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ANTHROPOMETRICAL AND SKINFOLD THICKNESS MEASUREMENTS ON THE POLAR ESKIMOS, THULE DISTRICT, NORTH GREENLAND

BY

R. GILBERG, J. BALSLEV JØRGENSEN
AND WILLIAM S. LAUGHLIN

WITH 11 FIGURES AND 12 TABLES
IN THE TEXT

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Abstract

Anthropometrical observations on 122 Polar Eskimos from the Thule area, North Greenland are referred and analyzed. Pure Polar Eskimos are compared with hybrids from the Thule District and with corresponding figures from Wainwright Alaska.

The Wainwright Eskimos are taller and of heavier body build than the Polar Eskimos. In both places the hybrids are taller than the pure Eskimos. The body proportions are the same in all groups whereas the Wainwright Eskimos have definitely shorter heads than the Polar Eskimos.

Skinfold thickness measurements on the Polar Eskimos reveal, that in males the amount of subcutaneus fat, after childhood, remains fairly constant through life. In females, fat is accumulated up to the age of 20, after which time it slowly disappears again through the ages.

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Universitetets Anthropologiske
Laboratorium
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CONTENTS

INTRODUCTION

The importance of studying Eskimo physique and constitution has long been generally accepted. There are several reasons for this interest in Eskimos.

Firstly, they form a rather distinctive and isolated group from a genetical point of view.

Secondly, the isolated intra group populations are geographically separated by long distances and with onedimensional contact between the populations as a result of the longitudinal distribution along the arctic coast lines.

Thirdly, the Eskimos have, until the last century, been isolated, but have in the 20th century been subjected to a very rapid evolution, culturally and technically and also biologically, with rapidly increasing hybridization and great alterations in nutrition and medical care.

The Polar Eskimos in the Thule District in Northwest Greenland have attracted special attention in this connection, being the northernmost people of the world, and the most isolated.

From 1962 extensive research on the Polar Eskimos has been conducted, including demography, genealogy, anthropometry, genetics, odontology, physiology, etc.

In 1963 anthropometrical investigations were made by a Danish-American team in Qânâq. These investigations included skinfold thickness measurements.

In the following, first the general anthropometrical results of the adult population will be reported, and compared with a similar material from Wainwright, Alaska (Jamison & Zegura, 1970). Secondly, the skinfold measurements will be analyzed and compared with measurements for Augpilagtoq, Upernavik District, West Greenland.

ANTHROPOMETRICAL INVESTIGATIONS

The Material

The Thule material consists of measurements of 122 individuals, 67 males and 55 females of 21 or more years of age. The measurements were taken in accordance with the IBP/HA-proposals (WEINER, 1969).

The material was split up into two main groups: Pure Polar Eskimos and hybrids. Individuals with less than 50 per cent ancestors from outside the Thule district are considered pure, whereas people with 50 per cent or more extra-Thule ancestors are regarded as hybrids. It must be pointed out that the major part of the non-Thule ancestors are West Greenlanders and accordingly still at least partly Eskimos.

As it was evident from the start that there were differences between the age groups; the material was also divided into three age groups: adults (21–40 years), matures (41–60 years), and seniles (over 60 years), (table 1).

Table 1. *The material.*

		21–40 years	41–60 years	Over 60 years	Total
Male	Polar Eskimos.....	17	14	11	42
	Polar Eskimo hybrids.....	20	5	0	25
Female	Polar Eskimos.....	22	14	3	39
	Polar Eskimo hybrids.....	14	2	0	16

Body Measurements

The means for stature, sitting height and relative sitting height are given in table 2, and the relationship between the groups is further illustrated in fig. 1.

It appears from the table that variation between standard deviations is within reasonable limits, indicating similarity in variation between the single groups.

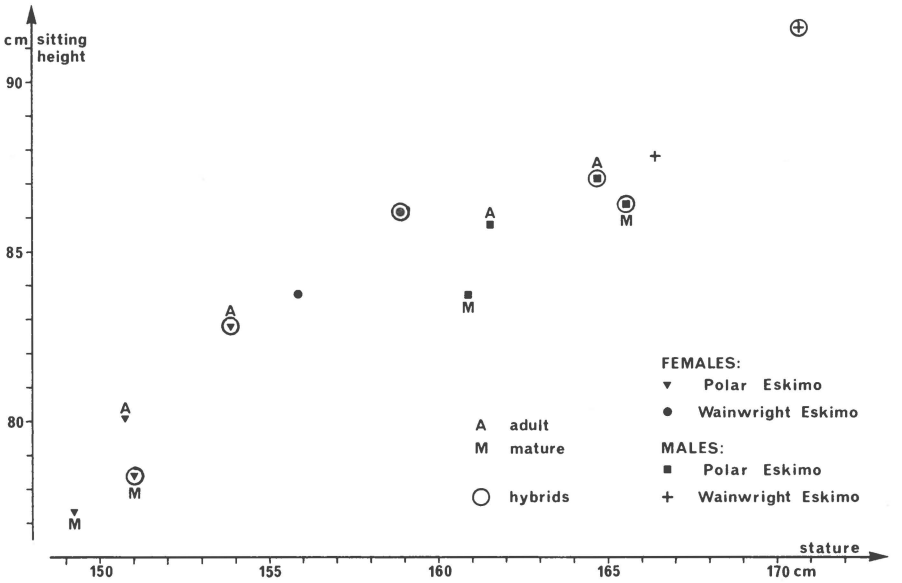

Fig. 1. Distribution of the means for stature and sitting height in Wainwright and Polar Eskimos.

As seen both in the table and the figure, the differences between the means of the groups arrange the means in a particularly regular pattern.

All Wainwright groups are taller than the Polar Eskimos and also have a higher sitting height.

Table 2. *Stature, sitting height and relative sitting height.*

	Stature			Sitting height			Rel. sitt. height		
	n	M	s	n	M	s	n	M	s
Males									
Thule pure ..... ad.	17	161,47	4,17	17	85,77	3,08	17	53,12	1,59
Thule pure .....mat.	14	160,89	5,24	14	83,75	3,33	14	52,09	2,35
Thule hybrid ..... ad.	20	164,73	5,76	20	87,18	2,92	20	59,94	1,17
Thule hybrid .....mat.	5	165,50	8,13	5	86,40	3,65	5	52,23	1,14
Wainwright pure.....	43	166,28	6,23	43	87,80	3,72	43	52,81	1,44
Wainwright hybrid....	8	170,73	4,99	8	91,64	3,56	8	53,57	1,17
Females									
Thule pure ..... ad.	20	150,80	3,52	21	80,17	3,47	20	53,08	1,80
Thule pure .....mat.	12	149,21	5,29	13	77,42	4,33	12	51,95	1,86
Thule hybrid ..... ad.	14	153,82	5,18	14	82,79	3,26	14	53,82	1,22
Thule hybrid .....mat.	2	151,0	–	2	78,25	–	2	51,83	–
Wainwright pure.....	37	155,78	6,01	36	83,73	4,71	–	–	–
Wainwright hybrid....	6	158,85	4,68	5	86,02	3,05	–	–	–

Both in Wainwright and Thule the hybrids have a higher stature than the pure Eskimos. With one exception the sitting heights show the same condition.

In Polar Eskimos, where a separation in age groups has been done, the means for the mature groups are lower, both concerning stature and sitting height, than the means for the adult groups. The only exception being between adult and mature male hybrids, where the mature group displays a higher stature than the adult.

Table 3. *Age variations in stature.*

		21–40 years	41–60 years	Over 60 years
Male	Polar Eskimos.....	161,5	160,9	155,5
	Polar Eskimo hybrids.....	164,7	165,5	–
Female	Polar Eskimos.....	150,8	149,2	142,5
	Polar Eskimo hybrids.....	153,8	151,0	–

In table 3, the statures for all three age groups are compared. Unfortunately, no old hybrids were measured.

It is seen that the statures decrease with increasing age in all groups, except the male hybrids. This may be the result of a "secular trend" towards higher statures.

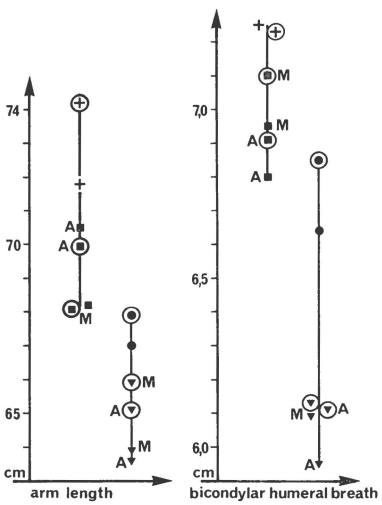

Fig. 2. Distribution of the means for arm length and bicondylar humeral breadth in Wainwright and Polar Eskimos.

The means for relative sitting height in the Polar Eskimos show clearly that only very small differences exist between the groups, except

that the adult hybrid male Polar Eskimos have a higher relative sitting height than all other groups. This close resemblance between the groups in body proportions appears also from figure 1. Why the young hybrid male Polar Eskimos have relatively shorter legs is not easy to explain.

The measurements for arm length and bicondylar humeral breadth are shown in table 4 and illustrated in fig. 2.

The means in the four Polar Eskimo groups lie very close together, and it would be too ambitious to analyze them further. In both measurements the Wainwright means are larger than the means of Polar Eskimos. In Wainwright the hybrids have longer and more powerful arms than the pure Eskimos.

Table 4. *Arm length and bicondylar humeral breadth.*

	Arm length						Bicondylar breadth					
	R			L			R			L		
	n	M	s	n	M	s	n	M	s	n	M	s
Males												
Thule pure ..... ad.	17	70,62	2,21	17	72,27	2,35	17	6,81	0,27	17	6,79	0,25
Thule pure .....mat.	14	68,25	2,45	13	68,08	2,61	14	6,95	0,24	14	6,94	0,21
Thule hybrid ..... ad.	20	70,00	3,77	20	69,72	3,37	20	6,88	0,41	20	6,94	0,47
Thule hybrid .....mat.	5	68,10	5,37	5	68,00	4,78	5	7,10	0,53	5	7,10	0,53
Wainwright pure.....	42	71,87	3,07	42	71,80	2,95	42	7,25	0,37	42	7,24	0,34
Wainwright hybrid	8	74,26	3,72	8	74,16	3,46	8	7,10	0,36	8	7,35	0,68
Females												
Thule pure ..... ad.	22	63,68	2,16	22	63,43	2,04	22	5,96	0,27	22	5,93	0,30
Thule pure .....mat.	14	63,82	2,69	13	63,73	2,16	14	6,09	0,19	14	6,08	0,26
Thule hybrid ..... ad.	14	65,43	3,19	14	64,71	3,46	14	6,14	0,23	13	6,08	0,33
Thule hybrid .....mat.	2	65,5	–	2	66,0	–	2	6,10	–	2	6,15	–
Wainwright pure.....	36	67,16	2,94	36	66,92	2,88	36	6,68	0,60	36	6,60	0,54
Wainwright hybrid.....	6	68,10	3,31	6	67,78	3,30	6	6,92	0,56	6	6,78	0,44

Circumferences

The means and standard deviations of the measurement of the upper arm, maximum forearm, and maximum calf circumferences appear from table 5, and the differences between the groups are further illustrated in fig. 3.

The standard deviations show a very high degree of similarity between the groups for all the measurements, indicating the same distribution for all groups—as would be expected.

A comparison from table 5 between right and left sides shows the interesting point that whereas there are no differences between right and left calf (in the two Wainwright groups), the left forearm is about 1 cm

Table 5. *Circumferences.*

	Mid. upperarm						Forearm						Calf					
	R			L			R			L			R			L		
	n	M	s	n	M	s	n	M	s	n	M	s	n	M	s	n	M	s
Males																		
Thule Eskimos .... ad.	17	27,94	1,64	17	27,68	1,96	17	27,00	1,08	17	26,12	0,99	17	34,35	1,31			
Thule Eskimos .... mat.	14	27,61	1,27	14	26,89	1,63	14	25,86	1,03	14	25,25	1,37	14	33,61	2,01			
Thule hybrids ..... ad.	20	28,93	2,12	20	28,37	2,56	20	27,35	1,73	20	26,35	1,82	20	34,85	2,65			
Thule hybrids ..... mat.	5	29,40	2,10	5	28,30	1,35	5	27,30	1,60	5	26,10	1,24	5	34,00	–			
Wainwright Eskimos	42	29,92	2,29	42	29,24	2,36	42	27,65	1,63	42	26,96	1,60	41	33,89	1,95	42	33,97	1,84
Wainwright hybrid.....	8	30,81	2,39	8	30,22	2,71	8	28,69	1,44	8	28,50	2,68	8	35,66	2,04	8	35,32	1,89
Females																		
Thule Eskimos .... ad.	22	25,61	2,23	22	24,75	2,29	22	22,89	1,09	22	22,32	1,43	21	32,69	2,07			
Thule Eskimos .... mat.	14	24,39	2,10	14	24,04	2,18	14	22,61	1,56	14	21,79	1,46	12	30,75	1,94			
Thule hybrids ..... ad.	14	26,43	2,57	14	25,75	2,94	14	23,25	0,96	14	22,57	1,05	14	31,75	2,93			
Thule hybrids ..... mat.	2	24,5	–	2	24,5	–	2	22,0	–	2	22,0	–	2	31,5	–			
Wainwright Eskimos	36	30,32	4,95	36	29,80	5,03	36	25,60	2,82	36	24,99	2,79	36	34,05	3,48	36	33,91	3,34
Wainwright hybrid	6	31,95	3,79	6	31,87	3,69	6	27,15	1,94	6	26,62	1,85	6	37,45	2,18	6	37,52	2,46

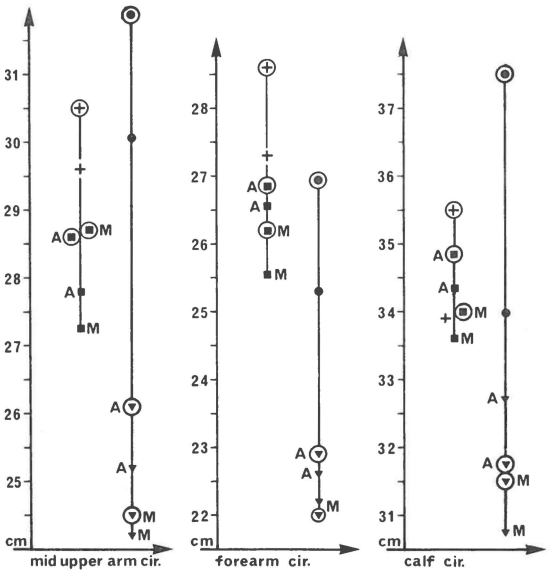

Fig. 3. Distribution of the means for circumferences in Wainwright and Polar Eskimos.

smaller in circumference than the right in all groups in both sexes. Right handedness and extensive use of the right arm is accordingly a dominant feature in both men and women, and in both pure Eskimos and hybrids as well in Greenland as in Alaska.

In fig. 3 the distributions of the circumferences are compared. Several interesting conditions appear. First the variation between the female groups are much greater than between the male groups. Secondly the Wainwright Eskimos, both pure and hybrids, have the highest means in all instances, except one. The calf circumference for the Wainwright pure Eskimo men is not larger than the circumference for the Polar Eskimo men. In general the Wainwright Eskimo appear to be of a heavier stock than the Polar Eskimos.

With only two exceptions the hybrids show higher and larger body build both in Alaska and in the Thule district of Greenland.

From this analysis of the measurements on the body, the following general conclusions may be drawn:

The Polar Eskimos are smaller than the Wainwright Eskimos, both in stature and stoutness. Accordingly, the differences in proportions are much smaller. This applies to both pure Eskimos and hybrids.

In Polar Eskimos—as well as in Wainwright—the hybrids show higher means than the pure Eskimos.

Finally, the stature of young Polar Eskimos is higher than the stature of middle aged, which again is higher than that of old people.

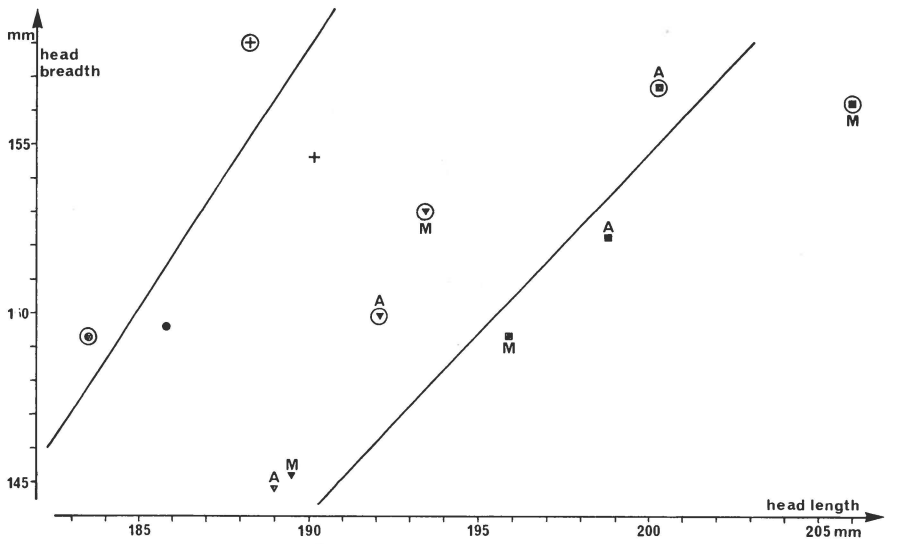

Fig. 4. Distribution of the means for head length and breadth in Wainwright and Polar Eskimos.

Measurements of the Head

Fig. 4 and table 6 show the relationship between means for head length and head breadth in the different materials. In fig. 4, which at first sight may look confusing, it is possible to separate two groups of well correlated observations. One in the left side of the figure comprising

Table 6. *Head length and head breadth.*

	Head length			Head breadth			Breadth/ length index		
	n	M	s	n	M	s	n	M	s
Males									
Thule pure ..... ad.	17	198,7	5,63	17	152,2	3,07	17	76,7	1,99
Thule pure .....mat.	14	195,9	4,46	14	149,3	5,28	14	76,2	3,46
Thule hybrid ..... ad.	20	200,3	6,57	20	156,7	5,58	20	78,3	3,59
Thule hybrid .....mat.	5	206,0	9,67	5	156,2	3,83	5	76,0	4,99
Wainwright pure.....	43	190,1	5,8	43	154,6	6,0	43	81,4	3,56
Wainwright hybrid.....	8	188,4	5,0	8	158,0	4,2	8	83,9	3,66
Females									
Thule pure ..... ad.	22	189,0	4,23	22	144,8	5,89	22	76,6	2,61
Thule pure .....mat.	14	189,5	4,24	14	145,2	4,04	14	76,7	2,48
Thule hybrid ..... ad.	14	193,1	4,67	14	149,9	3,68	14	78,0	1,86
Thule hybrid .....mat.	2	193,5	–	2	153,0	–	2	79,1	–
Wainwright pure.....	36	185,8	6,6	36	149,6	4,8	36	80,6	3,46
Wainwright hybrid.....	6	183,5	3,0	6	149,3	7,7	6	81,4	5,15

Table 7. *Facial measurements.*

	Bizygomatic breadth			Bibonial breadth			Facial height			Upper facial height		
	n	M	s	n	M	s	n	M	s	n	M	s
Males												
Thule pure ..... ad.	17	146,2	5,09	17	112,9	4,96	17	121,6	5,36	17	68,7	3,67
Thule pure .....mat.	14	148,7	4,92	13	118,3	5,23	14	121,2	6,02	14	70,9	5,18
Thule hybrid ..... ad.	20	148,7	4,27	20	113,1	6,48	20	124,0	5,55	20	69,6	5,31
Thule hybrid .....mat.	5	151,8	4,32	5	111,8	9,15	5	122,8	7,19	5	76,6	11,73
Wainwright pure.....	43	151,4	4,9	43	116,1	6,7	43	129,2	7,4	43	76,9	6,0
Wainwright hybrid.....	8	149,8	4,7	8	115,2	8,0	8	125,8	17,6	8	76,4	6,0
Females												
Thule pure ..... ad.	22	138,3	4,74	22	107,4	3,74	22	114,6	5,31	22	67,0	3,60
Thule pure .....mat.	14	139,7	3,15	14	110,0	6,16	14	113,5	7,21	14	66,0	4,30
Thule hybrid ..... ad.	14	142,1	4,44	14	109,9	3,55	14	115,9	4,29	14	69,1	4,90
Thule hybrid .....mat.	2	144,0	–	2	107,0	4,24	2	109,5	–	2	68,0	–
Wainwright pure.....	36	143,3	5,7	36	108,4	6,4	36	121,9	8,0	36	73,6	6,6
Wainwright hybrid.....	6	143,0	5,0	6	107,3	2,7	6	117,8	5,0	6	69,8	4,4

the four Wainwright means, and another to the right comprising the Polar Eskimo groups.

The same appears from the table, where it also is seen that the breadths do not show obvious differences between specific groups, whereas the Wainwright heads are much shorter than the Polar Eskimo heads. Another expression of this is the higher breadth/length index of the Wainwright heads.

In the Thule District hybrids have generally larger heads than pure Eskimos, but the same proportions.

In table 7 and figs 5 and 6, the means for the facial measurements are given. Neither the table nor the figure indicate major differences between the groups, except that the means from Wainwright are slightly larger than those of the Thule District.

Conclusion

The analysis of measurements of the Polar Eskimos has given the following results:

1. The hybrids are larger than the pure Eskimos, both in body and in head, but the proportions do not differ. The same difference between hybrids and Eskimos was found in Wainwright.
2. The stature in both pure and hybrid Polar Eskimos is highest in the adult group and lowest in the old (senile) group.

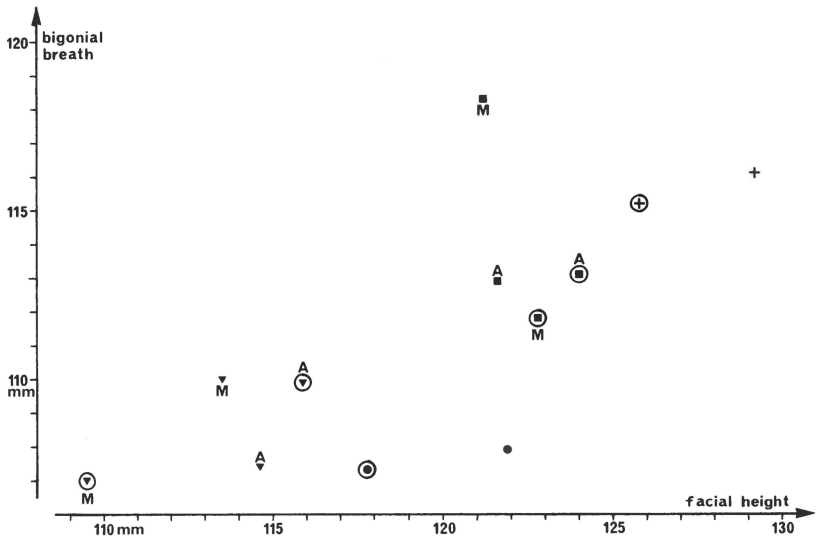

Fig. 5. Distribution of the means for facial height and bigonial breadth in Wainwright and Polar Eskimos.

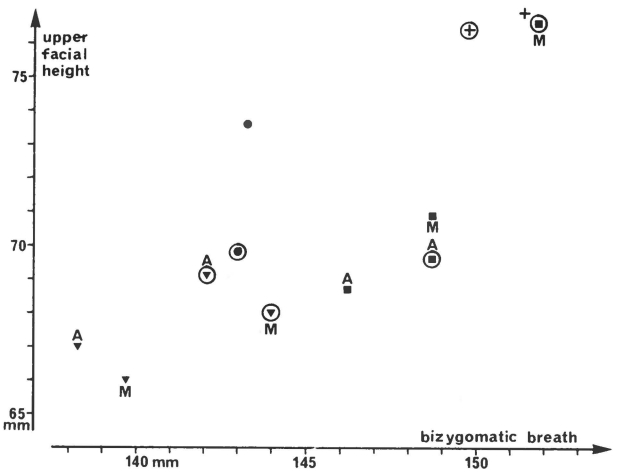

Fig. 6. Distribution of the means for bizygomatic breadth and upper facial height in Wainwright and Polar Eskimos.

The comparison between the Polar Eskimos and the Wainwright Eskimos show that:

1. Both pure and hybrid Wainwright Eskimos are larger in all dimensions than both pure and hybrid Polar Eskimos.
2. The Wainwright Eskimos, both pure and hybrids, have shorter heads than the Polar Eskimos and accordingly a distinctively higher breadth/length index.

SKINFOLD THICKNESS

The skinfold thickness measurements on the Polar Eskimos were made together with the other anthropometrical observations. They were carried out by GILBERG, LAUGHLIN, and JØRGENSEN.

The measurements on the Augpilagtoq Greenlanders (Upernavik District, West Greenland) were taken during a human-biological expedition to this area in 1967 by J. BALSLEV JØRGENSEN, JENS DAHL, and SANJAI SANGVICHIEN.

Three groups are compared:

I. Pure Polar Eskimos
II. Hybrid Polar Eskimos
III. West Greenlanders from Augpilagtoq.

The measurements were taken in accordance with the IBP/HA proposals, with a John Bull caliper.

Table 8. *The skinfold thickness material.*

	Age:	1–5	6–10	11–15	16–20	21–40	41–60	>60	Total
♂ Pure Polar Eskimos ..	1	4	5	2	5	17	14	11	58
Hybrid Polar Eskimos	2	12	14	9	3	20	5	–	63
West Greenlanders ...	3	13	20	15	6	15	6	6	81
	Total	29	39	26	14	52	25	17	202
♀ Pure Polar Eskimos ..	1	–	2	3	4	19	13	2	43
Hybrid Polar Eskimos	2	16	9	7	6	4	2	–	44
West Greenlanders ...	3	11	13	8	–	13	7	–	52
	Total	27	24	18	10	36	22	2	139

Table 8 shows the general distribution of the material. It appears that in many of the groups the number of observations is very small. Accordingly, the results of this investigation must be taken with the greatest reservation.

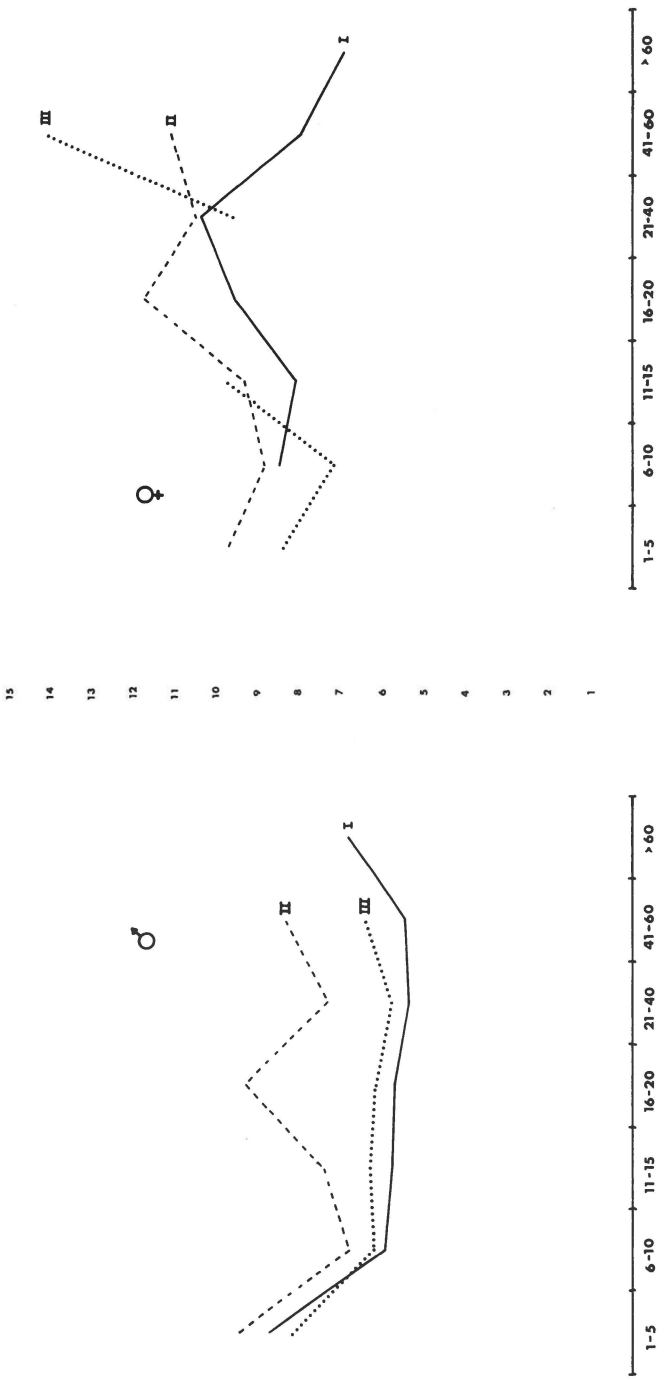

Fig. 7. Distribution of means for skinfold thickness over *triceps brachii*.
I: Pure Polar Eskimos.
II: Hybrid Polar Eskimos.
III: West Greenlanders.

Table 9. *Skinfold thickness over triceps brachii.*

		1–5 years	6–10 years	11–15 years	16–20 years	21–40 years	41–60 years	over 60 years
♂	Pure Polar Eskimos	4 8.65	5 5.88	2 5.75	5 5.72	17 5.36	14 5.45	11 6.81
	Hybrid Polar Eskimos	12 9.46	14 6.81	9 7.40	3 9.27	20 7.24	5 8.30	0 –
	West Greenlanders	13 8.05	20 6.22	15 6.26	6 6.17	15 5.68	6 6.38	
♀	Pure Polar Eskimos	0 –	2 8.45	3 8.07	4 9.50	21 10.41	13 7.91	3 6.97
	Hybrid Polar Eskimos	16 9.66	9 8.79	7 9.27	6 11.73	14 10.36	2 11.15	0 –
	West Greenlanders	11 8.35	13 7.08	9 9.70	0 –	14 9.63	8 14.08	0 –

On the other hand, there seems to be a trend in the results, which might deserve recognition.

Skinfold Thickness over the *triceps brachii*

As appears from table 9 and fig. 7, the three male groups are very much alike; after a fall in skinfold thickness during the first years, it retains the same size through the ages.

In the female groups, the variations are greater, especially in the higher ages. Any great increase in skinfold thickness with age can, however, be disregarded.

For the males at least, there seems to be a tendency towards heavier subcutaneous fat in hybrids than in pure Thule Eskimos.

Subscapular skinfold thickness

In this case (table 10, fig. 8), all three male groups show a slight increase with age.

Table 10. *Subscapular skinfold thickness.*

		1–5 years	6–10 years	11–15 years	16–20 years	21–40 years	41–60 years	over 60 years
♂	Pure Polar Eskimos	4 4.70	5 4.08	2 5.25	5 6.12	17 6.61	14 6.54	11 6.82
	Hybrid Polar Eskimos	12 4.93	14 4.24	9 5.27	3 9.27	20 7.94	5 8.67	0 –
	West Greenlanders	12 4.82	20 4.56	15 5.13	6 7.07	16 7.58	6 8.98	0 –
♀	Pure Polar Eskimos	0 –	2 4.75	3 5.47	4 8.30	21 8.93	12 7.18	3 5.80
	Hybrid Polar Eskimos	16 5.41	9 5.40	7 7.02	6 10.55	14 9.05	2 7.40	0 –
	West Greenlanders	11 5.45	13 5.02	9 7.30	0 –	13 9.26	7 11.04	0 –

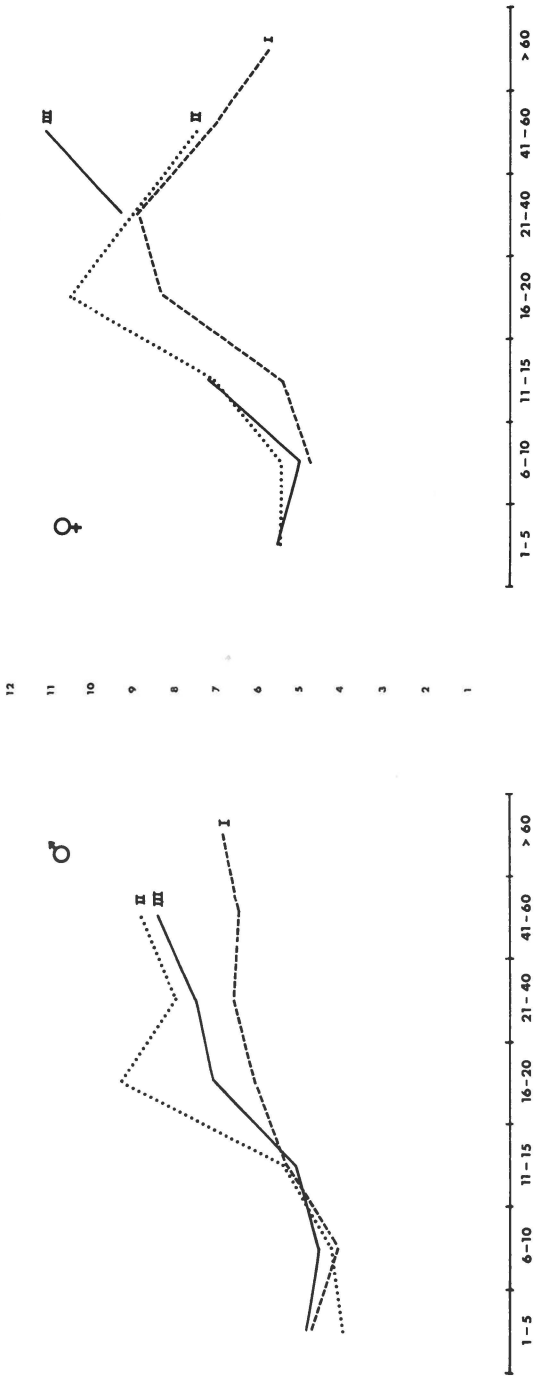

Fig. 8. Distribution of means for subscapular skinfold thickness.
I: Pure Polar Eskimos.
II: Hybrid Polar Eskimos.
III: West Greenlanders.

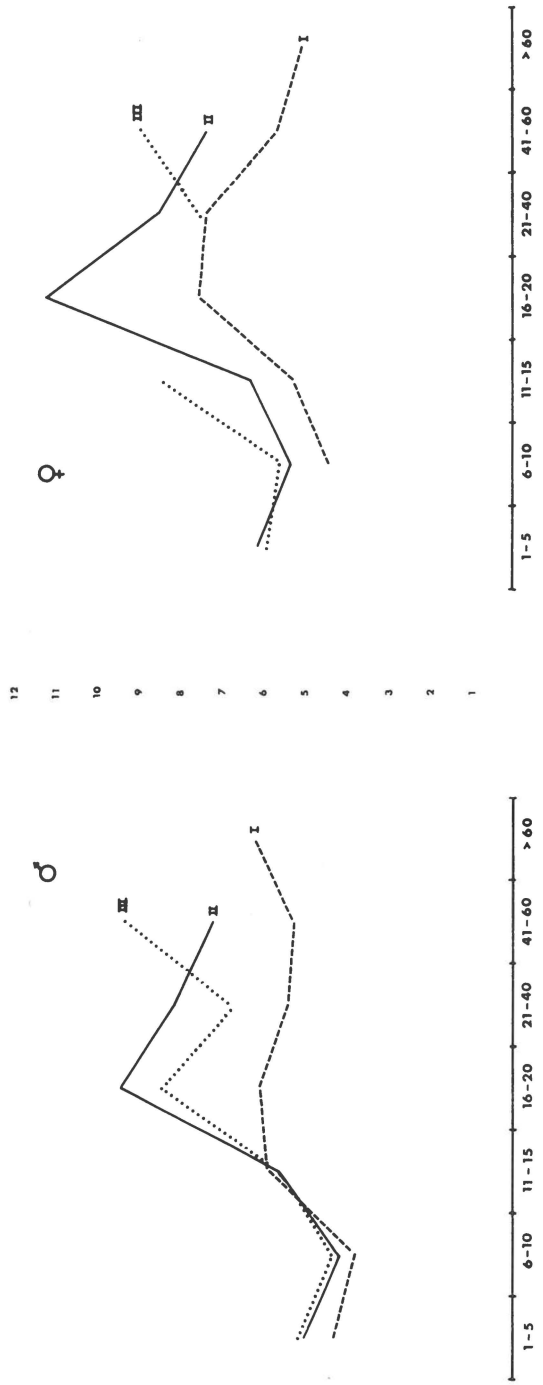

Fig. 9. Distribution of means for suprailiac skinfold thickness.
I: Pure Polar Eskimos.
II: Hybrid Polar Eskimos.
III: West Greenlanders.

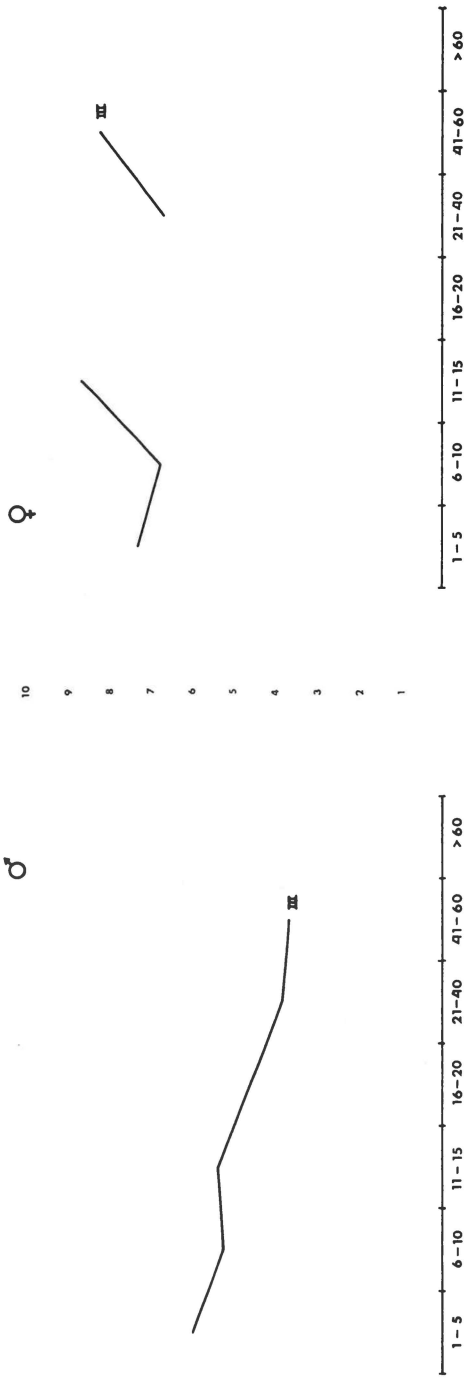

Fig. 10. Distribution of means for skinfold thickness over *triceps suræ*. (West Greenlanders)

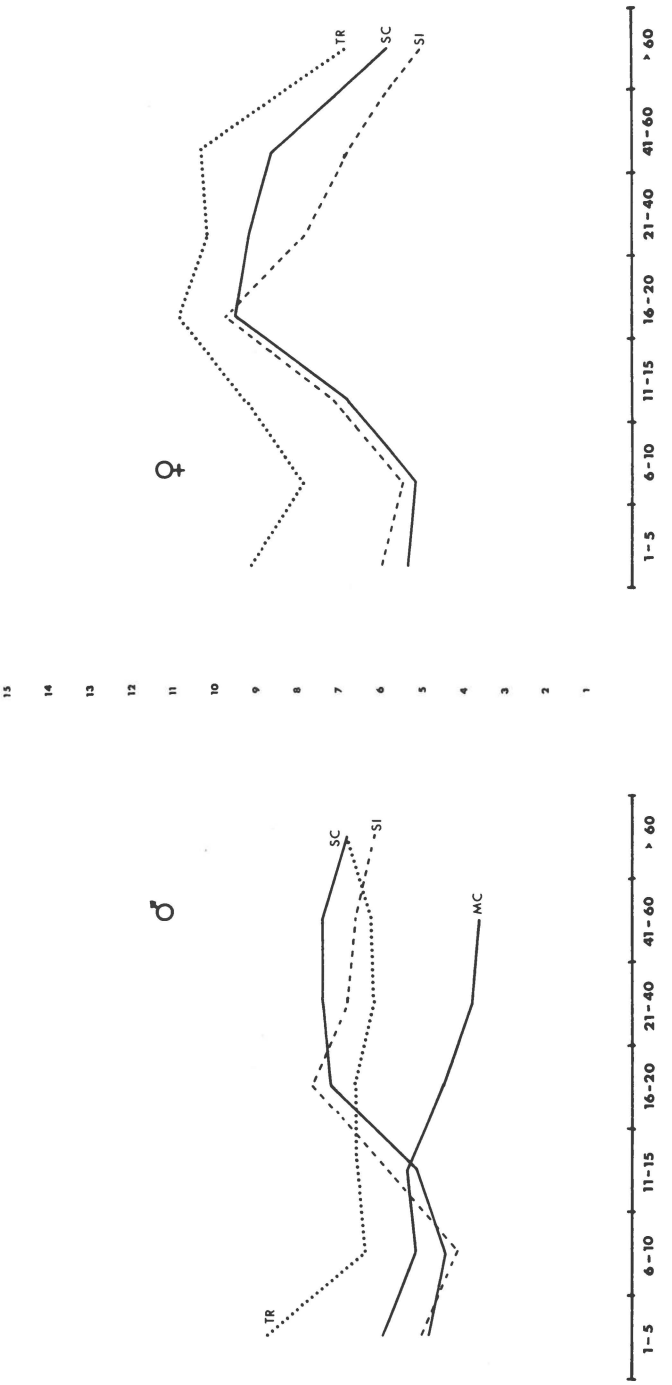

Fig. 11. Skinfold thickness in Greenlandic Eskimos (Pooled).
TR: *Triceps brachii.*
SC: *Subscapular.*
SI: *Suprailiac.*
MC: *Mid calf (Triceps surae).*

Table 11. *Suprailiac skinfold thickness.*

		1–5 years	6–10 years	11–15 years	16–20 years	21–40 years	41–60 years	over 60 years
♂	Pure Polar Eskimos	4 4.33	5 3.86	2 5.90	5 6.12	17 5.40	14 5.26	11 6.27
	Hybrid Thule Eskimos	12 5.04	14 4.17	9 5.77	3 9.47	20 8.16	5 7.26	0 –
	West Greenlanders	12 5.15	20 4.36	15 5.67	6 8.48	14 6.75	6 9.37	0 –
♀	Pure Polar Eskimos	0 –	2 4.40	3 5.33	4 7.53	19 7.28	13 5.63	2 5.05
	Hybrid Polar Eskimos	16 6.05	9 5.40	7 6.34	6 11.25	14 8.52	2 7.30	0 –
	West Greenlanders	11 5.87	12 5.61	8 8.38	0 –	13 7.48	7 8.84	0 –

Table 12. *Skinfold thickness over triceps suræ.*

		1–5 years	6–10 years	11–15 years	16–20 years	21–40 years	41–60 years	over 60 years
♂	West Greenlanders	12 5.98	20 5.23	15 5.37	6 4.55	15 3.85	6 3.65	0 –
♀	West Greenlanders	11 7.28	13 6.78	8 8.63	0 –	14 6.66	7 8.17	0 –

The women also increase their subcutaneous fat with age, but only up to 60 years of age, when they loose their fat again.

Skinfold thickness over *crista iliaca*

As will be seen from table 11 and fig. 9, this measurement shows exactly the same variation as the subscapular skinfold.

Skinfold thickness over *triceps surae*

This measurement was not taken in Thule. In the West Greenlanders it decreases with age in men, but remains fairly constant in women (fig. 10).

Conclusion

In fig. 11 the three groups have been pooled. In male Eskimos the subcutaneous fat decreases through the first years of age. After that it remains rather constant through life, but with a tendency to increase on the body and decrease on the extremities.

The females show a different pattern. After a fall in the first years, a distinct accumulation of subcutaneous fat occurs up to 20, and from that age it slowly disappears again. In the females no difference between the trunk and the extremities has been demonstrated.

LITERATURE

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