

The effect of water bag training on dynamic balance and defensive movements of handball juniors**Prof. Dr. Marwan Ali Abdullah**

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Introduction and research problem:

Sports training is a continuous process that is planned in several stages, each stage has its own duties, as these stages represent an integrated unit that ultimately seeks to bring the athlete to the top of his level in the type of activity he practices during the competition stage. Since one of the most important duties of sports training is to raise the player's physical and skill capabilities to the highest level, those in charge of the sports training process, when developing the player's physical and skill level, need to be familiar with the information related to training methods, means and tools, due to their impact on the development of special physical and skill capabilities.

Sports training in general and in handball in particular aims to develop the components of physical fitness and skills required, as it seeks to achieve the highest possible level, by using exercises to develop and enhance the players' abilities and physical and skill capabilities, thus giving them the opportunity to perform their duties at the highest level of efficiency to obtain the greatest benefit for them and their team.

Scientific development has achieved a great renaissance in all fields, which has led to the development of the sports field in a remarkable way through sports achievements in various types of sports and thanks to the reliance on scientific methods and techniques in sports training such as organized and standardized training based on scientific foundations that enabled the athlete to reach the highest level in sports championships.

"Bobu Antony" (2015) indicates that training with modern equipment is one of the basics of physical preparation as it has become one

of the necessary requirements in various sports activities that can be practiced, whether those activities are individual or group, as it is one of the effective methods that have an impact on the development of special abilities in various sports. What is called the Bulgarian bag has appeared, which refers to the physical fitness training method that uses a system of ropes and bands called suspended training that allows the player to work against his full weight in training (2: 36).

Vairavasundaram & Palanisamy (2015) add that fitness trainers and athletes alike are looking for new fitness tools that achieve the desired results, and using the water-filled core bag is the ideal tool because it is multi-purpose, functional and effective for all types of training (10:16).

"Lou, Alwyn" (2016) agrees with "Joyce, Lewindon" (2014) that using distinctive tools to disrupt balance such as the aqua bag, as these tools can be used in various positions and have the advantage of placing water in specific amounts inside them, which gives them a certain amount of resistance in addition to the movement disturbance that occurs during performance, and these disturbances work to reduce the speed of movement and work to strengthen the trunk muscles in a way that improves performance (9:187) (7:43).

Lou, Alwyn (2016) added that the aqua bag is considered one of the most important means of training the core muscles, as the bag is filled with water, which gives it a weight that is difficult to control during performance and training using it improves muscle strength, balance and stability of the trunk. It does not only target the large muscles, but on the contrary, it targets the small muscles and improves the neuromuscular coordination between them (9: 187).

Heyard (2008) states that resistance training, symbolized by the symbol W-F-B, which stands for water bag training, is suitable for beginners as well as advanced levels, and its intensity can be graded by changing the amount of water inside the bag. These inflatable cylinder-shaped bags can be filled with water, which creates an unstable and unpredictable weight mass. The aqua bag comes in three different sizes to ensure that there is always a size that suits different uses, as the unstable, constantly moving water mass helps to gain stability, strength and core strength. It not only stimulates large muscle groups but more importantly stimulates small muscle groups (6:140).

Through the previous presentation and within the researchers' knowledge of many scientific references and previous studies specialized in

the field of sports training in general and handball training in particular, and by following many matches for handball juniors in Minya Governorate, it became clear that there is a clear deficiency in the level of skill performance among juniors, which appears in the form of repeated skill errors, especially defensive ones, and a decrease in the level of performance during the last halves of the match, as it is known that handball coaches rely on developing the efficiency of the upper and lower extremities during training, as handball is one of the sports activities that depend in its practice on the muscles of the lower and upper extremities, and it is known that the amount of muscles in the lower extremities of handball players produces a large amount of strength that plays a major role in implementing skill duties.

The researchers noted through a survey study on a group of distinguished juniors and others who are not distinguished in defensive performance during matches, and the most important results were that the distinguished juniors enjoy clear physical efficiency at the level of the center muscles compared to other juniors who are not distinguished in skill performance and defensive movements in particular. The decrease in the physical and functional efficiency of the core muscles causes a deficiency in the connection between the upper and lower limbs of the player, which prevents the power from the lower limb completely reaching the upper limb as a result of the weakness of the trunk muscles responsible for transferring power from the lower limb to the upper limb, meaning that the interest in groups of trunk muscles through traditional training and neglecting other groups, which made them have a defect and a deficiency in their strength, which prompted researchers to try to find a way to treat this problem through water bag training. The water bag works to strengthen the core area and develop the trunk muscles in an effective functional manner, which helps to fully transfer the power produced from one end to the other and be completely fluid while maintaining no loss of power from the core area, which increases the amount and quantity of power transferred from the lower body to the top.

Research objective:

The research objective was to identify the effect of using the water bag on the level of (dynamic balance) for the handball junior under investigation and the level of (defensive movements) for the handball junior under investigation.

Research hypothesis:

1. There are statistically significant differences between the average ranks of the pre- and post-measurements of the research sample in the physical and skill variables in favor of the post-measurement.
2. The percentages of improvement differ between the pre- and post-measurements of the research sample in the physical and skill variables under study.

Research terms:**Aqua bags:**

It is a new tool for fitness training that has appeared in the past few years and works to develop muscle strength, muscle capacity, and trunk muscles. Its dimensions are an empty weight of 1 kg and a maximum weight of 26 kg. It can hold about (25 liters of water) in its diameter of 20 and its length of 85 cm. The bag material is PVC and the handle material is neoprene (4:420).

Research plan and procedures**First, the research methodology**

According to the nature of the research problem and to achieve its objectives and test its hypotheses, the researchers followed the experimental method using the experimental design for one group by following the pre- and post-measurement of the sample under study.

Second: Research community and sample

The research community is represented by handball juniors registered with the Egyptian Handball Federation for the 2024-2025 sports season in the 2006 Junior Handball League in Minya Governorate, numbering (25) twenty-five junior handball players.

The researchers also selected the research sample intentionally from the juniors of the Mallawi Sports Club team, and the sample size is (10) ten players registered with the Egyptian Handball Federation for the 2024-2025 sports season. The researchers also used (8) juniors as a survey sample from outside the basic sample and within the research community. Table (1) shows the research community and sample

Table (1)

Description of the research community and sample

Research community		Primary sampl		Exploration sampl		Excluded			
Number	Ratio	Number	Ratio	Number	Ratio	Number			Ratio
25	100%	10	40 %	8	33 %	7	Goalkeepers	3	12 %
							Injured	4	16 %

Table (1)

- Description of the research community and sample, where the percentage of the basic research sample was (40.00%), and the percentage of the exploratory sample was (33.00%), thus the two research samples represent a percentage of approximately (73.00%) of the total research community, as the researchers excluded (7) players from the research community due to the non-attendance of (5) players and the injury of (2) others.

Moderate distribution of the research sample individuals:

The measurements of the research sample were conducted by finding the skewness coefficients before starting the implementation of the proposed training program, in order to ensure moderation in the research variables that may affect the research results in all research variables, and the following table (2) shows this.

Table (2)

Arithmetic mean, standard deviation and skewness coefficient for the research

sample In the physical and skill variables under stud (n = 10)

Variables		Arithmetic mean	Median	Standard deviation	Skew coefficient
Age		١٧.٥٠	١٧.٥٠	٠.٥٣	٠.٠٠
Training age		١٧٣.٢٠	١٧٣.٠٠	١.٨١	٠.٣٣
Height		٧٣.٤٠	٧٤.٠٠	١.٥١	١.٢٠-
Weight		٤.٧٠	٥.٠٠	٠.٤٨	١.٨٦-
Physical variables	Dynamic balance	٦.٣١	٦.٣٠	٠.١٩	٠.١٦
Skill variables	Defensive movements	٤٩.١٨	٤٩.٣٠	٢.٢٦	٠.١٦-

Table (2) shows the following:

- The values of the torsion coefficients for the group using water bag training in the physical and skill variables under study ranged between (-1.86, 0.41), i.e. they were limited to (± 3), which indicates that the distributions are close to moderation in all research variables, which

indicates the moderation of the distribution of the research sample individuals.

Methods and tools for collecting data:

3. References and specialized research:

The researchers conducted a reference survey of references, research and specialized scientific studies in the field of handball in order to explore and formulate the research problem and present the surrounding aspects and identify the various dimensions that contribute to solving it and using previous studies and research in directing the study and methods of addressing it and how to discuss and interpret the results and benefit from those references and studies when designing the training program and identifying the most important physical and skill variables and choosing appropriate training as well as appropriate tests to measure the specified variables.

4. Devices and tools used in the research:

The researchers relied on collecting data on:

- Height and weight measurements on the Restameter device.
- The most prominent tools used were water bags of various types, hand balls, plastic cones, medicine balls, step boxes, measuring tape, stopwatch, hoops.
- The water bag, which has clearly appeared in the past few years and focuses on the use of external resistance, is a bag filled with water in quantities that match the player's level and age group, as it provides continuous and variable resistance with the movement of water inside the bag, and there are two types of water bags, a single-handed water bag (which is held by one fist with the water bag) and the other type is double-handed (which is held by two fists fixed to the water bag used).

3. Tests under study:

- Physical tests:
 - Y.TEST to measure dynamic balance.
- Skill tests:
 - Defensive movements test

Exploratory study

The researchers conducted an exploratory study on a sample of (8) players from the research community and outside the main research sample.

Scientific transactions for tests in the research:

A- Validity:

To calculate the validity of the tests, the researchers used discriminant validity, where the researchers applied these tests to the survey sample, which numbered (8) players, and they were divided into two groups, one of which was distinguished with a high level in handball and the other with a lower level, then the researchers calculated the significance of the differences between the two groups, as shown in Table (3).

Table (3)
Significance of the differences between the distinguished and the less distinguished in handball In the physical and skill variables under study (n = 8)

Variables		The least distinguished			The distinguished			Z value
		Arithmetic mean	Average ranks	Sum of ranks	Arithmetic mean	Average ranks	Sum of ranks	
Dynamic balance	Physical variables	٦.١٢	٢.٦٣	١٠.٥	٦.٤٧	٦.٣٨	٢٥.٥	*٢.١٩
Defensive movements	Skill variables	٤٨.٤٧	٢.٥٠	١٠.٠	٥١.١٣	٦.٥٠	٢٦.٠	*٢.٣١

Table (Z) value at level (0.05) = 1.96 (0.01) = 2.58

*Significant at level (0.05) ** Significant at level (0.01)

It is clear from Table (3) the following:

- There are statistically significant differences between the distinguished and less distinguished players in handball in the physical variables tests in favor of the distinguished players, which indicates the validity of the tests under investigation and their ability to distinguish between the two different groups.

B- Stability:

To calculate stability, the researchers used the method of applying the test and reapplying it, where they conducted the first application of the tests on the exploratory sample of (8) players, then reapplied the tests for the second time on the same sample with a difference of three days between

the first application and the second application, then calculated the correlation coefficient between the two applications, as shown in Table (4).

Table (4)

Correlation coefficient between the first application and the second application of the sample Under investigation in physical variables tests (n = 8)

Variables		First application		Second application		R value
		Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation	
Dynamic balance	Physical variables	٦.٢٦	٠.٢٠	٦.٢٨	٠.١٦	**٠.٩٤
Defensive movements	Skill variables	٤٩.٧٥	١.٤٩	٤٩.٨١	١.٤٠	**٠.٩٦

Table value (r) at level (0.05) = 0.707 (0.01) = 0.834

*Significant at level (0.05) ** Significant at level (0.01)

It is clear from Table (4) the following:

- The values of the correlation coefficients between the first application and the second application of the sample under study in the physical variables tests ranged between (0.94: 0.98), which indicates that the selected tests have high stability coefficients.

Water bag training program:

First: Objectives of the water bag training program:

- Raising the level and developing physical abilities.
- Developing the skill level.

Second: Content of the water bag training program:

To achieve the goal of the proposed program, the content of the proposed training program was determined in terms of duration, number of weekly training units, number of daily training units, load cycle, unit time, time ratios for general and specific physical preparation and skill preparation. The program content includes a set of physical and skill training, graded in terms of intensity and difficulty of performance. The following conditions were taken into account when selecting and designing the training:

- Focus on flexibility and stretching training for muscle groups to prepare the muscles for muscular work. Gradual increase in the intensity and distance of performing the training to be similar to the same performance of the motor work for the skill and matches.
- Selection of specialized training for the basic skills under study.

- The intensity of the training load for water bag training is between (60 - 80%) of the maximum intensity for the research sample.
- The number of repetitions within the main part ranges from (8 - 12) repetitions and groups of (3 - 6) groups.
- The number of water bag exercises that the researchers put in place was (70) exercises for the upper and lower limbs with both hands and one hand as follows:
 - 30 exercises with both hands (1 – 30).
 - 20 exercises with one hand from (31 – 50).
 - 20 skill exercises with one hand and two hands from (51 – 70).

The duration of the program was determined as (12) weeks at a rate of (5) training units per week, and one training unit per day for (90 minutes) for the main part and warm-up time outside the training program time, and the load cycle (2-1) with a time ratio for skill preparation (40), and for physical preparation (60%) divided into (40%) of the preparation time for general preparation, (60%) of it for special preparation. The time for the water bag program was determined by determining the times for the physical and skill variables required to be developed using this method, and the time for each unit ranged from (45) minutes in each training unit, and the rest of the unit time is worked on with the team coach. The water bag program was implemented from the fourth week of the training program. The number of units reached (40) training units at a rate of (5) daily training units for a period of (8) weeks. The time for the water bag program reached (1800) minutes, which is represented by the time for training the water bag for the physical and skill variables under study. Steps to implement the research

Pre-measurement:

The researchers conducted the pre-measurement of the sample under study in the physical and skill variables after completing the exploratory experiment and verifying the validity and reliability of the research tools on Saturday and Sunday, corresponding to 4 and 5/6/2023 AD. These measurements included (height, weight), and tests for the physical and skill variables under study.

Implementation of the training program:

The researchers applied the proposed training program to the sample under study using the Bulgarian bag, which took (12) weeks starting from Saturday, corresponding to 18/6/2023 AD to Thursday, corresponding to 1/9/2023 AD for the training program as a whole, as the researchers deducted (8) weeks from the program, which are the only ones in which the Bulgarian bag was applied.

Post-measurement:

The researchers conducted the post-measurement of the sample under study after completing the application of the proposed program in the same way as the pre-measurement on Saturday and Sunday, 3 and 4/9/2024 AD.

Statistical method used:

- Arithmetic mean.- Mann-Whitney non-barometric test.
- Median.- Correlation coefficient.
- Standard deviation.- Wilcoxon non-barometric test.
- Skewness coefficient.- Percentage improvement rate.

The researchers accepted a significance level at (0.05, 0.01) levels, and the researchers used the SPSS program to calculate some statistical coefficients.

Presentation, interpretation and discussion of the results**First: Presentation of the results**

Results of the first hypothesis, which states: There are statistically significant differences between the average ranks of the pre- and post-measurements of the research sample in the physical and skill variables in favor of the post-measurement.

Table (5)

Significance of statistical differences between the average ranks of the pre- and post-measurements For the research sample in the physical and skill variables (n = 10)

Variables		The least distinguished			The distinguished			Z value
		Arithmetic mean	Average ranks	Sum of ranks	Arithmetic mean	Average ranks	Sum of ranks	
Dynamic balance	Physical variables	٦.٣١	٠.٠٠	٠.٠٠	٧.٥٤	٥.٥٠	٥.٥٠	**٢.٨١
Defensive movements	Skill variables	٤٩.١٨	٠.٠٠	٠.٠٠	٦١.٤٥	٥.٥٠	٥.٥٠	**٢.٨٠

Table (Z) value at level (0.05) = 1.96 (0.01) = 2.58

*Significant at level (0.05) ** Significant at level (0.01)

It is clear from Table (5) the following:

- There are statistically significant differences between the average ranks of the pre- and post-measurements of the group using water bag training in the physical and skill variables in favor of the post-measurement.

Results of the second hypothesis which states: There are statistically significant differences between the average ranks of the pre- and post-measurements of the research sample in the physical and skill variables in favor of the post-measurement.

Table (6)

Percentage improvement rates between the pre- and post-measurements of the research sample In the physical and skill variables (n = 10)

Variables		Pre-test average	Post-test average	Percentage improvement
Dynamic balance	Physical variables	٦.٣١	٧.٥٤	%١٩.٤٩
Defensive movements	Skill variables	٤٩.١٨	٦١.٤٥	%٢٤.٩٥

Table (6) shows the following:

- The percentage improvement rates between the pre- and post-measurements for the group using water bag training ranged between (19.49%: 24.95%), indicating the effect of the program based on using water bag training in improving the physical and skill variables for the group using water bag training.

Second: Discussion of the results

The following is clear from Table (5) (6):

- There are statistically significant differences between the average ranks of the pre- and post-measurements for the group using water bag training in the physical and skill variables in favor of the post-measurement.
- The percentage improvement rates between the pre- and post-measurements for the group using water bag training ranged between (19.49%: 24.95%), indicating the effect of the program based on using water bag training in improving the physical and skill variables for the group using water bag training.

The researchers attribute this improvement to the effect of the proposed training program using the water bag as a modern tool for sports training, and where the use of gradual intensity exercises was taken into account, which gives the opportunity to repeat the performance many times and with high efficiency, which has shown its effect in improving the physical and skill variables under study, in addition to increasing the number of repetitions during the performance with continuous and gradual progress in the load, in addition to the diversity of the exercises used,

which took into account the diversity and comprehensiveness of the various parts of the body when choosing and implementing them.

The researchers also attribute this clear improvement in the physical and skill variables under study to the effect of the proposed training program using the water bag, which is considered a modern tool for sports training in handball training, as it includes the use of a group of diverse exercises, which adds diversity and change in the use of training tools as well as the participation of different parts of the body in one work such as (hands - legs - and trunk) during the performance, taking into account the scientific foundations while planning the preparation period in light of taking into account the age stage and available capabilities, which contributed positively to improving the level of physical and skill capabilities under study.

The researchers attribute this improvement of the sample individuals in the physical and skill variables under study in the dimensional measurement after applying the training program using the water bag exercises and the method of preparing it and taking into account the gradualness and undulation of the load and the rest periods between the exercises as a whole and between the exercise and its repetition, as the researchers took into account training with gradual loads during the application by training the different muscle groups, especially the muscles of the center, arms and legs and paying attention to special physical exercises that work in more than one direction on all the joints of the body and led to an improvement in the level of performance and the researchers focused on the muscle groups working during the performance as the motor transfer improved thanks to the use of the water bag because the weight used during it is not fixed in the movement during the performance and this works to create nerve stimuli that work to recruit more motor units and also worked to reduce the load on the joints and ligaments in order to improve neuromuscular coordination, balance and stability during the performance, which led to an improvement in muscle strength and ability.

The researchers also attribute this improvement to the positive effect of the water bag training program that contained physical exercises similar to motor performance as well as directed and varied specific exercises for body parts to develop physical abilities and the researchers used the combination of physical performance And the skill in training similar to motor performance, and continuing to implement water bag training has an effective impact in improving physical abilities due to what it includes of a

high degree of resistance to the body in order to strengthen the movements of the arms, legs and trunk and improve strength.

Kelly (2012) confirms that training using resistance tools works to increase the cross-sectional area of the muscle and increase the diameter of the thick muscle fiber in the trained muscle by focusing on the center muscles, so the muscle fiber grows and thus increases the amount of protein in the muscles, which leads to acquiring muscle tone (8:150).

Hay (1996) confirms that the activity of the elastic reflex allows for the excellent transfer of muscular ability to the same similar movement that requires high ability from the trunk and legs, and its results appear when performing muscular ability tests, as the physical component is considered one of the pillars of training that is relied upon in developing the player. It is one of the important foundations that shares with motor skills in forming the player from the physical aspect, and its effect will be reflected in the skill results, as training using the water bag is one of the forms of functional resistance training that aims to direct the resulting force in the direction of motor performance (5: 190).

"Cissik, J. & Dawes, J., " (2015) agree with "Baechle.t" (2004) that training with a water bag is a means of strengthening muscle strength, reduces the load on the muscles, focuses the load on the joints and ligaments, and recruits muscle units that improve muscle control and improve internal coordination to try to control the water inside the tools. This in turn adds new muscle excitement that is not usual in traditional training. However, training with movements similar to motor performance with tools that contain a certain amount of water causes a kind of disturbance during the movement. This aims to strengthen larger muscle groups compared to traditional training, which improves muscle strength (3: 191) (1: 71).

Thus, through the previous presentation, the first and second hypotheses of the research are achieved, which states:

- There are statistically significant differences between the average ranks of the pre- and post-measurements of the research sample in the physical and skill variables in favor of the post-measurement.
- The percentages of improvement differ between the pre- and post-measurements of the research sample in the physical and skill variables under study.

Conclusions and recommendations

First: Conclusions

In light of the research objectives and hypotheses and within the limits of the research sample and procedures and based on statistical treatments, the researchers reached the effectiveness of the training program prepared using water bag exercises in improving the motor abilities under study on some physical variables (dynamic balance) and some skill variables (defensive movements) for the handball players under study, and this was shown through:

- There are statistically significant differences between the average ranks of the pre- and post-measurements of the group using the Bulgarian bag exercises in the physical and skill variables in favor of the post-measurement.
- The percentages of improvement between the pre- and post-measurements of the group using the water bag exercises in the physical and skill variables ranged between (19.49%: 24.95%), which indicates the effect of the program based on the use of water bag exercises in improving the physical and skill variables of the group using the water bag exercises.

Second: Recommendations:

Based on the results reached by the researchers through this research, the researchers recommend the following:

1. The necessity of replacing traditional weights and tools with modern auxiliary tools within the training program units.
2. Holding refinement courses for trainers to provide them with knowledge and information about "water bag training" with the aim of spreading the use of modern auxiliary tools among trainers to benefit from its advantages and improve the athletic level of players.
3. The necessity of conducting more similar studies to identify the effect of "water bag training" in different age groups and on different sports.

Abstract of the research

The research aims to identify the effect of using a water bag on the level of (dynamic balance) for the handball junior under study and the level of (defensive movements) for the handball junior under study, according to the nature of the research problem and to achieve its goals and test its hypotheses, the researchers followed the experimental method using the experimental design for one group by following the pre- and post-measurement of the sample under study. The research sample is represented by the intentional method from the juniors of the Mallawi Sports Club team, and the sample consists of (10) ten players registered with the Egyptian Handball Federation for the sports season 2024-2025 AD, and the proposed training program consists of (70) training for the upper and lower limb with the hands, 30 training with the hands, 20 training with one hand from, 20 skill training with one hand and two hands from, and the duration of the program was determined to be (12) weeks at a rate of (5) training units per week, and one training unit per day with a duration of (90 minutes), and in light of the objectives of the research and its hypotheses and within the limits of the research sample and its procedures Based on statistical treatments, the researchers concluded that the training program prepared using water bag training was effective in improving the motor abilities under investigation on some physical variables (dynamic balance) and some skill variables (defensive movements) for the handball players under investigation. The percentage improvement rates between the pre- and post-measurements for the group using water bag training ranged between (19.49%: 24.95%), which indicates the effect of the program based on using water bag training in improving the physical and skill variables for the group using water bag training.

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