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Original article

## EFFECTS OF BULGARIAN BAG EXERCISES ON POWER AND SHOT SPEED FOR HANDBALL PLAYERS

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### Abstract\*

*Aim.* Handball is one of the most popular team sports worldwide. According to the International Handball Federation, about 800 000 teams from 183 handball associations are registered (IHF, 2013). In recent years, handball has received increased attention in research literature, and several authors have investigated the physical demands for elite players. One of the most ultimate extreme fitness tool is Bulgarian Training Bag. The unique shape of the bag designed to allow for both upper and lower body training while emphasizing superior grip strength at all times. The purpose of this study was to investigate the effects of Bulgarian bag exercises on power and shot speed for handball players.

*Methods.* Twenty handball female players were randomly allocated to receive either an 8-week intervention of the of Bulgarian bag exercises (n = 10) and a control group receiving 8-week of normal training only (n = 10). The radar speed gun monitored jump shots with a 2 m run-up in randomized order. The data collected before and after the program for the two groups.

*Results.* Statistical analyses showed that:

- The experimental group had significantly higher than the control group in shot speed.
- The experimental group had significantly higher than the control group in physical variables (strength-power)

*Conclusions.* Under the conditions of our study, complex training to 8 weeks resulted in an increase in power and shot speed for handball female players. These results have to be taken into account by coaches in order to better understand and implicated of these concepts for technical effects of training.

*Key words:* Bulgarian Bag Exercises, Power, Shot Speed, Handball Players

### Introduction

Handball is a sport in which two teams of seven players (six field players and one goalkeeper) play against each other. The goal of the game is to throw the handball into the opponent's goal and score a goal. The team will win the most goals after the end of the season. Thus, handball demands speed and endurance at the same time. It trains both muscle fibers, which can bring a particularly high performance in the short term, as well as those, which are specialized in a perennial load. A complete handball game of 60 minutes of game play will train your stamina. (Ahmed, 1998). Handball also requires jumping force and throwing force (fast-action).

Since handball is a physically very robust sport compared to other team sports such as football or basketball, regular strength training should also be on the coach's agenda. In particular, defenders must be able to physically intervene against the opposing offensive players, which is why strength and general fitness

training is also a very important component of professional handball training. Players can, train with weights and training devices, but weight lifting exercises like pull-ups or pull-ups can already be very effective. If the players have high physical fitness, they are also less vulnerable to injuries. (Kamal et al., 1998)

The Bulgarian Bag, also known as Bulgarian Training Bag is an exercise equipment in the form of a crescent moon used in strength training, Plyometrics, Weight training, aerobic exercise, and fitness in general. Bags are made of leather or synthetic leather and filled with sand; Weigh between 3 to 38 kg and have flexible handles to allow training of the upper and lower body, and to improve the prehensile strength.

Ivan Ivanov invented the Bulgarian bag in 2005. Ivanov is Bulgarian Olympic athlete in Greco-Roman wrestling worked as a Greco-Roman Olympic wrestling trainer at the Marquette, Mich., Olympic training center. Hewas looking for a training tool that would allow fighters to improve explosive actions. and

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the dynamic movements related to pushing, twisting, balancing, pulling, twisting, rotating, crouching, ramming, and throwing.(Sava Sport, 2015)

Ivanov was inspired by the tradition of the shepherds performing demonstrations of strength with sheep and goats at the fairs in their native Bulgaria. Shepherds were often forced to carry sheep and lambs around their shoulders when they moved with their flock, and they showed their strength at festivals. Ivanov based the design of his tool on the body of a sheep and saw its use as an interpretation of the tradition.

The exterior of the Bulgarian bag is made of very resistant leather or synthetic leather. The leather bags are handmade in Bulgaria and mostly constructed with goatskin. As goatskin is thinner and the follicles are shallow on the skin, there is less compromise in skin resistance compared to other leathers. The interior is filled with sand packs that have been weighed and wrapped individually and padded with wool to have a more smoothly rounded contour. Once filled, the main joint is closed with thick nylon.(Suples Training Systems, 2015)

The exterior of the bag consists of three types of handles and strips to allow various types of exercise with different grips.

- The main grips are two points at each end of the bag and are used for swing and rotation movements.
- The outer grips on three tube shaped protrusions coated with goatskin on the upper outer side of the bag. The outer grips are mainly used to work prehensile strength and upper body exercises.
- The third element is the ribbons, two nylon loop ribbons sewn directly to the outside of the bag. They are approximately 30 cm long and are used to stabilize the sac over the shoulders in lower train exercises, and as grips in arm exercises.

Home Bulgarian bags can be made from car tire chambers or children's floats.

The bag can be used as free weight in several simple and dynamic movements such as pushing, rotating, balancing and rotating, and added to the weight of the body itself to perform jumps, squats, pushups, dominated and abs. (Hulsey et al., 2012)



Fig 1 show the Bulgarian bag

The Bulgarian bag is available in several standard sizes, differing in weight and marked with a different color of the straps. When choosing a Bulgarian bag for your workouts, use a simple rule - it is about 20% of your weight, or follow the recommendations below:

- The lightest (XS) is 5 kg. They are with yellow straps and are designed for women weighing 27-45 kg, children and beginners who are in a very bad shape.
- The next size is an S - 8 - pound Bulgarian bag with green straps, which is for athletes weighing between 45 and 68 kg. People

with a few months' workout behind their backs should start with this size to master the various basic movements and exercises with the Bulgarian bag before switching to the next largest Bulgarian bag.

- The third size Bulgarian bag is M, which has green straps and weighs 12 kg. Designed for athletes between 68 and 86 kg. This size is also the most appropriate choice for physically fitters, fitness trainees and sportsmen, since the requirements it places on the athlete is an average of a good level of the body's energy security at



physical exercise, a stable average Body and a healthy hold.

- Silver straps are the 17-pound L-size Bulgarian bag, which is for athletes weighing over 86 kg. Recommended only for physically well-trained people with a sufficient level of anaerobic endurance and strong grip. Ordinary fitness lover will not be able to handle this size of the Bulgarian bag, so if you fall into this group, head to one of the previous variants.
- In addition, the latest, the heaviest version is XL-22kg, with brown or black straps. This Bulgarian bag is recommended only to elite athletes with years of training history behind them as it puts the body of the trainee with it at a serious load.

Bulgarian bag exercises, like all plyometric shock-training exercises, pose a greater risk of injury due to the large forces generated during acceleration, and should only be performed by individuals in good physical condition, or under supervision.(K. Sell K, et al. 2011)

The purpose of this study was to investigate the effects of Bulgarian bag exercises on power and shot speed for handball players

### Methods

#### Experimental Approach to the Problem

Two groups (experimental and control) performed a pre and post - training designed intervention in which Standing Long Jump Test, Softball throw test, Handgrip Strength (left), Handgrip Strength (right) and shot speed test. The experimental group (EG) (10female handball players) trained 1 hour per day 3 times a week on Bulgarian bag exercises for eight weeks. The control group (10female handball players) continued their normal training, while the experimental group completed Bulgarian bag exercises program to see whether this type of training modality would have a positive or negative or no effect on physical variables and shot speed among female handball players.

#### Samples

Twenty handball female players were randomly allocated to receive either an 8-week intervention of the of Bulgarian bag exercises (n = 10) and a control group receiving 8-week of normal training only (n = 10). The radar speed gun monitored jump shots with a 2 m run-up in randomized order. The data collected before and after the program for the two groups.

#### Testing Procedures

Subjects were assessed before and after eight weeks of Bulgarian Bag training program all measurements were taken one week before and after training at the same time of day. Tests followed a general warm-up that consisted of running, calisthenics, and stretching.

#### Hand Grip Strength Test

The purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles.

The subject holds the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer is adjusted if required - the base should rest on first metacarpal (the heel of the palm), while the handle should rest on middle of four fingers. When ready the subject squeezes the dynamometer with maximum isometric effort, which is maintained for about 5 seconds. No other body movement is allowed. The subject should be strongly encouraged to give a maximum effort.

#### Standing Long Jump Test

To undertake this test you will require:

- Long Jump pit
  - 30 meter tape measure
  - Assistant
- Conduct the test
- The athlete warms up for 10 minutes
  - The athlete places their feet over the edge of the sandpit, crouches down and using the arms and legs jumps horizontally as far as possible landing with both feet into the sandpit
  - The assistant measures and records the distance from the edge of the sandpit to the nearest impression made by the athlete in the sand pit
  - The athlete repeats the test 3 times
  - The assistant uses the longest recorded distance to assess the athlete's leg strength
- Softball throw test.

The softball throw is a track and field event used as a substitute for more technical throwing events in competitions involving Youth, Paralympic, Special Olympics and senior competitors.

The general rules for the softball throw parallel those of the javelin throw when conducted in a formal environment. However, the implement being thrown is a standard

softball, which resembles the size of a standard shot put but is considerably lighter.

#### Shot Speed test.

Speed radar is a device used to measure the speed of moving objects. It used in law-

enforcement to measure the speed of moving vehicles and often used in professional spectator sport, for things such as the measurement of ball speeds in handball.



Fig 2 show Microdigicam Laserto measure shot speed

#### Statistical analysis

All statistical analyses calculated by the SPSS statistical package. The results reported as means and standard deviations (SD). Differences between two groups reported as mean difference. Confidence intervals (meandiff ±

95% CI). Student's t-test for independent samples used to determine the differences in fitness parameters between the two groups. The  $p < 0.05$  was considered as statistically significant.

#### Results.

Table 1. Anthropometric Characteristics and age of the groups (Mean ± SD)

Group	N	Age [years]	Weight [kg]	Height [cm]
Experimental	10	20.17 ± 0.4	69 ± 3.9	178 ± 4.77
Control	10	21.09 ± 0.6	70 ± 4.1	179 ± 5.56

Table 1 shows the age and anthropometric characteristics of the subjects. There were no significant differences observed in the anthropometric characteristics and age for the subjects in the different groups.

Table 2. Mean ± SD and "T" Test between the pre and posttests for experimental group in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed.

Variables	Experimental group		Sign.
	Before	After	
Standing Long Jump Test	2.27±0.42	2.35± 0.53	S
Softball throw test	40.19±1.04	43.65 ±1.46	S
Handgrip Strength (lift)	26.00±1.45	28.25 ±2.05	S
Handgrip Strength (right)	30.80±2.56	33.70 ±3.67	S
Shot speed	109.19±2.89	113.35 ±2.97	S

Table 2 shows that:

- Significant Difference between the pre and posttests for experimental group in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed for posttest to the experimental group.

Table 3. Mean  $\pm$  SD and "T" Test between the pre and posttests for control group in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed

Variables	Control group		Sign.
	Before	After	
Standing Long Jump Test	2.26 $\pm$ 0.31	2.27 $\pm$ 0.29	NS
Softball throw test	40.53 $\pm$ 1.04	41.21 $\pm$ 1.11	NS
Handgrip Strength (lift)	26.71 $\pm$ 2.48	27.12 $\pm$ 2.15	NS
Handgrip Strength (right)	29.90 $\pm$ 3.18	31.05 $\pm$ 3.49	S
Shot speed	108.37 $\pm$ 2.88	110.17 $\pm$ 2.73	S

Table 3 shows that:

- No Significant Difference between the pre and posttests for control group in hand Grip Strength (lift), Standing Long Jump Test, and Softball throw test.

Table 4. Mean  $\pm$  SD and "T" Test between the two Groups (experimental and control) in hand Grip Strength, Standing Long Jump Test, Softball throw test and shot speed

Variables	Experimental group	Control group	Sign.
	After	After	
Standing Long Jump Test	2.35 $\pm$ 0.53	2.27 $\pm$ 0.29	S
Softball throw test	43.65 $\pm$ 1.46	41.21 $\pm$ 1.11	S
Handgrip Strength (lift)	28.25 $\pm$ 2.05	27.12 $\pm$ 2.15	NS
Handgrip Strength (right)	33.70 $\pm$ 3.67	31.05 $\pm$ 3.49	S
Shot speed	113.35 $\pm$ 2.97	110.17 $\pm$ 2.73	S

Table 4 shows that:

- Significant Difference between the experimental group and control group in hand Grip Strength (right), Standing Long Jump Test, Softball throw test and shot speed for posttest to the experimental group.
- No Significant Difference in handgrip Strength (lift)

## Discussion

This study assessed the effects of an eight weeks Bulgarian training bag program, on the power, shot speed, Experimental results indicated that all variables significantly increased in the experimental group only after the Bulgarian training bag program.

Due researchers occurrence of these changes to good Bulgarian training bag planning exercise program and rationing training loads in a scientific manner appropriate to the stage of the Sunni and training for research sample. Where the patron researchers training loads graded during the application of the program by training muscle groups different, especially the muscles of the centre, arms and legs and the concentration of the researchers on the muscle groups working during the throw spear, causing it to improve the physical abilities under discussion.

This is confirmed by (Vairavasundaram & Palanisamy, 2015) that Bulgarian bag strengthens and increases the physical strength of the hand, wrists, arms, shoulders, back, legs and rotational muscles.14 It also helps to improve core muscles, coordination, and mobility of shoulders and joints. Due to its shape, material and construction, the Bulgarian bag can be used to develop speed and agility in ways that are not possible with weights and machine circuits.

It is consistent with the findings (Jones, 2004). Bulgarian bag breaks the tradition of static resistance devices such as free weights that adhere to a single plane of motion (eg creating resistance by pushing or pulling weight towards or away from the body), using acceleration movements And deceleration to balance and rotate the sac at various angles to the athlete's body. As a result, the Bulgarian bag has the ability to increase the strength and agility of the body completely.



The multi-angular approach to gravity, momentum and inertia in physical exercise has been termed Variable Angular Resistance training. (Lake & Lauder, 2012)

After cardiovascular workout or weight training, the body continues to need oxygen at a higher rate than before starting exercise. High intensity exercise intervals with the Bulgarian Bag increase metabolic rates at levels higher than traditional weightlifting and cardiovascular activity because exercise includes both components, weight lifting and rapid dynamic movements.

Originally referred to as oxygen debt, this aerobic effect after exercise. More recently, researchers have used the term 'excess post-exercise oxygen consumption' to describe the different events that occur when the body restores itself to homeostasis, or resting. The body's metabolic rate rises for a longer period after high-intensity exercise. Depending on the level of stress and intensity of exercise, increases in metabolism can be observed up to 18-24 hours later. (Ranieri, 2001)

Since the handles of the Bulgarian Bag are flexible and not rigidly attached to the body of the apparatus, it is more complicated for an athlete to transfer the weight of the apparatus to his arm and forearm muscles than to traditional weights, and the athlete's wrists suffer a greater load. For people with weaker wrists, the use of wristbands that provide additional support would be advisable.

The Bulgarian Bag has a number of merits that can make everyone put it into practice:

- Can serve as a full body warm-up before commencing the day's workout;
- Also, use it for high-intensity training, for example cross-path method;
- Develops the superpower, stability, coordination, agility and balance that underlie almost all sports.
- Increases the mobility of your joints and hence the risk of trauma will decrease;
- Strains and strengthens your forearms and grip in a totally different way, and strong grip is among the mandatory elements in sports such as Judo, Canadian combat, etc.
- Also helps in weight loss and in weight gain.
- Learns and trains the transmission of motion from one circuit to another and its execution in more than one plane, is the principle of complexity.

- A great way to trace the exact moment of activation of each muscle from a given chain of motion;
- Can be used by both home and outdoor trainees;

Inspired by the strength of the once-Bulgarian shepherds, who often had to walk around the lamb herd, he decided to create such a tool for his trainees to help them not only become more explosive. In addition, to improve their own Dynamic qualities (speed, agility, coordination) needed to combat moves such as pushing, pulling, spinning, squeezing, throwing, etc. (Weiss & Halupnik, 2013)

Handball is a fast and physically assorted ball sport, which demands the field players physically everything. For this reason, handball players, whether professional or amateur players, not only train handball-specific, but also complete numerous training sessions in the gym. The two-team movement in the handball is extremely hard, which is why handball players need a strong stature in order to be able to defend themselves against opponent defenders or attackers. (Mounir, 1985)

A good handball player combines within the scope of his abilities numerous attributes such as speed, agility, strength and endurance. Handball players need strength in the legs for fast sprints and high jumps, but must also have powerful arms if they want to place the ball at high speed in the opponent's goal. Compared to football, the upper body of the handball is much more important, and it is important that handlers train the muscle groups of their entire body, so that they are physically fit for their challenging sport.

The device violates the tradition of static resistance to free weights that adhere to movement in one plane. This leads to the device's ability to increase the strength and flexibility of the whole body. The strong aerobic effect that results from the dynamic movements that are made with the pouch should not be forgotten. The metabolic increase can be observed even after 18-24 hours. (Kamal et al., 1998)

### Conclusion

- The Bulgarian Bag is an extremely effective training tool for female handball players.
- Safety is key when training with the Bulgarian Bag.



- Manipulating the variables in programming is the ultimate key to success in creating programs that are within your client's ability range and challenging enough to elicit the desired training effect you are looking for.

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