albeit differing somewhat at time at maximum increment, peaking at about age 9 in Mexico and at ages 6 and 11—12 in the U.S.

Hand width growth is much the same in velocity in Mexico and the U.S., essentially a normal distribution curve with negative skewness to the left, and peaking at age 15. In the girls, however, the curves of velocity differ in Mexico and the U.S., bimodal in the latter with peaks at ages 5 and 12; in the former the curve is roughly longitudinal in shape, with a peak at age 10.

The stages of growth, especially in velocity, of the various traits are summarized in *table 3*.

Weight/body surface area ratio (*Fig. 2a*). Changes in weight/body surface area ratio between ages 4 and 20 are similar in Mexico and U.S. boys and girls, respectively, to about age 12 in the girls and age 15 in the boys when the averages begin to be somewhat

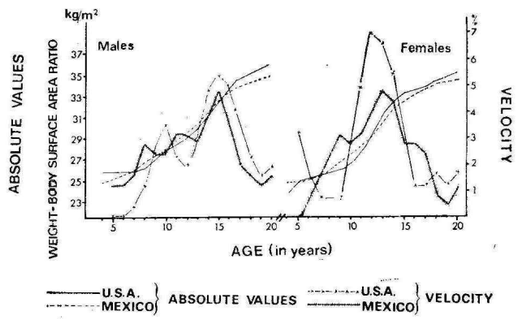


FIGURE 2a *Curves depicting changes in mean annual indices of children of Mexican sedentes and migrants, ages 4—20, by sex. Weight/body surface area.*

greater in the U.S. group. The velocity curves appear roughly normal in distribution in the Mexico boys, and bimodal in the U.S., peaking in the latter at 10 and 15 years and in the former at 15 years. Velocity in the girls manifests a similar pattern, namely, bimodality in the U.S. group with peaks at 5 and 12 years, and a flatter, roughly normal distribution curve in Mexico with a peak at 12 years.

Cephalic index (*Fig. 2b*). In the boys, changes in the cephalic index with age as represented in the curves, appear markedly different in the Mexico and U.S. children. In the former there is a decline between ages 4 and 19 with a slight upturn at 20 years, or a shift from low brachycephaly to mesocephaly by

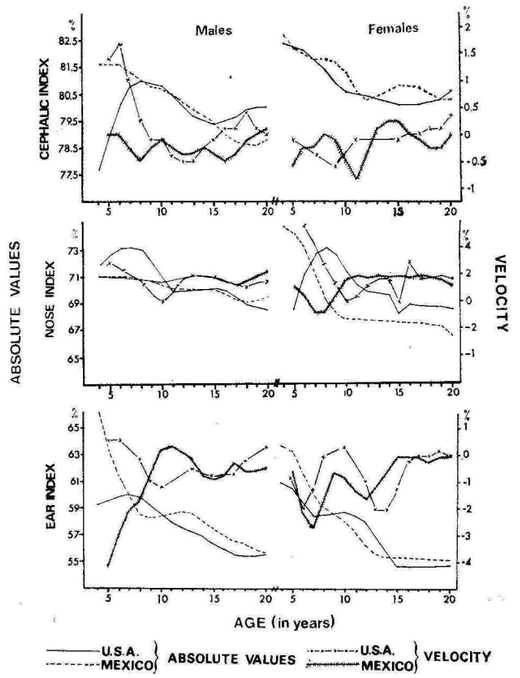


FIGURE 2b *Cephalic, Nose, Ear.*

age 13 or 14. In the U.S. group, the curve *rises*, or an increase in the index, between 4—8 years, from meso- to brachycephaly, followed by a decrease in the index to age 15, again followed by a slight upturn in the curve.

In the girls the curves are more or less parallel, each group manifesting a drop from clear brachycephaly to the upper limits of mesocephaly between 4—20 years. The velocity curves show small negative rates of change in both the Mexico and U.S. children.

The velocity curves appear erratic in boys and girls, with no indication of a pubertal peak, in both Mexico and the U.S.

Ear Index (*Fig. 2b*). In males the ear index decreases with age, the ear becoming relatively longer. The curves, however, suggest different patterns of development in the children in Mexico and in the U.S. although at age 20 the curves, or mean indices, virtually meet in both groups. In rate or velocity of change with age, the index appears erratic in the U.S. children whereas in Mexico there is a clear peak between 10—12 years.

The ear index in the girls, both in Mexico and the U.S., seems to follow the pattern noted in the boys except that the diminution of the index ceasant about ages 14—15 when a leveling off occurs and continues to age 20. Velocity of change appears to be bimodal with peaks at ages 9—10 and 15—16 in both groups.

Nose index (*Fig. 2b*). The curves for nose index in the boys are similar in both Mexico and the U.S. between ages 11—20; at earlier ages however the U.S. sample is characterized by higher values than in Mexico, that is, a somewhat relatively broader nose. In rate of change of velocity, a more or less sharp decrease between ages 4—10 is followed by only a slight diminution between ages 11—20, this in Mexico and the U.S. boys.

Among the girls the nose index "growth" pattern between ages 4 and 20 differs markedly in the Mexico and U.S. groups. In the former, the index declines sharply between ages 4—10, becomes a plateau thereafter to age 18 when a downturn again commences. In contrast, the index in the U.S. group increases with age from 4 to 8 years, thereafter decreasing to age 16 when it levels off. In velocity the curve for Mexico also decreases sharply to age 10 but then becomes more or less bimodal in shape with peaks at 12—13 years and at 16 years. The U.S. curve is quite different, descreasing to about 8 years, turning upward to age 10, and becoming a plateau thereafter.

Why the curves should be so markedly different in the two groups is not clear.

The Adult Population

Data on the adult population, aged 21—70 years divided by 10 year intervals, are given for sedentes and migrants by sex, in *appendix tables 4—5*.

Body weight. Both the migrant men and women tend to be heavier than their sedente compatriots in every age group. Mean body weight in the males is greatest in the age group 41—50 in sedentes, somewhat earlier in the migrants (31—40), with a sharp drop in old age in sedentes and migrants. Among the females, the age group 51—60 tends to be heaviest in the sedentes, somewhat earlier in the migrants (age group 41—50).

Stature. Average stature tends to be greater in the migrants than in the sedentes in the various age groups in each sex. Among both sedentes and migrants, mean stature is greatest at age group 21—30, declining more or less thereafter. This tendency in men and women would seem to suggest that the younger generation had more closely approached their potential in growth as a result perhaps of improved nutrition and health status.

Body surface area. The mean is about the same in sedentes and migrants in the several age groups in the males, somewhat greater in the migrants among the females. Body surface area appears to increase with age in the sedente males, but reaches a maximum at age group 31—40 in the migrants. In the female sedentes the mean is lowest in the young (age group 21—30) and in the old (age group 61—70), whereas in the migrants it is also lowest at age 21—30 but remains fairly stable thereafter.

Head length. In both sexes the averages are much the same in sedentes and migrants in the several age groups. Little or no change in mean head length is evident in the several age divisions of the males; in the females the head appears to be shorter in old age than in the younger age groups, in the sedentes only.

Head width. Mean dimensions are about the same in sedentes and migrants, especially in the males. Little or no change in the averages of the several age groups appears in the male sedentes, but the head is somewhat broader at age groups 31—40 and 51—60 in the migrants. The females manifest a slight increase

APPENDIX

TABLE 1. *Number of individuals measured in Mexico and in the U.S.A., by age and sex*

Age	Mexico		U.S.A.	
	Males	Females	Males	Females
4	6	2	5	3
5	6	6	4	7
6	13	5	8	8
7	9	7	6	10
8	11	12	8	8
9	8	10	17	8
10	17	11	8	12
11	8	9	14	14
12	16	12	17	19
13	19	9	16	19
14	16	13	11	24
15	8	16	19	26
16	17	18	16	14
17	16	16	22	29
18	8	17	19	21
19	9	13	23	30
20	12	16	24	21
21—30	74	83	108	106
31—40	21	37	21	44
41—50	38	68	62	88
51—60	56	32	68	49
61—70	16	10	34	7
TOTAL	404	422	530	567

in mean head width with increasing age, both sedentes migrants.

Minimum frontal. Mean dimensions are about the same in sedentes and migrants in both sexes. Little or no change is apparent in the several age groups, in sedentes and migrants, males and females.

Menton-crinion. Curiously, average total face length is greatest in old age (age group 61—70) in the male sedentes, but reaches a maximum at age group 31—40 in the migrants. The females manifest still another pattern, namely, a maximum at age group 51—60 and a sharp drop in age group 61—70, both in sedentes and migrants. (It should be noted that the measurement, especially in males in middle age and after, is subject to error due to a receding hair-line or tendency to baldness).

Menton-nasion. Mean dimensions are about the same in sedentes and migrants, in both sexes. No special age group trend is apparent in the males, sedentes or migrants; the mean diameter is least in the old age group of the females, sedentes and migrants.

Bizygomatic. The face tends to be broader in migrants than in sedentes, especially among the females. A slight increase in average face width occurs in the older age groups among sedentes and migrants.

Bigonial diameter. The bigonial diameter also tends to be greater in migrants than in sedentes, in both males and females. Male sedentes manifest a slight increase in bigonial width with advancing age whilst in the migrants the maximum is reached at age group 31—40. The pattern differs in the females, namely, little change with age in sedentes but a definite and continuous increase in mean diameter of males with advancing age.

Nose height. Mean nose height is about the same in sedentes and migrants, males and females. In males it tends to be greater in the older age groups in sedentes, but is much the same at all age groups in the migrants. Contrarywise, among the females nose height is much the same in all age groups among sedentes but tends to be greater in the older age groups of migrants.

Nose width. Little or no difference is apparent between the means of sedentes and migrants, males or females. Width of nose increases with advancing age group in sedentes and migrants and in both sexes.

APPENDIX

TABLE 2. *Mean dimensions (mm.)* of children of Mexican parentage in Mexico (M) and in Texas (US), by age: Males*

Trait and country		4 + 5		6 + 7		8 + 9		10 + 11		12 + 13		14 + 15		16 + 17		18–20	
		$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.
Weight	M	16.6	1.9	19.5	2.1	24.4	3.4	28.2	3.8	35.6	6.5	43.1	7.5	51.6	6.1	55.2	6.0
	US	17.7	2.0	20.7	2.6	24.0	2.3	30.8	4.7	34.2	5.0	44.9	8.2	55.3	8.1	58.4	8.1
Stature	M	979.2	63.1	1 091.0	39.5	1 205.4	68.8	1 278.6	50.1	1 405.4	72.4	1 536.7	74.9	1 616.8	67.3	1 635.5	67.5
	US	1005.2	47.3	1 116.0	77.8	1 226.2	44.4	1 337.0	57.4	1 421.4	66.6	1 562.0	88.0	1 662.2	64.7	1 662.6	59.9
Head Length	M	167.7	7.0	170.2	6.4	174.9	5.9	174.9	4.3	180.3	6.8	182.5	7.1	185.2	5.7	187.8	6.9
	US	177.4	2.8	173.6	5.3	175.8	5.6	180.7	5.4	179.1	5.6	185.4	5.0	187.8	7.6	187.7	6.8
Head Width	M	137.7	5.1	139.0	5.1	139.9	4.5	141.8	4.9	143.6	5.5	145.4	4.9	147.0	5.0	146.9	4.5
	US	138.3	4.9	140.3	4.2	141.6	4.3	143.4	4.1	144.8	4.9	146.2	3.9	148.8	4.3	150.6	5.1
Min. Frontal D.	M	91.7	3.3	93.2	2.6	94.9	3.2	97.7	2.8	98.4	4.0	99.3	4.4	100.5	3.9	100.6	4.2
	US	93.9	1.0	95.7	3.3	96.3	3.7	98.4	3.9	98.5	3.3	100.5	3.2	102.9	4.0	102.3	4.3
Menton-Crinion	M	146.4	8.3	148.4	5.6	157.2	7.4	157.8	6.8	162.4	8.6	170.7	10.0	176.9	6.2	179.1	8.7
	US	144.0	7.0	152.6	10.4	157.5	5.7	163.0	7.7	166.4	9.9	171.6	9.8	179.6	7.3	182.7	7.8
Menton-Nasion	M	94.9	4.6	96.4	3.5	101.6	5.4	103.9	4.6	108.6	5.3	115.1	7.3	120.3	5.5	120.7	4.6
	US	95.7	4.2	98.2	4.5	103.6	3.1	108.2	5.2	110.2	5.1	114.5	6.3	121.3	5.0	123.9	5.8
Max. Bizy. Dia.	M	110.9	3.1	114.0	4.1	117.0	3.0	120.3	4.3	125.0	5.9	128.6	5.8	132.8	4.8	134.5	4.1
	US	112.3	4.1	117.5	5.2	120.4	4.5	123.8	4.0	126.5	5.0	130.3	4.2	136.1	5.2	137.6	5.2
Bigonial Dia.	M	79.9	3.7	79.8	2.9	85.6	3.4	86.0	4.5	88.6	5.3	92.0	5.4	94.8	4.3	97.0	5.5
	US	79.3	1.5	82.7	4.6	87.0	4.6	88.6	4.1	92.1	5.9	94.8	3.7	99.3	4.4	99.5	5.5
Nose Height	M	39.7	2.3	41 4	2.1	43.6	2.5	45.6	2.7	47.8	2.7	51.0	4.3	53.3	3.4	54.2	2.6
	US	40.0	2.3	41.6	3.7	45.0	2.3	47.3	2.5	48.8	3.4	50.9	3.7	53.8	3.3	54.3	3.2
Nose Width	M	28.9	1.9	29.2	2.0	31.0	2.6	32.0	1.7	33.4	2.3	35.7	3.6	36.7	2.7	37.3	2.3
	US	29.0	0.8	30.5	2.3	31.6	1.9	32.9	2.3	33.9	2.6	35.9	2.7	37.6	2.1	37.1	2.6
Hand Length	M	113.6	5.7	124.8	5.8	133.9	8.9	142.7	6.9	157.3	9.3	171.9	11.2	182.8	9.9	184.3	9.9
	US	117.0	5.7	128.7	8.9	138.2	5.9	150.9	7.0	159.4	9.1	177.5	9.2	187.7	7.7	186.4	9.3
Hand Width	M	55.6	2.5	58.3	3.0	62.7	3.3	66.7	2.9	72.2	4.4	77.7	6.0	84.1	4.4	87.4	5.1
	US	55.3	1.0	61.0	2.9	65.0	3.2	71.4	3.4	73.5	4.4	82.9	6.0	88.9	3.9	89.1	4.7
Ear Height	M	54.5	3.9	56.0	3.8	58.2	2.7	59.1	2.5	60.6	4.0	61.9	3.3	62.8	3.1	64.4	3.5
	US	55.0	2.8	57.3	3.8	57.1	2.8	60.6	3.0	61.0	3.2	62.4	3.6	64.9	4.7	64.3	4.5
Ear Width	M	34.9	1.8	34.3	2.1	33.9	2.5	34.4	1.7	35.6	2.0	35.1	2.7	35.7	2.1	35.3	2.1
	US	32.7	1.6	34.4	2.2	34.4	1.6	34.8	2.4	35.3	2.4	35.2	1.9	36.3	2.9	35.1	2.1
Cephalic I.	M	82.3	5.9	81.8	4.3	80.1	4.0	81.0	3.5	79.8	3.9	79.7	3.9	79.4	3.5	78.3	3.4
	US	78.0	3.3	80.6	3.0	80.6	3.4	79.4	3.7	81.0	3.9	78.9	3.0	79.3	3.6	80.3	3.5
Nose Index	M	72.9	6.6	71.0	6.8	71.2	4.7	70.4	4.8	70.0	5.5	70.1	5.4	69.1	6.2	68.8	4.8
	US	72.6	3.1	73.6	6.7	70.4	5.8	69.9	6.2	69.7	5.8	70.7	6.4	70.1	6.0	68.6	6.5
Ear Index	M	64.4	6.9	61.4	3.8	58.4	3.6	58.2	3.3	58.8	3.4	56.7	4.3	56.9	4.0	55.0	4.2
	US	59.5	3.0	60.1	4.2	60.4	3.4	57.5	3.7	57.9	4.6	56.5	2.8	56.1	3.8	54.8	3.8
Surface I.	M	0.66	0.06	0.76	0.05	0.90	0.09	1.00	0.08	1.18	0.13	1.37	0.14	1.53	0.11	1.59	0.11
	US	0.69	0.05	0.79	0.08	0.91	0.05	1.07	0.10	1.17	0.11	1.41	0.16	1.61	0.13	1.65	0.12
Wgt/Surface I.	M	25.2	1.2	25.6	1.2	27.0	1.3	28.1	1.8	29.9	2.2	31.4	2.3	33.6	1.7	34.6	1.7
	US	25.6	1.5	26.0	0.8	26.5	1.2	28.6	1.8	29.1	1.7	31.7	2.3	34.2	2.5	35.4	2.4

* All diameters except weight (kgs.) and indices.

APPENDIX

TABLE 3. *Mean dimensions (mm.)* of children of Mexican parentage in Mexico (M) and in Texas (US), by age: Females*

Trait and country		4 + 5		6 + 7		8 + 9		10 + 11		12 + 13		14 + 15		16 + 17		18–20	
		$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.
Weight	M	16.5	1.3	19.4	3.0	23.2	3.5	29.2	4.9	35.1	7.5	43.6	6.4	46.8	6.1	48.5	6.5
	US	16.6	2.1	19.4	2.4	22.5	3.7	27.5	3.5	37.8	7.6	46.8	7.6	48.9	6.6	51.1	9.6
Stature	M	993.0	52.9	1 082.1	54.5	1 182.0	67.3	1 315.6	61.7	1 400.0	71.2	1 486.1	40.3	1 532.8	57.2	1 523.2	60.1
	US	991.7	51.5	1 091.1	45.3	1 193.5	79.2	1 305.5	64.5	1 437.5	65.9	1 524.2	50.5	1 551.3	53.7	1 535.5	59.5
Head Length	M	165.5	4.0	166.2	6.0	167.7	4.6	173.9	4.6	175.5	5.3	175.3	6.1	178.8	4.6	177.5	6.5
	US	165.5	7.0	167.2	6.4	170.4	6.4	173.2	5.6	175.7	6.6	179.5	6.4	179.6	5.7	179.6	4.9
Head Width	M	133.6	4.0	136.4	5.2	137.6	4.0	138.8	4.8	139.7	4.8	141.6	4.4	143.8	5.0	142.7	5.8
	US	135.9	4.3	137.9	4.1	137.5	5.5	138.4	4.7	142.1	4.8	142.8	4.0	144.4	4.3	143.9	4.4
Min. Frontal D.	M	90.4	2.1	92.6	3.0	93.8	3.4	95.4	3.4	96.3	3.2	97.1	4.5	97.4	3.9	98.6	4.3
	US	91.9	2.6	93.5	2.9	93.9	3.9	95.8	2.2	97.8	3.4	99.1	4.5	99.8	3.8	99.2	3.8
Menton Crinion	M	140.7	6.1	144.9	9.7	150.1	8.9	159.2	8.1	160.3	6.3	167.5	6.7	167.8	7.9	169.1	8.4
	US	140.0	11.1	146.9	5.9	151.7	8.3	155.7	7.9	164.3	8.9	168.1	7.5	172.7	8.8	169.0	9.6
Menton Nasion	M	87.7	2.5	94.8	6.7	99.1	5.4	104.7	4.5	107.3	5.9	111.9	5.0	111.8	5.0	112.9	5.4
	US	91.7	3.7	95.6	2.4	100.4	5.1	103.6	4.7	109.2	5.6	112.3	5.0	114.7	5.7	113.1	6.3
Max. Bizy. Dia.	M	108.5	1.4	112.0	4.0	116.1	4.6	119.7	3.1	121.1	4.6	126.8	5.5	127.4	5.1	128.5	4.8
	US	111.2	4.0	115.1	3.8	117.2	5.3	120.0	3.0	125.0	2.9	129.0	5.0	129.4	5.1	129.2	3.9
Bigonial Dia.	M	73.2	3.6	79.6	3.8	81.0	3.5	85.0	3.6	87.6	4.0	89.7	3.6	89.0	4.9	91.4	4.1
	US	80.3	3.6	81.9	4.5	84.9	4.0	86.2	5.1	89.3	3.7	93.4	5.9	94.0	5.1	92.7	5.0
Nose Height	M	36.7	2.5	41.0	4.5	43.8	3.3	47.0	2.9	47.6	3.3	50.0	2.5	50.7	3.3	50.8	3.4
	US	40.8	1.3	41.4	2.3	43.9	2.7	45.4	3.1	48.7	3.1	49.7	3.7	50.6	2.8	50.6	3.0
Nose Width	M	27.2	0.5	28.9	1.3	30.3	2.3	31.4	2.0	33.0	2.4	34.1	1.8	33.8	2.3	34.1	2.3
	US	27.7	1.7	29.9	2.5	31.9	2.6	31.5	1.9	33.8	2.4	35.0	2.2	34.6	2.4	34.8	2.5
Hand Length	M	113.2	5.1	121.4	8.2	132.4	8.4	148.3	7.4	155.3	9.6	166.3	6.2	169.4	8.7	168.7	9.0
	US	112.1	8.2	124.2	7.0	135.9	10.0	148.6	9.7	163.5	7.7	171.1	8.4	172.9	8.5	171.2	8.3
Hand Width	M	53.5	3.1	56.8	2.9	60.7	3.2	67.0	4.0	69.8	5.4	73.7	4.3	74.6	4.2	76.0	4.1
	US	54.7	2.6	58.1	2.5	61.5	4.0	66.5	3.4	73.6	4.4	77.6	3.9	76.9	3.8	77.4	4.5
Ear Height	M	51.7	2.5	53.3	3.0	54.1	2.8	57.5	2.3	57.6	3.6	59.5	3.0	59.4	2.9	60.7	3.2
	US	53.3	1.5	55.4	2.9	56.5	2.1	57.1	3.2	59.2	2.8	61.3	3.6	61.6	3.6	60.6	3.1
Ear Width	M	33.0	1.0	32.0	2.1	31.9	1.9	33.1	1.7	32.5	2.1	32.8	2.2	33.3	1.9	33.6	2.0
	US	34.0	2.0	32.3	2.0	34.1	2.3	33.4	2.1	34.3	2.2	33.5	2.1	33.4	2.0	33.4	2.4
Cephalic I.	M	80.8	3.6	82.1	3.9	82.1	3.0	79.9	4.1	79.7	3.5	80.9	3.5	80.4	3.5	80.5	3.9
	US	82.2	4.0	82.4	2.9	80.8	3.7	80.0	4.1	80.9	3.3	79.6	3.2	80.5	3.2	80.2	3.0
Nose Index	M	74.3	3.9	71.1	7.4	69.3	5.3	67.1	5.4	69.7	7.2	68.3	4.0	66.9	6.2	67.4	5.8
	US	68.5	3.1	72.5	7.6	72.7	6.0	69.6	6.2	69.7	7.1	70.9	6.9	68.6	6.6	69.0	6.4
Ear Index	M	63.9	2.4	60.1	3.5	58.7	3.7	57.6	3.4	56.4	3.7	55.2	4.4	56.0	3.3	55.5	3.7
	US	63.9	4.9	58.3	3.2	60.4	4.2	58.6	4.3	58.0	3.4	54.8	3.5	54.2	3.7	55.0	3.7
Surface I.	M	0.66	0.04	0.75	0.07	0.87	0.09	1.03	0.10	1.17	0.14	1.34	0.10	1.4	0.10	1.4	0.10
	US	0.66	0.06	0.76	0.06	0.86	0.10	1.00	0.09	1.23	0.14	1.41	0.11	1.45	0.10	1.46	0.13
Wgt/Surface I.	M	24.9	0.9	25.6	1.6	26.5	1.6	28.1	1.8	29.7	2.6	32.4	2.3	33.0	2.3	34.0	2.2
	US	24.9	1.0	25.5	1.3	25.9	1.4	27.3	1.3	30.5	2.7	33.1	2.8	33.6	2.5	34.6	3.4

* All diameters except weight (kgs.) and indices.

Hand length and width. The hand tends to be larger in migrants than in sedentes in the several age groups, and in both sexes. In males, hand length appears to be smaller in the old age group, in sedentes and migrants; hand width remains about the same in the several age groups in sedentes and migrants. In migrant women hand length remains about the same in the several age groups but increases slightly with age in the sedentes. The reverse appears in width of hand, a definite increase with age in the migrants but little or no change in the sedentes.

Ear height and width. The ear tends to be larger in the migrants than in sedentes, males and females. In both height and width, the ear tends to increase in mean size with an advance in age, in sedentes and migrants, males and females.

Cephalic index. The cephalic index remains more or less constant in all the age groups of sedentes and migrants, and in each sex, ranging between 79.5—81.8 in the males and 80.0—81.6 in the females.

Nose index. Little or no difference in the index is perceived between sedentes and migrants. In sedentes and migrants, males and females, the index tends to increase slightly with age, that is, for the nose to become relatively broader.

Ear index. The index is about the same in sedentes and migrants. The ear apparently becomes relatively longer in the older age groups, in both sexes and in sedentes and migrants.

Weight/Surface area ratio. In each sex the index is somewhat greater in the migrants than in sedentes. The index is higher in the older age groups, that is, more weight per surface area, in both sedentes and migrants, and in both sexes.

Girls vs Boys

The children of Mexican parents in Mexico and in the U.S.A. were combined by sex and age and their growth curves, absolute and in velocity, are portrayed in *Figs. 3a-f.* The results are:

Body weight (*Fig. 3a*).Girls tend to be heavier than boys until about age 15 when the boys begin to be heavier. The velocity curves manifest overlapping

APPENDIX

TABLE 4. *Age trends in mean dimensions (mm)* of Mexican adults in Mexico (sedentes) and in the US (migrants): Males*

Age group / Trait and country		21—30 $\bar{X}$	21—30 S. D.	31—40 $\bar{X}$	31—40 S. D.	41—50 $\bar{X}$	41—50 S. D.	51—60 $\bar{X}$	51—60 S. D.	61—70 $\bar{X}$	61—70 S. D.
Weight	M	57.1	5.4	61.5	7.1	65.8	9.3	62.7	10.5	64.5	8.4
	US	62.3	9.5	73.6	13.3	66.7	12.4	67.3	13.3	64.0	11.7
Stature	M	1 646.3	63.8	1 640.5	51.9	1 634.8	71.5	1 611.2	56.1	1 603.7	57.7
	US	1 665.2	59.1	1 673.5	34.2	1 637.7	59.6	1 633.8	55.4	1 619.8	55.9
Head Length	M	188.3	6.9	189.3	6.6	189.4	6.3	186.8	6.1	187.8	5.6
	US	188.9	6.3	189.1	4.9	188.8	6.4	188.0	6.1	188.1	6.0
Head Width	M	149.5	5.4	150.0	4.7	151.0	6.0	149.3	5.9	149.9	5.1
	US	150.1	5.0	154.7	5.6	151.2	5.0	152.9	5.6	150.3	6.0
Min. Frontal Dia.	M	102.1	4.4	101.8	5.2	103.0	5.1	101.6	5.7	103.3	3.6
	US	102.8	4.2	105.0	4.8	103.2	4.8	104.0	4.6	103.5	3.9
Menton Crinion	M	183.1	10.2	183.2	9.4	181.4	10.4	181.9	10.2	186.0	9.4
	US	184.6	8.9	187.2	6.9	184.5	10.7	183.0	9.5	184.1	8.2
Menton Nasion	M	121.5	6.2	124.9	5.8	122.0	7.2	123.2	6.7	125.1	7.7
	US	124.2	6.4	125.1	5.2	125.5	6.0	123.1	7.1	124.7	7.9
Max. Bizy. Dia.	M	137.7	5.3	138.8	3.8	139.1	6.2	139.0	5.4	140.9	4.4
	US	138.8	5.1	142.7	4.2	139.8	5.2	141.2	5.5	141.1	4.8
Bigonial Dia.	M	99.3	5.5	98.8	6.2	100.5	6.6	98.9	5.0	101.2	6.4
	US	101.7	6.2	105.8	5.8	101.1	6.7	102.7	6.4	105.2	6.5
Nose Height	M	54.7	3.3	55.8	3.2	55.3	4.2	56.9	3.5	57.3	3.2
	US	55.6	3.5	55.7	3.4	55.7	3.0	56.0	3.4	56.5	3.8
Nose Width	M	38.0	2.2	38.9	3.6	38.9	3.1	40.4	3.2	40.9	2.2
	US	37.8	2.5	38.9	2.3	39.9	3.5	40.2	3.4	40.1	3.1
Hand Length	M	185.0	9.9	185.6	8.4	183.5	7.8	184.0	8.2	181.2	8.8
	US	187.5	8.8	188.6	7.1	183.7	9.2	183.6	8.2	182.5	7.2
Hand Width	M	87.3	5.0	89.3	4.5	88.0	4.1	89.3	5.9	88.0	2.8
	US	90.7	4.5	95.4	4.4	91.5	5.0	90.7	4.4	90.1	4.4
Ear Height	M	64.1	4.2	66.1	3.1	68.4	4.1	69.2	4.6	72.5	4.0
	US	65.2	3.1	67.8	4.4	69.1	4.3	70.3	4.2	73.6	4.9
Ear Width	M	35.7	2.7	36.1	2.1	37.4	2.4	38.5	2.8	39.3	3.5
	US	36.5	2.6	37.6	2.5	37.8	2.6	37.4	2.9	38.4	3.0
Cephalic I.	M	79.5	4.3	79.4	3.4	79.7	3.2	80.1	3.7	79.9	3.2
	US	79.5	3.3	81.8	2.8	80.1	3.2	81.4	3.9	80.0	3.3
Nose Index	M	69.7	5.3	69.9	7.3	70.7	7.2	71.2	7.2	71.7	6.3
	US	68.2	6.3	70.0	5.1	71.8	6.8	72.1	7.4	71.3	6.7
Ear Index	M	55.8	4.1	54.7	3.4	54.8	4.1	55.8	3.4	54.2	4.2
	US	56.1	3.7	55.5	4.1	54.9	3.9	53.3	4.5	52.5	4.3
Surface I.	M	1.62	0.10	1.66	0.10	1.71	0.13	1.66	0.14	1.67	0.11
	US	1.69	0.14	1.82	0.15	1.72	0.16	1.72	0.16	1.68	0.15
Wgt/Surface I.	M	35.2	1.62	36.8	2.47	38.3	2.78	37.6	3.35	38.4	2.86
	US	36.6	2.7	40.1	4.0	38.5	3.7	38.7	4.2	37.9	3.5

* *All diameters except weight (kgs.) and indices.*

normal distributions with a peak in the girls at age 13 and in the boys at age 15.

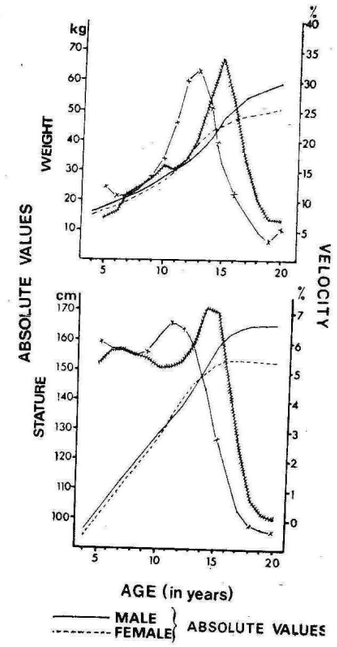
Stature (*Fig. 3a*). Absolute growth in time appears similar in boys and girls to age 14 when the boys overtake the girls. The curves are longitudinal in type with the girls peaking at age 11, the boys at ages 14 and 15.

Body surface area (*Fig. 3a*). Here too the absolute growth curves are alike to about age 14 when the girls begin to exceed the boys. In velocity, the curves are approximately normal distributions, peaking at age 14 in the girls, age 16 in the boys.

Weight/Body surface area ratio (*Fig. 3a*). A crossing-over of the curves of boys and girls occurs at several ages. A roughly normal distribution is noted in both girls and boys in velocity of "growth", with a peak at age 15 in boys, at age 13 in the girls.

Head length (*Fig. 3b*). The curve of absolute growth is sharply divergent in boys and girls, especially beginning at age 12 when the boys manifest more rapid growth. In velocity also the curves differ, tending to bimodality, peaking at ages 5 and 10 in the girls, 8 and 15 in the boys.

Head width (*Fig. 3b*). The absolute growth curve of girls parallels that of the boys until age 17 when it levels off whereas that of the boys continues.



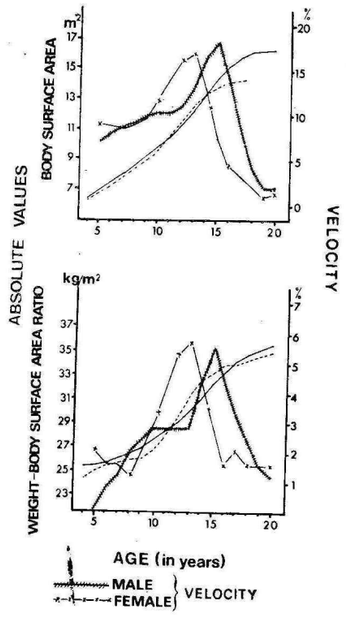


FIGURE 3a *Comparison of mean annual growth, absolute and in velocity, of sons and daughters aged 4—20 of Mexican parents (sedentes and migrants combined): Weight, stature, body surface area, weight body surface area ratio.*

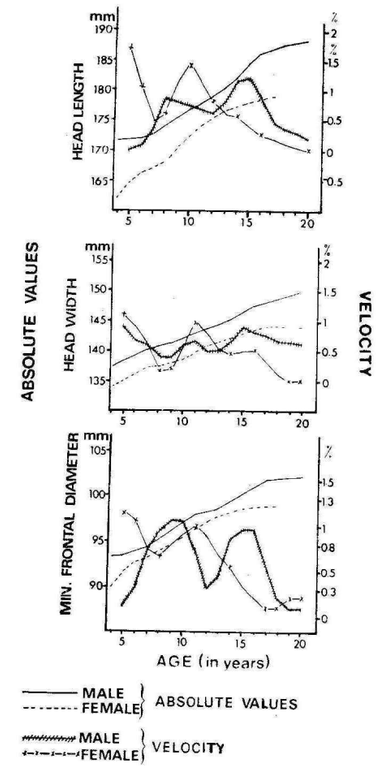


FIGURE 3b *Same: Head length, width, minimum frontal.*

Percentage increment or velocity is highest at ages 5 and 11 in the girls, ages 5 and 15 in the boys.

Minimum frontal (*Fig. 3b*). Girls parallel the boys in absolute growth to about age 14 when the growth in the latter accelerates. In velocity, the curves appear bimodal, peaking at about ages 7 and 15 in the boys and ages 5 and 11 in the girls.

Bizygomatic (*Fig. 3c*). Growth in boys and girls is parallel to about age 15 when a spurt in face width occurs in the boys. The velocity curves are roughly longitudinal in type, with a maximum at age 15 in the boys and ages 5 and 13 in the girls.

Bigonial (*Fig. 3c*). The bigonial growth curves appear similar to those in the bizygomatic, namely, boys and girls parallel to age 14 when growth accelerates in the boys. In velocity the curves are roughly bimodal, the boys peaking at ages 7—8 and 15, the girls at ages 5 and 11, with some upturn in the curves at age 20.

Menton-crinion (*Fig. 3c*). Absolute growth is parallel in boys and girls to age 13 when acceleration occurs in the boys; the curve in the girls levels off at about age 16, whereas it continues in the boys. In velocity the boys manifest a bimodal curve with peaks at 7—8 and 15; the maximum in the girls is at ages 10—13.

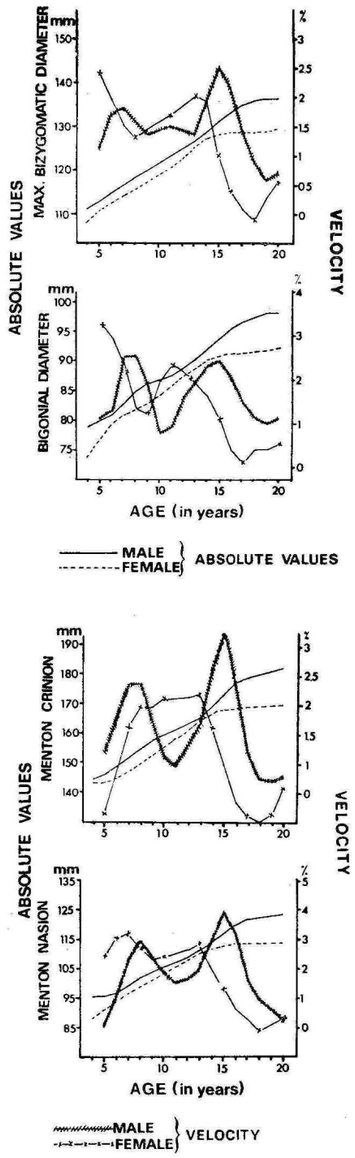


FIGURE 3c *Same: Bizygomatic and bigonial diameters, menton-crinion, menton-nasion.*

Menton-nasion (*Fig. 3c*). The pattern of absolute growth here is similar to that of menton-crinion, except that acceleration occurs at age 14 in the boys. Here too the velocity curve of the boys is bimodal peaking at ages 8 and 15; the curve of the girls is roughly longitudinal in shape with a peak at age 13.

Nose height (*Fig. 3d*). The absolute growth curves in boys and girls are much the same to about age 14 when acceleration occurs in the boys; a leveling off is noted in the girls at age 16. In velocity the curve is more or less flat in the boys to about age 14 when some acceleration occurs followed by a decline; the girls manifest a peak at age 5 and relatively diminishing increment thereafter.

Nose width (*Fig. 3d*). The growth curves of boys and girls are virtually alike to age 13 when acceleration occurs in the boys; leveling off of growth appears at age 14 in the girls, at age 16 in the boys. Velocity-wise, the curve is bimodal in the girls, peaking at ages 7 and 12; in the boys the peak is at age 15.

Ear height (*Fig. 3d*). Absolute growth is more or less parallel in boys and girls to age 14 when acceleration occurs in the boys; leveling off of growth is noted at age 14 in the girls, age 16 in the boys. In velocity the boys manifest a roughly trimodal curve, with peaks

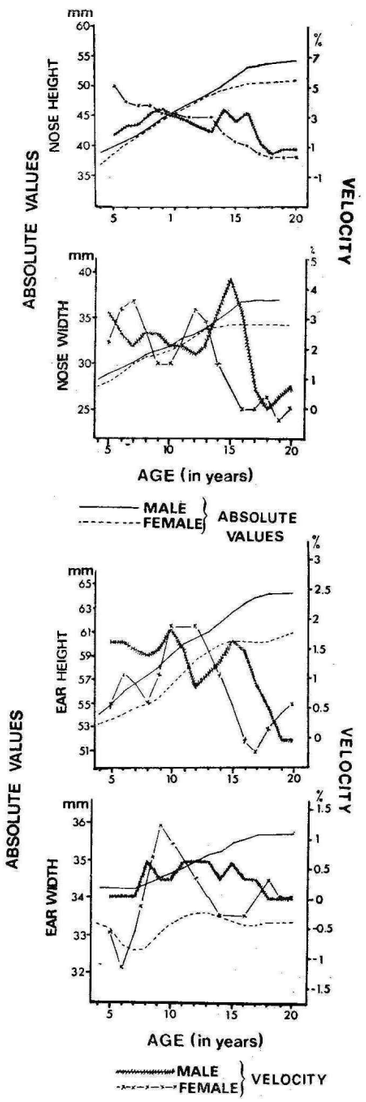


FIGURE 3d *Same: Nose height, width, ear height, width.*

APPENDIX

TABLE 5. *Age trends in mean dimensions (mm)* of Mexican adults in Mexico (sedentes) and in the US (migrants): Females*

Age group		21—30		31—40		41—50		51—60		61—70	
Trait and country		$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.	$\bar{X}$	S. D.
Weight	M	52.0	8.5	53.7	9.8	58.8	12.2	60.3	12.6	57.2	5.9
	US	53.9	10.3	59.1	11.8	64.7	13.2	64.0	12.7	63.2	10.2
Stature	M	1 520.6	52.7	1 509.2	50.7	1 505.8	47.3	1 501.2	52.9	1 466.9	56.1
	US	1 534.6	61.0	1 514.2	49.9	1 505.1	49.0	1 506.4	51.3	1 487.9	40.5
Head Length	M	178.9	5.6	178.9	5.1	179.4	6.2	179.9	5.2	177.3	4.6
	US	179.2	5.5	178.0	6.9	180.7	6.0	181.7	7.2	180.3	4.6
Head Width	M	143.0	4.7	143.9	3.4	144.2	4.7	145.5	5.2	144.5	5.7
	US	144.7	5.4	145.0	4.1	145.2	5.0	146.7	5.0	146.3	4.8
Min. Frontal Dia.	M	98.9	3.6	98.3	3.7	98.9	4.3	98.5	3.5	99.5	1.6
	US	99.9	4.1	99.5	4.2	100.5	4.0	101.5	4.4	100.3	4.1
Menton Crinion	M	173.8	8.5	173.0	8.4	175.8	8.3	176.5	8.2	167.7	12.5
	US	170.0	8.4	169.7	7.4	172.9	9.0	174.8	8.7	169.2	9.9
Menton Nasion	M	115.4	6.1	115.3	5.7	116.7	5.0	113.8	6.4	112.0	7.5
	US	114.8	5.5	113.5	5.2	114.8	5.5	116.3	5.3	113.2	4.3
Max. Bizy. Dia.	M	130.0	4.4	129.9	4.6	131.0	5.1	132.2	4.9	132.3	5.3
	US	131.2	4.8	131.2	4.4	132.7	4.8	134.4	5.9	140.0	5.3
Bigonial Dia.	M	92.0	4.0	90.6	4.9	93.3	5.2	93.5	5.4	93.8	4.5
	US	94.1	4.7	93.6	4.8	96.2	5.0	97.1	5.0	99.0	4.0
Nose Height	M	52.1	3.4	52.1	4.2	52.0	2.7	51.5	3.2	52.2	3.7
	US	51.2	3.2	50.9	2.7	51.5	3.2	52.9	3.5	53.7	3.3
Nose Width	M	34.0	2.7	35.0	2.1	35.3	2.5	36.2	3.3	38.0	1.7
	US	34.6	2.5	34.8	2.8	36.3	2.6	37.1	3.0	38.1	2.7
Hand Length	M	168.3	7.4	168.1	7.3	169.1	7.9	170.3	8.1	171.4	6.1
	US	170.5	8.2	170.6	8.0	169.7	8.5	171.7	8.7	171.4	9.8
Hand Width	M	76.8	3.9	77.0	3.5	78.8	3.8	78.7	3.8	78.2	5.0
	US	78.5	4.5	79.4	4.7	80.6	4.1	81.3	4.0	84.6	3.4
Ear Height	M	60.5	3.3	62.2	2.9	64.0	3.8	64.9	3.9	67.3	4.3
	US	61.6	3.7	61.7	3.3	64.4	3.7	67.0	3.6	68.7	5.5
Ear Width	M	33.2	1.7	33.4	2.3	35.2	2.3	35.5	2.5	35.4	2.4
	US	33.8	2.5	33.7	2.7	35.7	2.7	36.2	2.4	37.1	3.2
Cephalic I.	M	80.0	3.0	80.3	3.2	80.4	3.5	81.0	3.4	81.6	4.3
	US	80.8	3.1	81.6	4.0	80.5	3.5	80.8	3.7	81.2	2.7
Nose Index	M	65.4	5.5	67.6	6.8	68.1	6.3	71.0	8.5	73.1	5.7
	US	67.7	5.7	68.7	8.1	70.9	6.9	70.4	6.9	71.3	7.7
Ear Index	M	54.9	3.7	53.8	3.6	55.1	3.6	54.8	3.7	53.0	4.4
	US	55.0	3.7	54.6	4.0	55.6	4.1	54.1	4.7	54.1	2.9
Surface I.	M	1.47	0.12	1.48	0.12	1.53	0.15	1.55	0.16	1.49	0.10
	US	1.50	0.13	1.54	0.14	1.59	0.15	1.59	0.14	1.57	0.12
Wgt/Surface I.	M	35.3	2.99	36.1	3.65	38.0	4.19	38.6	4.30	38.3	1.79
	US	35.7	3.75	38.0	4.49	40.2	4.59	39.9	4.54	40.1	3.85

* *All diameters except weight (kgs.) and indices.*

at ages 5—6, 10 and 15; the curve of the girls is roughly normal in distribution with a peak at ages 9—11.

Ear width (*Fig. 3d*). Absolute growth in the boys appears in the shape of a flattish S, leveling off at age 7; in the girls also it is a flattish, inverted S. The velocity curve of the boys is erratic, nearly flat, but is much different in the girls, the latter peaking at age 9.

Hand length (*Fig. 3e*). The growth curves of boys and girls are almost identical to age 14 when the boys accelerate. In both girls and boys the curve is roughly longitudinal in terms of velocity, both peaking at age 5 with another peak at ages 14—15 in the boys.

Hand width (*Fig. 3e*). The growth pattern of hand width is similar to that of hand length, except that leveling off occurs at age 13 in the girls, and about age 18 in the boys. Incremental growth is apparently relatively stable in the boys to age 12 when it begins to increase and reaches a peak at age 15; in the girls peaking is at ages 5 and 11—12.

Cephalic index (*Fig. 3f*). Interestingly, the cephalic index apparently remains virtually the same between ages 4 and 20 in the girls whereas in the boys there is a peak at age 4 and steady diminution thereafter to about age 17. In velocity the curves of boys and girls cross at several ages.

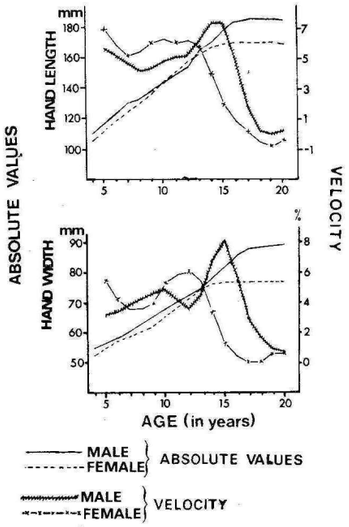


FIGURE 3e *Same: Hand length and width.*

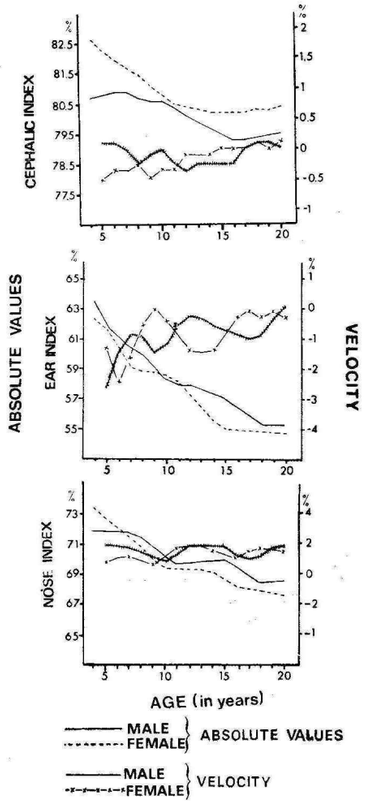


FIGURE 3f *Same: Indices: Cephalic, nose, and ear.*

Nose index (*Fig. 3f*). The nasal index is much the same in boys and girls, declining between ages 4 and 20. As in cephalic index, the velocity curves are flattish and criss-cross.

Ear index (*Fig. 3f*). The index in both girls and boys steadily declines between age 4 and 20. In velocity "growth" is generally negative, the curves of boys and girls criss-crossing.

DISCUSSION

Malina et al. (1982) have provided a thorough review of the published literature on the status of anthropometric traits of migrants relative to sedentes, the population from which the former came. As they observe, Shapiro (1939) and Illsley et al. (1963) suggested selection in the migrants on the basis of their studies on Japanese migrants to Hawaii, and for internal migrants in the United Kingdom, respectively. Hulse (1981), also gives an extensive review of the subject himself having found differences in size between migrants and sedentes in internal migration in Ireland, but attributes them to differences in occupation between these groups. In contrast, little or no significant physical differences between migrants and sedentes were found in a study of Italian Swiss (Hulse, 1968) and in a study of Mexicans (Goldstein, 1943). In further studies of Mexicans, Lasker (1952, 1954) and Lasker and Evans (1961) noted differences in anthropometric traits between sedentes and migrants to the U.S. but found age at the time of migration a highly significant factor in their results, namely, the younger the age at migration the greater the impact of the new and improved environment.

Our present study, comparing a number of physical traits of adult Mexican sedentes and migrants by one-way variance, it will be recalled, indicated significant differences in some of the traits (body weight, body surface area, and widths of head, face, and hand). However, that these differences are or were a reflection of physical selection prior to migration, seems to us dubious. Most of the Mexican migrants in our study came or were brought to the U.S.A. at an early age: at ages 4—19, males, 37 %, females, 51 %; at ages 20—24, males, 20 %, females, 23 % (Goldstein, 1943, p. 24). As previously noted, Lasker (1952, also 1953) clearly demonstrated that Mexican migrants who came to the U.S. before age 27 were significantly larger than migrants who were older at the time of their migration, attributing the differences to environmental factors which were especially important during the years before closure of epiphyses. This explanation would seem in large measure to fit the results of our study. Yet there may well have been selection in migrants from Mexico to the U.S. in terms of health status, that is, a sickly person presumably would not seek to undergo the stress of migration, or indeed, if seriously ill or physically handicapped, probably would have been barred from legally entering the country by immigration authorities. Of relevant interest in this connection is the observation of Lasker (1954, p. 57) on migrants from Paracho Mexico, to the U.S.:

> There is selection for age and past migration and probably for knowledge of English, past occupation, and individual skills. There is also an economic selection at least to the extent of means to reach the community where the (labor) contracts are made, and frequently to pay bribes to get an interview with the proper authorities. With adequate means to do so, a few men who had been rejected were able to go to the United States on their own (either legally or as "wetbacks"). These factors so override in importance whatever consideration of physique might otherwise influence the choice of workers by the U.S. agents (of labor employment) that—with possibly the exception of hand breadth—no evidence of physical selection was found.

Our adult data, it will be recalled, are analyzed with regard to age, the total number of individuals divided by 10 year age intervals in sedentes and migrants in each sex. Lasker (1953) also considered the age factor on physical traits in adult Mexicans but in sedentes only. (The Goldstein (1943) data on sedentes were used for comparisons by Dr. Lasker. Slight differences occur between the computed averages in his report and our study. The Goldstein metric data on nuclear families included measurements on relatives (e.g. grandmother, nephew, etc.) in a number of instances, and these as well as persons over age 70, excluded by us, may have been included in the Lasker study and account for the minor discrepancies in the averages). The age trends in our study, with a few exceptions (e.g. head length of the females increases with age in the Lasker data, remaining virtually stable in our data), appear similar in the Lasker study and our own albeit average dimensions differ for the same trait in several instances. The latter may be due to differences in samples and/or difficulties in locating some landmarks in the living (e.g. nasion).

A full discussion of the various explanations for changes with age in anthropometric traits of adults is given in Lasker (1952) and need not be repeated except perhaps to note his observation that similar changes with age have been reported for various groups in different parts of the world, and that actual changes in many physical traits do occur with an advance in age. Hence the age distribution, even in an adult population sample, must be a consideration in studies of anthropometric traits.

As for the children of Mexican sedentes and migrants, aged 4—20 years, generally similar patterns of growth were observed in most of the physical traits considered. Yet a clear tendency for larger size in the children of migrant parents was discerned in many of the traits, especially beginning at about the ages of puberty. These differences, it will be recalled, in many instances were statistically significant when age was held constant in a one-way analysis of variance (*table 1*). To be sure, in some of the the traits the growth curves (mean diameters) came close or met at age 20 in both groups of children (e.g. stature, head length, nose height, hand length).

In regard to differences in growth patterns between boys and girls, as expected the latter manifested earlier development in most of the traits in terms of age at maximum increment (*Figs. 1—3*).

Malina et al. (1982) considered the question of selection in *internal* migration of *children* aged 6 to 15 from a rural Zapotec speaking community in southern Mexico to Mexico City in 1968. Comparisons were made in physical traits between the migrant children and the children of the same age and sex who had not migrated (sedentes). The children were subsequently re-examined in 1978 when the group ranged in age between 16 and 25. No significant differences were found in age and in 23 anthropometric traits between the sedentes and migrants although the deviations from a "grand mean for each variable adjusted for age variation" tended to be larger in size in the migrants for most of the measurements. The authors, however, considered their results indicated "no apparent selection for physical characteristics at these young ages" (p. 714).

Our data on children of Mexican parents in Mexico and in the U.S. would seem not strictly comparable with those based on "internal" migration of children, although the results appear to be similar, namely, a tendency for larger size in migrant parents and their children than in sedentes. Generally better living conditions among the migrant parents in the U.S. which in turn contributed to better nutritional and health status of the children born and raised in the U.S., probably account for the tendency for the larger size among the latter at comparable ages.

Although not directly related to the question of selection in migrants, a perceptive study by Malina and Zavaleta (1980) on secular changes in growth of Mexican-American children in Texas between 1930 and 1972, is of pertinent interest. They found no or little evidence of a secular increase in stature or body weight to 10 years of age when a secular increase in average dimensions became apparent and which became larger with age until 12 years for stature and 14 years for weight in girls, and until 15 years of age for both stature and weight in boys. The largest secular differences, they note, were apparent during the pubertal years.

It may be recalled that our data on children of both sedentes and migrants also manifested a similar tendency of greater velocity in growth during the pubertal ages, not only in stature and weight but in other physical traits as well albeit the rate of growth tended to be more or less greater in the children of migrants than of sedentes. Malina and Zavaleta (1980) remark that the secular differences in body size attained at the pubertal periods may also reflect a trend toward earlier maturity (p. 456). Support for the latter contention seems to be the findings of Goldstein (1943, p. 27) that the mean age at menarche was earlier in the daughters of Mexican migrants than in the daughters of Mexican sedentes (12.62 years vs. 13.31 years).

Optimal growth and development, the full realization of the genetic potential, no doubt was not attained in our children of Mexican parents either in Mexico or in the U.S.A. The socioeconomic status of the Mexican families, as previously noted, was generally quite poor, and as has been abundantly demonstrated in the published literature, there is a pervasive

relationship between poor socioeconomic status and generally inadequate nutritional and poor health status in a group, a complex of factors especially affecting adversely the physical if not mental development of the children in the group (Malina and Zavaleta, 1980; Center for Disease Control, 1972; Goldstein, 1954; Krogman, 1972). Indeed growth studies would seem needed of children in families of middle and upper economic strata, in Mexico, and of children of second generation Mexican-American parents.

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