

Statistical Comparison and Chronological Change of the  
Physical Growth and Development of Korean  
—From 1910 to Present(1994)—

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### I. Introduction

It is commonly recognized that physical and development in influenced not only by the biological phenomena of each person but by the internal or external factors such as hereditary diseases on living surroundings, in particular, clothes, foods, shelters, region, climate and seasons, occupations, physical exercises, and historical and mental constituents. Accordingly in research of the Koreans as a single race, interest is focused on what influence is chronologically exerted on the physique by the external factors such as postnatal ones.

Social, economic and cultural situations have been remarkably improved since 1960s as a result of the effort to construct the welfare so-

ciety and then, the consecutive(1st, 2nd, 3rd, 4th and 5th) Five-year Economic Development plans have led to an increased yield, the enlargement of income in farming and fishing villages, the argumentation of hygienic medicine, the betterment of sociocultural and educational facilities, and the rapid acceleration of scientific techniques.

In this respect, it seems to be meaningful to study how the Korean physical conditions of the present are changed in comparison with that of the past. For that purpose, with the chronological groups from 1910s to the present (1994), the authors tried to compare the records obtained by other researchers since 1910s by investigating what influence was exercised by social, economic and cultural conditions for

each chronological interval and identifying the level of improvement of the physical condition.

The results of comparison of the author's record with those of the other researchers are presented below.

## II. Materials and Method

### 1. Materials

The materials and records on the physical growth and development of the Koreans come from the following papers(See Table 1 and References).

Table 1. The Objective of Research

Author's	Year	Title	Objector of exam.
Kubo, T.	1913	Beitrage zur Physichen Anthropologie der Koreaner	Korean
Kokida, K.	1935	Korean Body Structure	Korean
Lee, B. N.	1940	Study on the Body Structure and Body Functions in the Korean Youth	Korean
Kim, I. D	1953	Biometric Study on Korean	Korean
Kwon, E. H.	1967	A study on Health Administration Status Measures to Improve Physical Conditions of Primary, Middle and High School and University Students in Korea	Korean
Park, S. Y.			
Park, S. Y.	1975	Studies on Body composition in Adult Koreans with Reference to Ideal Body Weight and Total Body Fat	Korean
Park, S. Y.	1978	Study on Physical Growth and Development and Nutritional Status in Korea	Korean
Choi, Y. K.	1983	Study on Physical Growth and Development in Korean	Korean
K. P. A.	1985	Korean Standard Value of Physical Growth and Development in Korean Youth	Korean
Park, S. Y.	1985	Studies on the Standard Physical Growth and Development with Reference to Korean Adolescence by Age of Body Height	Korean
Park, S. Y.	1994	Study on Korean Standard Values of Physical Growth and Development in Korean	Korean
et. al.			

### 2. Method

Published papers discussed in the section of materials show the following observation items. Body measurements: Body height, body weight, chest girth, sitting height.

## III. Result and Discussion

### 1. Body Measurements

The published records on body measurements such as body height, body weight, chest girth, and sitting height are shown and studied as

below:

1) Body height

Body height is generally considered as the barometer of physical development; its investigated results by periods, sex and age are presented in Table 2, Figure 1 and 2. Every author's records on physical development of male are marked in a similar pattern until the age 16, while after that age, the comparison of the

records between 1910s through 1994 show great differences; especially, Kubo's(1913) record is the lowest and Kokida's(1935) next; the records of Lee(1940)'s and Kim(1953) tend to be similar, but those of Kwon, Park (1967), Park(1975,1978), Choi(1983), K.P.A. (1985), and Park et. al.(1994) are greatly heightened.

Table 2-a. The Comparison of Body Height by Each authors and Year(Male)

	1913	1935	1940	1953	1967	1978	1983	1985	1994
12		140.5	140.0	141.1	140.6	143.6	147.5	144.9	146.6
13		146.0	144.4	146.0	144.9	150.2	154.4	152.6	152.8
14		149.4	150.2	151.5	151.1	156.0	160.3	159.2	159.5
15	159.2	156.1	155.6	157.2	157.0	162.0	164.8	164.0	165.5
16	161.4	159.8	160.3	161.3	162.1	165.3	167.3	167.2	169.7
17	161.2	162.8	163.3	163.9	165.0	167.2	168.3	168.3	170.9
18	159.6	164.2	165.5	165.7	166.3	168.8	169.1	168.9	172.3
19	159.6	164.7	166.2	165.9	167.0	169.3	169.7	169.9	172.7
20	161.1		166.5	166.8	167.3	169.9		170.2	
21	161.4		166.1	166.5	170.0	169.4			
22	161.3		166.3	166.4	171.3	169.5	170.7		172.6
23	159.4		166.2	166.1	171.4	169.0			
24	162.2		165.9	166.2	171.4	169.9			
No. of Sample	400	1097	5336	5765	6799	19771	57270		9087

Table 2—b. The Comparison of Body Height by Each Authors and Year (Female)

	1913	1935	1940	1953	1967	1978	1983	1985	1994
12			142.3	143.8	143.0	145.0	149.3	147.8	148.0
13			145.9	146.2	147.6	149.9	153.1	152.1	151.7
14		143.7	149.4	150.3	151.0	152.5	155.2	154.9	156.7
15	140.7	144.5	152.2	153.2	153.6	154.9	156.3	155.8	158.3
16	139.5	145.8	154.4	154.4	154.8	155.9	157.1	156.7	159.0
17	143.6	147.0	154.5	154.9	155.5	156.6	157.5	156.6	160.3
18	146.0	148.7	154.5	154.9	155.7	157.0	158.3	157.3	160.2
19	147.1		154.2	155.1	156.3	156.8	159.0	157.2	160.4
20	148.0		154.0	155.0	156.6	157.4		157.6	
21	148.0	148.3	154.7	154.7	156.8	157.6	159.7		
22	145.3		154.7	156.5	157.2				159.4
23	146.2	149.3	154.2	157.2	157.0				
24			154.4	154.8	157.2				
No. of Sample	244	661	2248	4570	6584	12399	50757		5805

The records for female are a little different from these of male; 1913 and 1935 show even lower records than 1940. As in the case of male, however, it is possible to divide into three

stages, that is stage I (1913,1935), stage II (1940,1953), and stage III(1967,1978,1983,1985, 1994).

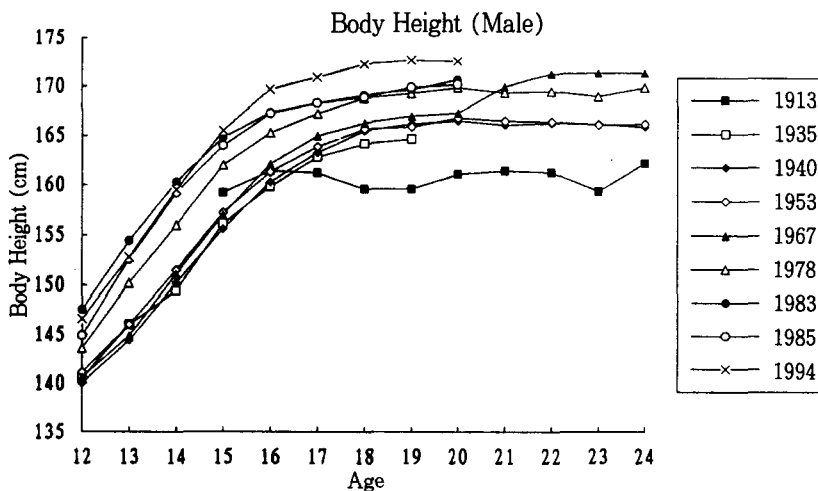


Fig. 1. Mean Value of Body Height by Sex and Age (Male)

To compare them, the lines for physical development appear linear by the 15, but they are changed to slow curves. Especially, physical developments in 1978, 1983, 1985 and 1994 are outstanding. In otherwords, physical growth shown by the data is linearly continued until the ages 16-17 for male and until the age 14 for female, which means that female has physi-

cally grown factor by 1-2 years than male. After those ages, male continues to grow slowly by the age 23 while physical growth of female is nearly halted after the ages 15-16. In case of both male and female, physical development is shown to be different according to chronological divisions of the years 1913-1935, 1940-1955, and 1960-1994.

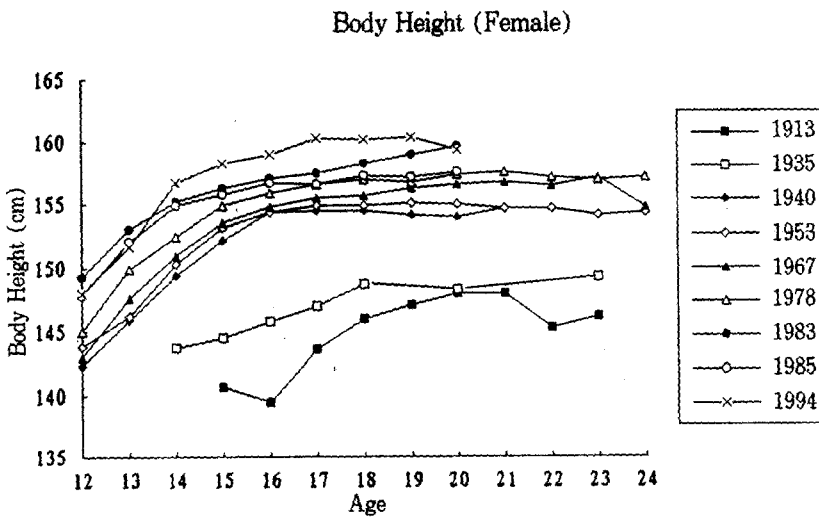


Fig. 2. Mean Value of Body Height by Sex and Age (Female)

In particular, Kwon and Park(1967)records are heightened with the comparison of those before the 1950s. However, the state of comparatively stable physical growth appears for the first time in record of Park(1978), which seems to result from the success of the First, Second and Third Five Year Economic Development Plans.

In particular, with the betterment of all social economic, cultural and educational conditions since the 1960, the Korean body height reveals more heightened and stable pattern in

the 1970s.

Conclusively, this phenomenon can be attributed to the rapid development after the 1960s of all social conditions such as the development of modern medicine, the betterment of living environment and the encouragement of gymnastics.

## 2) Body weight

Since saying one's body weight is heavy means generally that one's physical growth is good with the good nutritional state, strong muscular power and the superior capacity for physi-

cal exercise. Table 3, Figure 3 and 4 are the sex. records of body weight by periods, age and

Table 3-a. The Comparison of Body Weight by Each Authors and Year (Male)

	1913	1940	1953	1967	1978	1983	1985	1994
12		33.2	33.6	32.9	35.6	38.6	35.5	41.2
13		36.4	36.6	36.1	40.2	43.9	41.5	45.2
14		40.9	41.1	41.5	45.8	49.3	47.4	50.3
15	50.7	45.4	47.0	46.0	51.9	54.0	52.3	56.6
16	53.8	50.9	51.8	51.3	56.0	56.9	56.2	60.4
17	53.1	54.4	54.7	54.2	58.3	58.6	58.2	61.4
18	52.7	57.5	57.5	56.3	59.7	60.1	59.8	63.9
19	52.7	58.1	58.2	57.3	60.4	61.5	60.2	65.7
20	53.9	57.9	58.5	58.3	60.4		62.0	
21	54.7	57.1	58.9	59.0	60.6	64.0		66.4
22	56.2	58.2	58.6	58.6	59.4			
23	55.2	59.1	58.9	60.1	59.3			
24	55.6	58.4	58.4	58.6	60.9			
No. of Sample	400	5336	5765	6799	19771	57270		9087

Table 3-b. The Comparison of Body Weight by Each Authors and Year (Female)

	1913	1940	1953	1967	1978	1983	1985	1994
12		34.4	34.6	34.6	36.7	40.3	38.2	41.0
13		38.0	33.4	39.1	41.7	44.5	43.1	44.8
14		41.8	42.4	42.7	45.1	47.6	46.8	49.9
15	35.3	45.8	47.3	46.1	48.3	49.5	49.6	51.9
16	40.2	48.8	49.5	48.7	51.0	50.6	51.2	53.2
17	41.4	50.7	52.0	49.9	52.0	51.0	51.8	53.5
18	42.8	52.0	53.4	50.9	52.8	51.9	51.9	54.2
19	45.4	52.1	53.2	50.6	51.9	52.0	51.5	55.2
20	46.2	52.4	53.5	51.3	51.7		51.8	
21	46.4	52.1	53.5	51.0	52.0	52.1		53.3
22	45.2	53.3	51.2	50.5				
23	44.3	53.4	51.4	50.6				
24	44.9	52.9	51.0	50.4				
No. of Sample	244	661	2248	4570	6584	12399	50757	5805

In case of male, except Kubo(1913) whose record represents the lowest and idiosyncratic development pattern, the other records show linear increase of body weight mostly from the ages 12(32.90–33.60kg) to 18(57.0kg). Body weight at the period of the physical growth

completion(between the ages 18 to 23) increases gradually by the chronological shift.

For example, the chronological body weights of male at the age of 22 are 56.2kg(1913), 58.6kg(1953), 58.6kg(1967), 59.4kg(1978), 64.0kg(1983) and 66.4kg(1994).

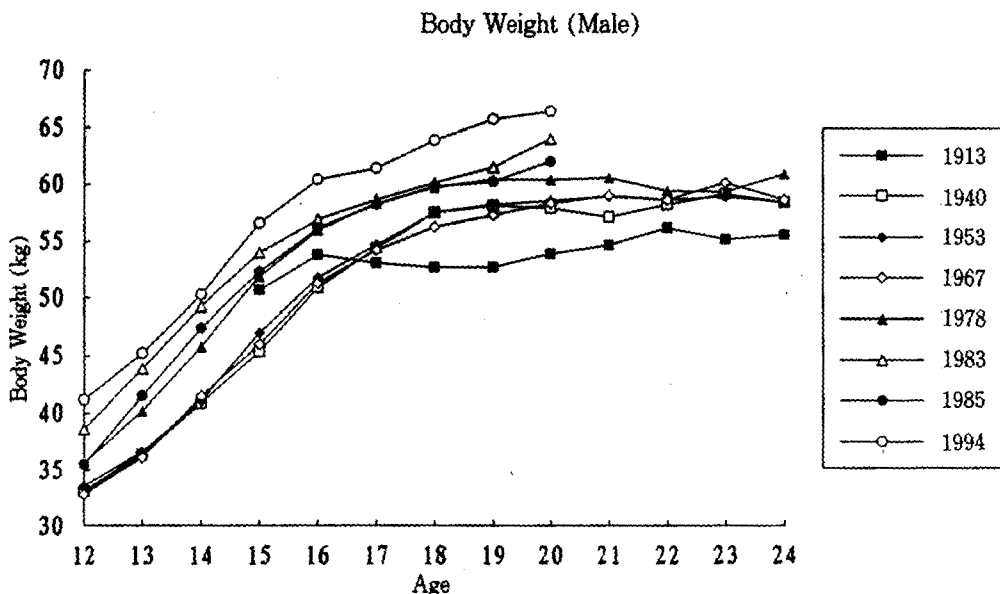


Fig. 3. Mean Value of Body weight by Sex and Age(Male)

Body weight for female at the ages 12 to 16 also keeps chronologically linear increase without great differences. Unlike other items, body weight records for female from over the 16 represent peculiar phenomena.

This is to say, the 1953 records after the Korean Liberation were increased compared with those before the Liberation. But, in 1967, 1978, 1983 or 1994 when every social and economic

condition has been improved, the female body weight has rather lower values.

Compared with the chronological increase of body weight and chest girth which will be mentioned next, this phenomenon is considered to be the result that modern most modern women take good control of their body weights for their beautiful physical appearances.

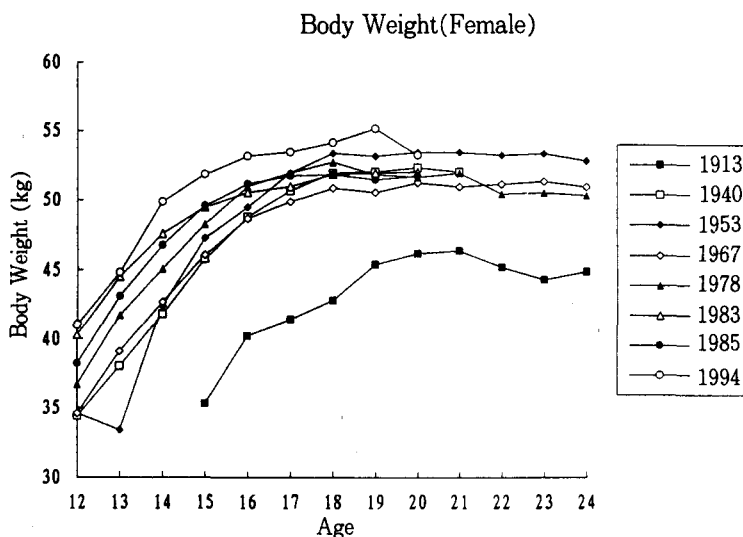


Fig. 4. Mean Value of Body Weight by Sex and Age(Female)

### 3) Chest girth

Since chest girth contains heart and lung as the source of various physical training, it is used as the most important item representing one's physique and physical constitution. The

large chest girth means the good development of heart and the superior capacity for enduring exercises and works. Table 4, Figure 5 and 6 are the chronological records of chest girth by age and sex.

Table 4-a. The Comparison of Chest-girth by Each Authors and Year (Male)

	1940	1953	1967	1978	1983	1985
12	63.4	67.9	66.7	68.5	70.6	67.3
13	69.0	69.2	69.0	71.7	74.3	70.6
14	72.5	73.3	73.4	75.9	78.1	74.2
15	76.2	77.7	76.3	81.1	81.5	77.6
16	80.6	81.4	80.6	84.3	84.2	80.4
17	83.1	84.0	82.8	86.5	86.2	82.3
18	85.2	85.9	84.5	87.6	87.6	83.4
19	86.6	86.8	84.8	88.3	88.8	84.4
20	87.2	87.3	86.3	88.8		85.6
21	87.8	87.5	87.2	89.3		
22	88.4	88.3	87.3	89.0	90.4	
23	88.6	88.6	87.9	90.2		
24	87.4	88.4	88.1	90.1		
No. of Sample	5336	5765	6799	19771	57270	



Table 4—b. The Comparison of Chest—girth by Each Authors and Year (Female)

	1940	1953	1967	1978	1983	1985
12	64.9	65.6	67.7	69.9	72.7	67.1
13	67.1	68.2	71.2	73.7	76.2	70.4
14	69.5	70.0	74.3	76.5	78.7	72.8
15	71.4	72.7	76.7	79.2	80.4	74.7
16	84.3	75.5	78.8	81.3	80.8	75.9
17	76.0	76.6	79.2	81.9	81.4	76.2
18	77.8	78.0	80.7	82.6	81.3	76.4
19	78.1	78.5	80.6	82.6	81.4	76.5
20	78.7	78.9	81.5	83.5	82.4	77.8
21	78.7	79.1	81.5	83.3		
22		79.0	81.5	82.8		
23		78.9	82.4	83.1		
24		78.5	81.3	82.9		
No. of Sample	2248	4570	6584	12399	50757	

Chronological chest girth for male increases linearly by the age 18, while it doesn't after that age. That is it shows little differences in 1940, 1953, and 1967 but great increase in 1978, 1983, 1985, and 1994.

Unlike for male, each chronological difference of chest girth is shown for female. To take for example the age 22, the age of physical growth completion, we can recognize the increasing concern about the beautiful physical

appearance of modern women; the observations of the age 22 increase continually (78.7cm in 1940, 79.1cm in 1953, 81.5cm in 1967, 82.6cm in 1975, 83.13cm in 1978 and 84.06cm in 1983).

On the other hand, this indicates the improvement of the physical capacity and work efficiency as a result of great acceleration of all social, economical and cultural conditions.

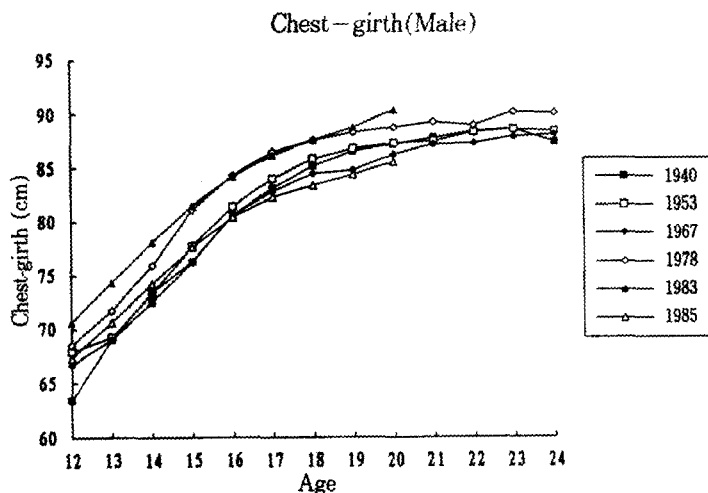


Fig. 5. Mean Value of Chest-girth by Sex and Age(Male)

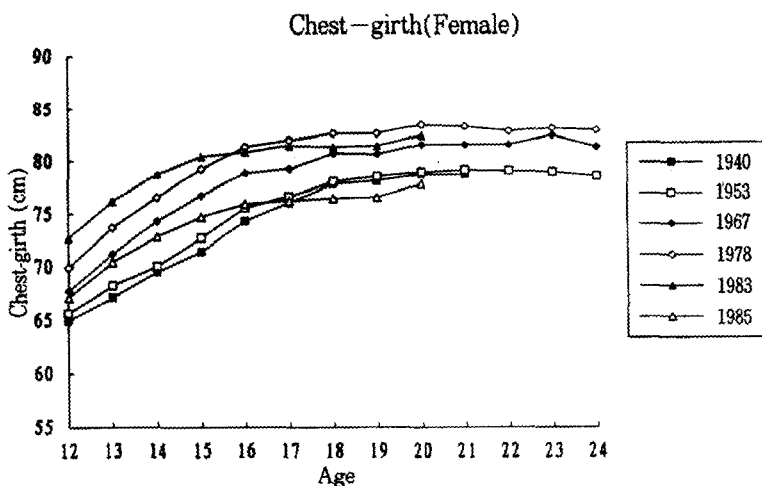


Fig. 6. Mean Value of Chest-girth by Sex and Age(female)

#### 4) Sitting height

High sitting height suggests that physical development is good. Excluding the length of legs affected by external and postnatal factors, sitting height can be the more desirable barometer for physical growth than body height.

As in the case of chest girth, high sitting

height indicates the strong function of the internal organs and so the superiority of enduring physical exercise and work efficiency.

The records of sitting height has been publicized since 1940. Table 5, Figure 7 and 8 are the chronological records of sitting height by age and sex.

**Table 5—a. The Comparison of of Sitting Height by Each Authors and Year (Male)**

	1940	1953	1967	1978	1983
12	76.2	76.0	75.9	77.6	79.0
13	78.7	78.9	78.0	80.7	82.0
14	81.6	82.0	81.2	84.0	85.6
15	84.6	85.4	84.2	87.1	88.2
16	87.3	87.8	87.3	89.3	89.9
17	89.2	88.9	88.7	90.6	90.7
18	90.3	89.5	90.2	91.5	90.4
19	90.5	89.8	90.4	92.0	90.0
20	90.8	89.8	90.5	92.0	89.9
21	90.5	89.9	91.1	92.4	
22	90.8	89.8	91.1	92.0	
23	90.7	89.7	91.3	91.0	
24	90.7	89.5	90.8	92.4	
No. of Sample	5336	5765	6799	19771	52270

**Table 5—b. The Comparison of Sitting Height by Each Authors and Year (Female)**

	1940	1953	1967	1978	1983
12	79.4	77.7	77.5	78.9	80.7
13	80.4	79.6	80.2	81.8	82.9
14	82.0	82.7	82.1	83.4	84.2
15	84.1	83.6	83.6	84.8	84.9
16	84.6	84.6	84.6	85.3	85.1
17	85.0	85.2	84.7	85.6	85.0
18	85.2	85.6	84.6	86.1	83.9
19	84.8	85.3	84.3	86.0	83.5
20	85.3	85.1	84.7	86.1	84.1
21	85.0	84.8	84.7	85.9	
22		84.4	84.6	85.6	
23		84.3	85.2	86.1	
24		84.6	84.5	85.8	
No. of Sample	2248	4570	6584	12399	50757

For male, sitting height represents linear growth increase until the age 16 in every period, and after that age its increases form slow

curves. The growth completion of sitting height is shown at the age of 18 to 23. For female, linear growth increase generally continues by

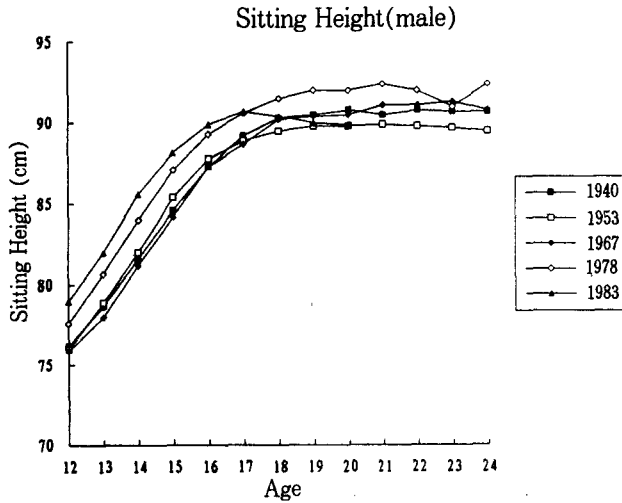


Fig. 7. Mean Value of Sitting Height by Sex and Age (Male)

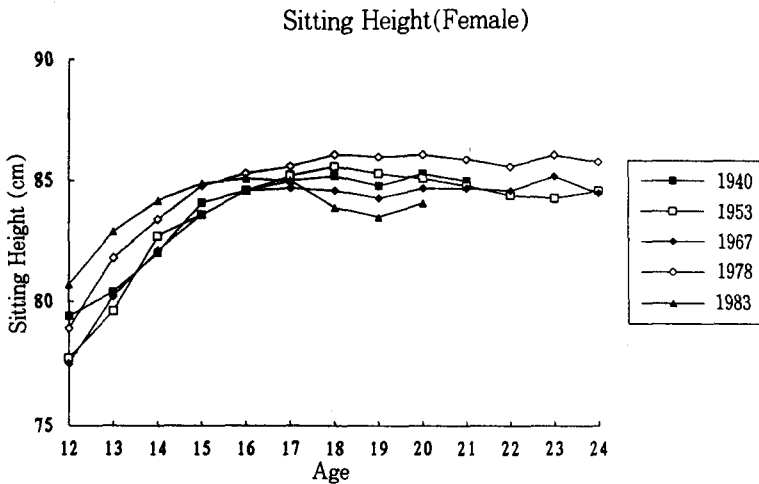


Fig. 8. Mean Value of Sitting Height by Sex and Age (Female)

the age 16.

In both cases of male and female, sitting height after that age are almost similar in its chronological records. This phenomenon suggests that sitting height is most greatly influenced by inborn factors. Therefore, the fact that body height has greatly increased in spite of little increase of sitting height means that the

development of legs are greatly improved. That is, since the lower part of a body is greatly influenced by the external of postnatal factors, this phenomenon is due to the social, cultural, economic and educational factors since after 1960.

## 2. The Chronological Changes of Body Height and Body Weight of the Koreans

Table 6 represents the chronological comparative observations on body height and body weight of

the Korean adults. In case of Kubo's record (1913), body height for male was 161–162cm and body weight 55–56kg, while for female 147–148cm and 45–46kg, respectively.

**Table 6.** Chronological Observation on the Body Height and Body Weight of Korean Adults

Sex	Item/Chronology	1913 (Kubo)	1935 (Kokida)	1940 (Lee)	1953 (Kim)	1967 (Kwon, Park)
Male	Body height (cm)	161–162	165–166	166.12	166.46	167.6±5.3
	Body weight (kg)	55–56	57–58	58.20	58.55	58.9±5.5
Female	Body height (cm)	147–148	152–153	154.38	154.82	156.6±4.6
	Body weight (kg)	45–46	49–50	52.14	53.47	51.2±5.1

Sex	Item/Chronology	1975 (Park)	1978 (Park)	1983 (Choi)	1985 (Park)	1994 (Park)
Male	Body height (cm)	169.2±4.1	169.2±4.1	170.7±6.2	171.0±5.8	172.6±5.5
	Body weight (kg)	59.2±4.8	61.9±6.9	64.0±7.3	64.3±7.5	66.4±9.5
female	Body height (cm)	158.1±4.4	158.1±4.4	159.7±4.9	160.0±5.2	160.0±4.6
	Body weight (kg)	50.7±5.0	50.4±5.0	52.1±6.0	52.6±5.9	53.3±6.9

22 years later, the record of Kokida(1935) showed that male had 165–166cm body height and 57–58kg body weight, while female had 152–153cm and 49–50kg. Lee's record(1940) was not greatly different from that of Kokida (1935): 166.12cm and 58.2kg for male and 154.38cm and 52.14kg for female. The Korean liberation also appeared similarly. However, the report of Kwon, Park et al.(1967) showed that the physical growth of students in Korea increased according to the improvement of food situation and stabilization of livelihood; body height increased by around 1cm(for male, 167.61±5.25cm: for female, 156.63±4.59cm) and body weight by 1.8kg(for male, 58.90±5.50kg: for female, 51.16±5.09kg). The 1975's record,

investigated nationwide by the author, also showed a continuous growth in body height; 2.7cm for male(169.20 4.10cm) and 3.3cm for female(158.10 4.20cm), compared with those in 1950s. The 1985s record, investigated nationwide by the Park, also, showed a continuous growth in body height; 4.54cm for male(171.0cm) and 5.18cm for female(160.0±5.2cm), compared with those in 1950s. The 1994's record, investigated nationwide by the Author, also, showed a continuous growth in body height; 5.54cm for male(172.6±5.5cm) and 5.18cm for female(160.0±4.6cm) compared with those in 1950's. As to body weight, however, the data showed little difference from Kim's record(1953), apparently indicating good con-

trol of body weight. This result is considered to be caused by the increasing concern on the physical fitness, which has had a close relationship with the relative emphasis on the physical strength measurement in entrance examinations at each level of schools in Korea.

#### IV. Summary

The following results are obtained from the investigations of the records of each researcher for the purpose of identifying the chronological changes on the physical growth and development of Korean.

1. Body measurements such as body height, body weight, chest girth, and sitting height increased with age, but, at the age of the completion of physical growth, they showed the chronological increases; especially in 1994 after 1960, such increases were remarkable.

2. Body height and body weight increased per 10year in average 1.3cm and 1.3kg for male and 1.6cm and 0.94kg for female, respectively (They are mean increase values).

3. The physical growth at the age of its completion increased chronologically, in particular, in 1967, 1978, 1983, 1985 and 1994.

These phenomena provide for the evidence that the betterment of food situation in Korea by the improvement of every social and economic condition has exercised a considerable effect on the physical growth and development.

#### Reference

1. Diehl, H.S. and W. Dalrymple, *Healthful Living*, 9th ed., Mcgraw-Hill, New York, 1973, 171-185.

2. Kim, I.D., "Biometric Study on Korean; I. Body Structure, II. Miss Proportion and Body Strength", *Universitas Seoulensis Collectio Theseon Scientia Naturalis*, 3, 1956, 1-59.
3. Kokida, K., 'Korean Body Structure(I)', *J. Chosun and Manchurian Med.*, 172, 1935, 15-32.
4. Kokida, K. and F. EKeda, "Korean Body Structure (II)", *J. Chosen and Manchurian Med.*, 182, 1936, 1-32.
5. Kubo, T., "Beitrage zur Physischen Anthropologie der Koreaner", *Mitteilungen aus der Medizinischen Fakultat der Kaiserlichen Universitat zu Tokyo*, 12, 1913, 53-114.
6. Kwon, E.H., *The Textbook of Public Health*, Dong Myung Sa, Seoul, 1963, 160-165.
7. Kwon, E.H., T.R. Kim, C.H. Cha, H.J. Park, S.Y. Park, Y.W. Lee and B.J. Yun, "A Study on Health Administration Status and Measures to Improve Physical Condition of Primary, Middle and high Schools and University Students", *Student Health Service*, Seoul National University, 1968, 1-218.
8. Lee, B.N., "Study on the Body Structure and Body Functions in the Korean Youth", *J. Chosun Med. Assoc.*, 30, 1940, 923-1042.
9. Park, S.Y., "Studies on Body Composition in adult Koreans with Reference to Ideal Body Weight and Total Body Fat", *Kyung Hee Univ. Med. Journal*, 2, 1977, 23-41.
10. Park, S.Y., *Studies on the Physical Growth Development, Standard Body Weight and*

Normal Adapted Body Weight of Korean,  
J. of the Notional Academy of Sciences,  
Republic of Korea, Natural Sciences, XVI,  
1977, 117-152.

11. Park, S.Y., "Study on Physical Growth and Development and nutritional status in Korea", Theses Collection, Kyung Hee University, 9, 1979, 761-784.
12. Park,S.Y., "Studies on the Standard Physical Growth and Development with Refer-

ence to Korean Adolescence by Age of Body Height "J. of the Korean Biometric Association, 9-1, 1984. 243-280.

13. Park,S,Y., Study on Korean Standard Values of Physical Growth Development in Korean, 1994. Choi,Y.K., "Study on the Physical Growth and Development in Korean' The Graduate School Thesis, Kyung Hee University, Seoul, Korea, 1984.

<국문요약>

韓國人の體格變化에 關한 比較研究  
-1910年度부터 1994년까지-

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年代別로 본 韓國人の 成長發育狀態를 서로 比較해 봄으로서 얼마나 향상되었나 알아보고자 1910년 도부터 1994년까지 各 著者들의 成績을 調査分析한 바 다음과 같은 結論을 얻었다.

1. 身體計測值인 身長, 體重, 胸圍, 座高는 加齡에 따라 증가하고 있으나 成長 完了期에서는 各年度別 로 점차 增加되었고 특히 1960年 以後 1994년에는 그 成長이 현저하게 나타났다.
2. 身長과 體重은 平均 10年當 男子의 경우 1.3cm와 1.3kg씩 增加되었으며 女子는 1.6cm와 0.94kg씩 增加하였다(上記의 數值들은 平均增加值임).
3. 成長完了期에 있어서 各 年度別로 成長發育이 增加되었고 특히 1967年, 1983年, 1985年 그리고 1994년에 와서는 현저한 增加를 나타내었다.

이러한 現象은 社會的 經濟的 諸條件의 向上으로 韓國人の 食生活이 좋아졌음으로 成長發育과 體位 向上에 많은 影響을 미쳤다는 것을 立證하고 있다.