LAWS AND CHARACTERISTICS OF THROWING POWER CHANGES FOR DIFFERENT WOMEN DISCUS THROWERS

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INTRODUCTION

Throwing power means that rate of muscles do work when throwers do throwing movements. It depends on strength and speed of thrower. It is a sensitive index to mirror explosive force   and   fast   strength. The purpose of this paper is revealing laws and characteristics of throwing power changes for different women discus throwers by result measuring of throwing various weights to different Chinese women discus thrower and throwing   power   calculating,   and providing   scientific   basis for effective making fast strength training of women discus thrower.

METHODS

1. The study objects of this paper are 60 grade 2 and   above Chinese women discus throwers (tab.1).

Tab.1   General Situation of Study Objects

	Master	Grade 1	Grade 2
Number	13	17	30
Age	22±2.6	20.8±2.7	18.5±2.6

Master: 55m;   Grade 1: 51m;   Grade 2: 39m

2. Asking for the thrower, from standard weight of women discus (1Kg) to 7Kg, take 0.25Kg--1Kg as a weight unit, to throw various kettle-bell. Each weight has 2--3 times to throw, and take the best one as its decisive result.

3. Using two "Chuen Feng" high speed cameras have shot together the movement of thrower, and making analysis, thereby, getting the data about the angle of release, the height of release, and the distance of force.

RESULTS

1. The Definition of Throwing Power

Throwing power means that rate of muscles do work when throwers do throwing movements. It is as same as the meaning of power in mechanics, that is:

$$P=\frac{\int_0^s Fds}{t}=\frac{\overline{Fs}}{t}=\overline{F}V_0$$

2. Calculation to Throwing Power

From the theorem for projectional motions:

$$D=\frac{V_0^2 \sin a \cos a + V_0 \cos a \sqrt{V_0^2 \sin^2 a + 2gh}}{g}$$

and the theorem for conservation of energy: $\dfrac{MV_0^2}{2}+Mg\,\Delta h=\overline{F}S$. And it can be deduced for the throwing power equation to discus throw:

$$\overline{F}V_0 = \frac{5.45MD^3}{S\cos^3 a(D\tan a + h)\sqrt{D\tan a + h}}$$

(M: the weight of implement; D: the distance of throw; S: the distance of force; a: the angle of release; h: the height of release)

3. Results and Discussion

To reveal the laws and characteristics of throwing power changes for different women discus thrower, we have made the measuring of throwing various weights to different Chinese women discus thrower (Master; Grade 1; Grade 2), and to calculate their throwing power (Tab.2-3).

Tab.2 Contrast Between Kettle-Bell Weight and Throwing Power
For Different Women Discus Thrower

	1	2	3	4	4.5	5	6	7	8	9
Master	826	1216	1363	1398	1415	1464	1379	1323	1231	1123
Grade 1	736	1123	1216	1230	1247	1208	1224	1172	1096	1020
Grade 2	647	927	991	1025	1012	971	931	923	760	746

Tab.3 The Relation Between Power and Weight
of Different Women Discus Throwers

Grade	Number	Section
Master	13	0.905
Grade 1	17	0.862
Grade 2	30	0.900

The Tab.2-3 show: 1) there are a very close relation between the power and the weight   Increase with the weight of kettle-bell, throwing power is more and more. However, when the weight of kettle-bell reaches a certain extent, if it is increased continually, the power is not only increasing, but also it reduce obviously. 2) It is also different for the kettle-bell weights of the greatest power what the thrower display. Generally speaking, the kettle-bell weights of the greatest power: master > grade 1 > grade 2 Tab.4.

Tab.4   The Greatest Power Weight for different
Women Discus Throwers (Kg)

	Master	Grade 1	Grade 2
Number	13	17	30
Weight	5.25±0.50	4.38±0.93	4.00±0.82

CONCLUSION

1. There are a very close relation between the power and the weight, Increase with the weight of kettle-bell, the throwing power also raise gradually. However, when the weight of kettle-bell reaches a certain extent, the power is not increased; and it will be reduced obviously if it is increased continually.

2. It is various for the implement weights of the greatest power what the thrower   display. Generally speaking, the higher the thrower's performance the

stronger the greatest throwing power and the heavier the corresponding throwing weight.

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