THE RELATIONSHIP BETWEEN DELIVERY SPEED 
AND THE USE OF LIGHTER OR HEAVIER IMPLEMENTS

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Abstract
The use of weighted balls provides an effective means to improve muscle strength, endurance and functional fitness. Anyone can use medicinal balls or weighted balls to improve their physical condition, from rookies to performers. Weighted ball training increases muscle strength and throwing speed, depending on the weight (of the used items) and it promotes diversity by introducing a new stimulus in physiological adaptation. At the same time, matching an appropriate speed represents a dangerous factor concerning the safety of the athlete as it may become too demanding with regards to the biomechanics involved. Speed cannot be so easily controlled. Overall strength is developed with the aid of plyometric exercises, as well as muscle endurance, and last but not least, suppleness. Research focused on the effectiveness of strategic training has revealed mixed results.

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JEL classification: I20, I25

1. The addressed issues

Athletes that throw either javelins, discs, hammers, baseballs, soccer balls, or any other object, often train with much heavier materials in the hope that it will strengthen the muscles involved in the actual throwing motion, thus increasing the release rate of the object. There are still ongoing talks of a strategy that could lead to the best results. Failing to achieve a certain goal after working with heavy balls is most likely caused by the lack of specific training. When athletes fail to throw objects heavier than the norm by using the technique required in the event, the achieved gain of force will not be very helpful.

2. Practical Applications

While promoting weighted training exercises, several studies (De Rennes, C. et al. 1994) have shown that athletes who train with heavier items/balls actually improve their velocity as long as the practice throws are similar to the required throwing form. This method of training is the most specific and useful form of weighted training that an athlete can use.

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On the other hand, other experts (theorists as well as coaches) argue specifics, such as the imperativeness of alternating weights during training, which (taking into account that speed is the result of symbiosis between strength and coordination), seems to be a correct statement. As has been shown, throwing heavier objects develops muscle power, while using lighter balls, improves coordination through the recruitment and use of fast twitch muscle fibers. These two advantages mold together, and lead to an increase in throwing speed.

How should the two ways of throwing be harmonized? How does someone appropriately choose the weights?

In general, lighter weights are used to train speed, while the use of heavy balls leads to an increase in power. Firstly, a coach should determine the athlete’s training objectives: power or speed? A large number of athletes opt for heavier objects than is necessary. The general rule to be applied when selecting weight is that the ball should be heavy enough to slow the motion, but not as much as to reduce the accuracy or control of the throwing gesture. At the end of training, fatigue will diminish the quality of execution. Some experts (Ivan, C., 2002) recommend a surplus of 50 up to 100% (under certain conditions).

According to the principle of progressive load, it is recommended that movement becomes more economic and strength grows, higher weights can be moved on to. It is thus preferable to start with a light ball, and then gradually increase the load.

Misuse of these exercises however, can affect technique by deteriorating the motion pattern, pace and the speed of execution. One aspect often encountered in practical training (with throwers) is the lack of a way to transform accumulated force (from the preparatory period) into specific quality (explosive force). The consequence of this fact is, stagnation (in the best case), or even the regress of performance, usually accompanied alteration of technique.

To avoid these situations, Ardelean, T. (1981) formulates a methodical rule: accumulation of pure force must be transformed progressively into a specific quality, which in turn must be integrated in competition technique and form or, in other words, preventing the apparition of these negative effects can be achieved by alternating weighted and regular executions.

Russian scientists recommend a preliminary period of heavy object throwing, followed by light ball work in order to build a strong shoulder before subjecting it to the great forces involved when applying speeds higher than the norm.

A relatively new study published on the Brian Mackenzie's Successful Coaching (2003) website discusses the advantages of working firstly with heavy and then lighter objects as opposed to alternating load throws. In light of this information, University of Hawaii researchers have initiated an experiment involving student-athletes over a period of 10 weeks, after a program that included three workouts per week:
A control group used only the standard weight (150 grams);
the second group was trained with standard weight as well as a heavier load (170 grams) for 5 weeks, those were followed by another 5 of working with the standard weight as well as lighter load (113 grams);
the third group used standard weight as well as heavier and lighter loads during the same practice session, over a period of 10 weeks.

A normal workout included 66 throws, distributed as follows:
• for the control group – each throw was executed with the standard weight;
• for the second group
  o 11 throws with a standard weight ball, 44 with the heavier load, 11 with the standard ball, for the first 5 weeks;
  o 11 throws with a standard weight ball, 44 with the lighter load, 11 with the standard ball, for the following 5 weeks;
• the third group trained by the following formula: 11 standard-22 heavier-22 lighter-11 standard.

After 10 weeks of training, the control group failed to improve velocity, but the other two had increased their speed by about 6 to 8%. As such, it appears that weighing down or lightening the practice ball can lead to an increase in throwing speed. At the same time, the experiment has revealed that the order in which the weighted exercises are distributed throughout a training program is irrelevant. Regardless of the order, either light or heavy first, as long as there is alternation throughout training, there will be results.

Hawaiian scientists quoted by Reynolds, W. (2003) recommended the use of objects or balls that are 20% above or below the standard weight. No athlete was injured during the experiment, which shows that the use of such weights is reasonable and safe.

### 3. Conclusions

• ball throwing/medicine ball throwing develops contraction power in the shoulder;
• an optimal result can be obtained if lighter as well as heavier balls are used during the same practice session throughout the training interval.
• the use of objects or balls that are 20% above or below the standard weight is recommended.
REFERENCES

4. Reynolds, W., 2003, “Athletes who throw things should alternate between heavy and light”. Brian Mackenzie’s Successful Coaching, p. 6