An Attempt of Prediction on Menarche Age

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初潮年齢予測に関する試案

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ABSTRACT　　This study attempted to predict Menarche age to evaluate maturative rate in primary school and junior high school periods. Ninety four longitudinal data of stature from 6 to 18 years old was obtained from health examination table, and birth height, birth weight, onset age of walking, height and weight growth amounts from birth to first grade (predictive factors) were obtained by questionnaires. Height growth amounts for a year was calculated with these longitudinal stature's data, and P,H,V(Peak Height Velocity)age was determined. Correlation and multiple correlation between Menarche age and predictive factors were computed. As the result, it was shown that correlation between Menarche age, and onset age of walking, height and weight growth amounts from birth to first grade were significant. In addition, multiple correlation between Menarche age and these three predictive factors were significant. However it was concluded that the predictive equation determined with these three predictive factors was not so exact.

1. Introduction

The estimation of motor fitness development during school is a theory which was derived from necesity of considering physique , as represented by regression and multiple regression estimation.<1> During school age, however the change of physique is remarkable, and the individual variation is also large. Therefore relative merits of motor fitness is not clear whether they are determined by large and small physiques or by maturation. Fomer day we<2<3<4> have investigated the relationship between physique and motor fitness in each group according to maturity rate in high school periods about that, as the result, it was found that the relationship between physique and

motor fitness was rare in between the same group according to maturity rate. In other words, the influence of maturation is more remarkable than that of physique to motor fitness during school age. Of course, it is natural that the physique grow according to the mechanism of maturation. Accordingly there is a tendency which is considered that the more stature is large, the better motor fitness is too. And about estimating motor fitness development during school, if they could have considered not only tall and short height but also maturation it would be easier for them to grasp. Under the present condition, however even if we would have tried to consider maturity rate, there is almost no data of index of that for investigation. Thereupon, I have considered that

P, H, V Age		Birth Height (B,H)	Birth Weight (B,W)	Onset age of walking (O,A,W)	Height growth amounts from B to F,G(H,V)	Weight growth amounts from B to F,G(W,V)
8	X	48.69cm	2870.0g	11.88	66.20cm	16.28kg
	SD	1.91	383.6	2.03	3.87	1.61
9	X	49.73cm	3120.0g	12.54	64.45cm	16.09kg
	SD	1.92	363.5	2.13	4.47	2.08
10	X	48.99cm	2973.0g	12.69	66.03cm	16.45kg
	SD	2.96	386.4	1.91	4.39	2.48
11	X	50.33cm	3121.0g	13.10	61.91cm	15.67kg
	SD	1.94	273.7	2.49	4.63	1.77
12	X	48.80cm	2844.0g	14.00	61.86cm	14.04kg
	SD	1.79	202.3	0.24	2.24	1.15

F,G : First Grade

Table 1　Mean and standard deviation of factors which have
possibilities of predict for P,H.V ages

if Peak Height Velocity (P.H,V) age as the index of maturation can be predicted by some kind of method before primary school age, the index of maturation which is able to grasp the motor fitness during school age would be able to be made.

2. Method

Health investigation forms by questionnaires were distributed for subjects of a woman's college 287 freshwomen in 1984. Investigated items are longitudinal data of stature and body weight from primary school to high school, bith height, birth weight, onset age of walking, Menarche age. Complete data for investigation of 94 students were able to be gotten. Growth amounts during a year were sought from longitudinal data of stature, and Peak Height Velocity age was determined and was grouped into each P,H,V age. Growth amounts of stature and body weight from birth to primary school(first grade)were sought from these longitudinal data. Birth height and weight, onset age of walking,

Menarche age, growth amounts of stature and body weight from birth to first grade were calculated in each P,H,V age's group. And correlation and multiple correlations between Menarche age, and birth height, birth weight, onset age of walking, growth amounts of stature and body weight from birth to first grade were attempted to be analyzed.

3. Results and discussion

It was shown that there is no big difference in birth height and weight but seemed to be a difference in onset age of walking, and growth amounts of stature and body weight from birth to first grade (for the next simple writing growth amounts of height and weight) between groups. Further to clarify about this, results analysis of variance was attempted about five items and all were recognized significant difference ($P < 0.01$) on growth amounts of stature only, P,H.V ages' groups of 11, 12 years old were less than that of 8, 9,11 years old about grouth amounts of height. (as shown

	B.H	B.W	O.A.W	H.V	W.V
P.H.V Age	0.0442	0.0099	* 0.2028	* -0.2419	-0.1614
Menarche Age	0.1518	0.1202	* 0.2277	* -0.2703	* -0.2070

* (P < 0.05)　** (P < 0.01)

Table 2　Correlation coefficients between P.H.V and Menarche ages , and predictive factors

	B.H B.W	O.A.W H.V	O.A.W W.V	H.V W.V	B.H B.W O.A.W	O.A.W H.V W.V	B.H B.W O.A.W H.V W.V
P.H.V Age	0.0500	** 0.3118	0.2504	0.2429	0.2602	* 0.3133	* 0.3261
Menarche Age	0.1553	** 0.3447	* 0.3013	* 0.2617	0.2816	** 0.3450	** 0.3724

* (P < 0.05)　** (P < 0.01)

Table 3 Multiple correlation coefficients between P.H.V and Menarche ages . and predictive factors

in Table 1)　In other words,　growth amounts of height are little comparatively in a late maturing person, then it is considered that P.H.V ages will be able to be predicted by much and little of growth amounts of height untill first grade in higher P.H.V ages' person. However, it was not sure about lower P.H.V ages' person.

It was recognized that there was no signifi- cant difference in onset age of walking also, but it seemed to have a tendency that onset age of walking was becoming sooner according to be higher for P.H.V ages. Therefor, to grasp definitly more further about tendency like this, correlation between these five items, Menarche and P.H.V ages were attempted to be analyzed. As shown in Table 2, items which have significant correlation between P.H.V ages are onset age of walking and growth amounts of height. and that between Menarche age are

growth amounts of weight in addition to items of the two. Consequently as results in analysis of variance and simple correlation analysis, it was found that early maturity rate person is lower than late maturity rate one in onset age of walking, and is larger than that in growth amounts of height.

It is considered that if Menarche age would be able to predicted predictive factors would be three factors of growth amounts of height. weight and onset age of walking. Miyata and Yoneda<5>have reported about that it was shown that persons whose onset age of walking is earlier is large in birth weight. From result of this time . however, it was clear there was no significance in correlation between onset age of walking and birth weight. (correlation coefficients between O.A.W and B.W are -0.0036) And when Menarche age are predicted standard errors of estimation value become large,

Item	Multiple Regression Equation	
P.H.V Age	Y = 0.097X - 0.0605X + 0.000022X + 12.21	* 0.3133
	Y = 0.096X - 0.053X + 12.1	** 0.3118
Menarche Age	Y = 0.111X - 0.0543X - 0.0000097X + 14.69	** 0.3450
	Y = 0.111X - 0.058X + 14.75	** 0.3447

X : Onset Age to walk
X : Height amounts from birth to first grade
X : Weight amounts from birth to first grade

Table 4　Multiple regression equation of P.H.V age and Menarche age

because of that, the prediction from multiple regression analysis was attempted.

As shown in Table 3, items which the significance is shown in multiple correlation between Menarche age are O.A.W : H.V, O.A.W : H.V : W.V, B.H : B.W : O.A.W : H.V : W.V(P < 0.01), O.A.W : W.V, H.V : W.V(P < 0.05). Therefore, it is considered that effective predictive factors for Menarche age from two variables are onset age of walking and growth amounts of height, the case from three variables is able to add growth amounts of body weight in them.

Then predictive equation was calculated by multiple regression analysis. (as shown in Table 4) It was concluded that three factors of onset age of walking, growth amounts of height and weight were extracted as valid factors of prediction for Menarche age. As mentioned by reports up to this time ,<6<7<8> onset age of walking was determined by individual difference of maturation and there is a possibility to be predictive factors of maturity rate. However it is considered that relationship between cause and effect on growth amounts of height and weight is too difficult to devate.

By the way, results that growth pattern of stature was investigated were recognized that there was individual differences of growth spurt before primary school in our fomer paper, <9<10> but this time was not able to mention clearly because of lack of infants'detail data of stature and body weight. Therefore, predictive equation shown in Table 4 is insufficient to predict accurately and accuracy rate of prediction is also low. (predictive errors which were calculated from multiple correation coefficients were 90 %) As the conclusion, it was found that these factors were not valid sufficiently to predict, however, there would be possibilities of prediction this time.

4. References

<1> T. Mizuno :Japanese physical fitness standard table, Tokyo Univ.Pub. 1980.
<2> K. Fujii and K. Ohta : Difference of the motor fitness development of female studets on the classification of maturity rate, Nagoya City Univ. bull. No33, 47-54, 1987.
<3> K. Fujii and K. Ohta : Difference of the motor fitness development of male students on the classification of maturity rate -- differencies of correlation analysis on the classification of maturity rate in high school period -- . A I T .bull. No24, 53-58, 1989.

〈4〉 K. Fujii: Differencies of the motor fitness development of male students on classification of maturity rate --development process of motor fitness by discriminating the difference of maturity rate during high school-- , A I T, bull. No26, 29-34, 1991.

〈5〉 E. Miyata and S. Yoneda : A study on the time of beginning to walk , Child Health Study. 31-5 : 235-239, 1973.

〈6〉 T. Kimura and H. Ohkubo : The correlation of physical growth and sexual ripeness, Child Health Study. 26-2 : 64-67, 1968.

〈7〉 H. Iwata : A study on the prone progression of human infants --the relationship between the acquisition of bipedal walking and the development of prone progression-- , Child Health Study. 44-3 : 301-307, 1985.

〈8〉 A. Takano. K. Fujimura and H. Usui : Follow - up study on growth of infants -- growth study by birth weight -- . Child Health Study. 32-1 : 38-41, 1973.

〈9〉 K. Fujii and K. Ohta : Growth patterns classified according to difference of stature in boys -- analysis based on distance curve and velocity curve -- . No 35 J. S. P. E. Abstracts. P. 504. 1984.

〈10〉 K. Fujii and K. Ohta : Growth patterns classified according to difference of stature in girls -- analysis based on distance curve and velocity curve -- , Tokai Annual Report of Health and Physical Education. Vol.11 : 1-9, 1989.