

A BIOMECHANICAL ANALYSIS ON THE EFFECT OF WEIGHTLIFTING TRAINING ON WOMEN'S HEIGHT

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PREFACE

There has formed a powerful woman's weight lifting team in China since the upsurge of China's weight lifting sports in 1985. They have made more and more progress in various woman's weight lifting matches. At present, they are holding a leading post in this field in the world sports.

It has troubled many people whether weight lifting training could effect the increase of women's height. In order to clear up all the worries, to promote the healthy development of weight lifting sports and to investigate the relationship between weight lifting training and the increase of height, we have successfully conducted a research and made a analysis on the height of nearly 100 woman weight lifting players in some parts of China's provinces by using high speed photographic method. And thus facts and theoretical evidences are provided to dispel these worries.

SAMPLE AND METHODS

Sample

From Nov.1986 to May.1990, five large woman's weight lifting matches had been held in China (cf. Table 1).

Table 1 A Survey of Five Large Woman Weight Lifting Matches from 1986 to 1990

time	Nov.1986	May.1987	May.1988	May.1989	May.1990	total
team(s)	29	32	35	29	32	157
players	192	222	231	234	231	1110

75 topnotch players out of 1110 players have been investigated and interviewed. Among them, 22 are of heavy weight lifting players, most of whom from the three provinces of Northeast; 22 are of light weight lifting players, most of whom from the South and the other 31 are from different parts of Central China. Moreover, we made a follow-up investigation of 10 players through four years' training. At the same time, we took a speed-up photograph of a topnotch player of Shandong Provincial Team of Woman's Weight Lifting and took a fixed-spot picture of her clean jerk and her snatch, which is followed by a detailed analysis of this film.

METHODS

Sight Interview and Measuring

We interviewed the players and each one's height was measured by the weight-height instrument with a precision of 1mm.

Speed-up Photograph

In order to get a general analysis of woman's receive-stress condition at each moment of weight lifting, we took a fixed-spot picture of a topnotch player in Shandong Provincial Team of Woman's Weight Lifting while she was acting the clean jerk and snatch. The weight she lifted is 80 percent of that of the best one. It was conducted with a domestic LBS-500 speed-up camera and a frequency of 100 pictures per second.

Comparative Analysis

A comparative analysis has been made after the selection of the measuring data and statistical analysis.

RESULTS AND DISCUSSION

A Receive-stress Analysis of Different Parts of a Body in the Process of Woman's Weight Lifting

After we have analyzed every segment of a woman body at each moment of clean jerk and snatch by using Japanese body model, we come to the following conclusions: The vertical stress received by the bones of different segment are much more than that of a normal one standing and walking. Especially at the speed-up moment of barbell when lifting and snatching, the stress distribution at the body and legs is greater. At one training course of three and a half hour, the weight she lifted adds up to 15 tons. Suppose there are 300 courses each year, the accumulated weight she can lift will be 27,000 tons. It is unimaginable for a normal person to receive such stress at different segments of his body.

Biologically, generally speaking, teen-agers between 12 and 18 years old have a rapid growth in their cartilage. After 18, bones becoming ossifying. At about 25, diaphysis and epiphysis join together and come the being of the complete bones. Ossifying finally comes to an end and the growth of height is quite stable. Height increase mainly depends on the growth of long bones and its speed and scale have a lot to do with the factor of training except those of heredity gene and nutrition. All the trainees have a high nutritive value diet and a good appetite, which promote the growth of their bodies. Meanwhile, the great intensity of weight lifting training can stimulate the crossnerves, with the reinforcement of heart systole, speed-up of heart beating and the promotion of energy releasing of fat acid glycogen. In this way metabolism becomes quicker and benefits the growth of a body.

As we have known, the stress a normal person received at walking or running is an important element to stimulate the growth of bones. Scientists have done such experiments: Asking a normal young man to lie in bed for long and making a study of his calcium metabolism, they discovered: "It depends on the vertical stress of the long bones to maintain the metabolism of mineral substances of bones. And the formation of the stress come from the gravitation of the earth while walking." Therefore we come to the conclusion that the vertical stress in training surpasses that of a normal person in acting, so benefit the growth of the bones.

A Comparison of 100 Players' Actual Height and Their Possible Hereditary Height

A person's growth is a interaction result of congenital heredity and postnatal circumstances, and a unifying process of heredity and adaptation for an organism in outer conditions. Heredity gene only decides the possible scale of organism growth, it is the outside conditions that affect the development of heredity potentiality.

In this project, we made a follow-up investigation of 10 woman weightlifting players, and made a comparison between the actual height increase and the possible heredity height through four years' training(cf. Table 2). The equation to calculate the possible heredity height is : Daughter's Height =(father's height × 0.923 +mother's height) ÷ 2

As can be seen in Table 2.

Table 2 A Comparison of 10 Topnotch Players' Actual Height and Their Possible Heredity Height

players	age (year)	father height (cm)	mother height (cm)	height (cm)	possible height (cm)	gap (cm)
Ms Yang	17	170	158	160	157.5	+2.5
Ms Zhang	18	169	151	155.5	153.5	+ 2
Ms Han	18	175	163	163.5	162.5	+1.2
Ms Jin	20	178	162	167.5	163.6	+3.9
Ms Zhang	20	172	170	165	164.3	+0.7
Ms Li	21	186	174	179	172.8	+6.8
Ms Li	21	176	166	167.5	164.2	+3.3
Ms Min	20	180	168	171	167.1	+3.9
Ms Han	23	176	166	169	164.8	+4.2
Ms Qu	21	178	172	170	168.9	+1.1

all the ten investigates have surpassed their possible height affected by heredity gene to a certain extent. The average surpassing height is 2.9cm and the scale is from 0.7 cm to 6.2cm. What's more, all the 160 man weight lifting players who took part in the 19th, 20th and 21th Olympic Games have been investigated as to their height. The results are: 130 players (80%) are higher than their fathers or brothers, and this further prove the fact that weightlifting training do not prevent growth.

A Comparison of the Height of Woman Weight Lifting Players and That of Hurling and Marathon Players (cf. Table 3)

Table 3 A Comparison of the Height of Woman Weight Lifting Players and That of Hurling and Marathon Players

events	number of players	average age (year)	average height (cm)	rate of surpassing (%)
weight lifting	75	16.21±1.72	160.80±4.67	73
hurling	42	20.7 ±2.34	172.76±3.73	81
marathon	27	16.32±2.21	160.40±7.21	41

As can be known in Table 3, although hurling and marathon players receive

much less stress in their usual training as that of weightlifting players, among 75 woman weight lifting players who are investigated, there are 73% of them have achieved or surpassed their possible heredity height; of 42 hurling players, 81% of them received; of the 27 marathon players, 41% of them have. The average age of the hurling players is 20.7, which is of the stable growth period and that weight lifting and marathon players (aged from 16.21 to 16.32) is of the period of slow growth. Therefore all the woman weight lifting players investigated have a tendency of height increasing.

CONCLUSION

The receive-stress of different segments for a woman weightlifting player in her training is much greater than a normal person. The received stress is a necessary factor to stimulate bone growth and to promote height increasing. Woman weight lifting training do not prevent the increase of height, on the contrary, strength training increase the speed and scale of those on heredity gene.

REFERENCES

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