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The Effect Of Training On A Sandy Ground In The Development Of Response Speed And Explosive Strength And Their Relationship To Take-Off Shoot Of Handball Players Under The Age Of 20 (Biskra Union Team Field Study)

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Abstract :
The purpose of this study was to determine the effect of training on sandy ground on the development of response speed and explosive strength, as well as their relationship to take-off shoot of handball players under the age of 20. We used the experimental method on a deliberately selected sample of 14 Biskra Union players divided into two equal and homogeneous groups, the control and the experimental. For motor response speed, explosive force test (cmj and cd), and take-off shoot test at (09) and (06) meters, we used Nelson's auditory and visual tests.The findings concluded that training on sandy ground affects the development of response speed and explosive strength, as well as having a correlation with take-off shoot of handball players under the age of 20

Keywords: Ground, Response Speed, Explosive Strength

Article info

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1. INTRODUCTION

The motor response is one of the mental abilities that plays an important role in the technical and artistic performance of offensive and defensive skills, and it forms with the rest of the physical characteristics one of the foundations in resolving situations. Recognizing and perceiving stimuli helps the player prepare motor programs in the brain, which makes the response fast. This shows how important mental ability is in handball, along with compound strength. Explosive strength is one of the most important performance requirements in all sports, including handball, because it is the deciding factor in winning matches, especially when team levels converge. Trainers use sandy grounds to build strength and speed. Coaches and handball specialists must solve scientific training issues. It also requires finding modern scientific and experimental methods to improve players' physical and skill levels.

1.1.Study problem:

The problem of this study can be formulated in the following main question:

What effect does training on sandy ground have on developing response speed and explosive strength, as well as their relationship to take-off shoot in handball players under the age of 20?

The following sub-questions fall under this problem:

- Whate ffect does training on sandy ground have on the response speed of handball players under the age of 20?
- Is training on sandy ground beneficial to the development of explosive strengthin handball players under the age of 20?
- Is there a link between the speed of motor response and the explosive strength of shooting in handball players under the age of 20?

1.2.Study Hypothesis:

This study proceeds from the following main hypotheses:

Sandy ground training has an impact on the development of response speed and explosive strength. And there is a symmetrical relation ship between them and take-off shoot in handball players under the age of 20

The following sub- hypotheses fall under this main hypotheses:

- Training on sandy ground has an effect on developing response speed in handball players under the age of 20.
- Training on sandy ground has an effect on the development of explosive strengthin handball players under the age of 20.
- There is a correlation between the speed of the motor response and the explosive strength of take-off shot of handball players less than 20 years.

1.3.Defining concepts and terms

1.3.1. Sandy Ground

The sandy surface of the sports field is fundamentally different from other surfaces because when a foot is lowered onto it, it is submerged into the sand, which causes increased relative movement between the dry, incoherent sand grains. As a result, the athlete must exert more force to push the body mass up and over them while performing the exercises (Aleaziz Faraj & Firas Matrash, 2021, p. 139).

1.3.2. Response speed

It is the ability of an individual to respond to a specific stimulus as quickly as possible, and it is made up of reaction speed and response speed (Sharit, 2014, p. 13).The total amount of time that passes between the occurrence of the stimulus and the completion of the movement or action is what Hasan Allawi and Muhammad Nasr al-Din refer to as "the link between the time of reaction and the time of

movement" (Qadur, Morsli, & Iad, 2019, p. 3).

1.3.3. Explosive strength

its the capacity to exert the most force in the shortest amount of time (Hammad, 2008, p. 90). The development of this aspect of muscle strength is related to the regulation of the muscle's activity during a single contraction by the muscle's maximum shortening (the muscle shortens when it flexes) and with the involvement of the greatest number of motor units during the strongest contractions. As the number of motor units stimulated by nervous system stimuli rises, so does the force of muscle contraction (Jaber & Ehab, 2005, p. 44).

1.3.4. Take-off shot

Attackers in the back line frequently use this type of shooting to get past the defensive line and get close to the goal of the opposition. The attacking player, after receiving the ball, approximates steps that aid in the strength to stand up or rise with the opposite leg of the throwing arm. This is the motor performance of this type of correction (Feghouli & Muhammad, 2020, p. 238).

1.4.Literary Review

1.4.1. Bahman Mirzaei et al. (2014)

Under the title: *The effect of six weeks of horizontal jumping versus vertical jumping in the sand on muscle pain and performance* .The purpose of this study was to determine how six weeks of horizontal and vertical sand jumping affected leg strength, jumping, running, and agility .The study's sample consisted of 30 Iranians who were randomly selected and distributed as follows: age (20.4 ±1.1 kg), height (177.4 ±5.1 cm), mass (72.7± 9.7) kg, and divided into three groups: (10) horizontal jumpers, (10) vertical jumpers, and (10) controls .The study's findings showed that the two experimental groups performed better than the control group in both horizontal and vertical sand jumping, indicating that the sand's ability to improve muscular performance is real.

1.4.2. Feghouli Samir and Hadadeh Mohamed (2019)

Under the title: *The use of exercises by the high-intensity and repetitive interval training methods in developing the performance of the muscle strength of the lower extremities (maintenance force, force characterized by speed, explosive force) and their effect on the skill of shooting accuracy from the high jump for handball players under 21 years old*. The goal of the study was to determine how repetitive training drills and high-intensity interval training affected the handball players' high jump shooting accuracy and muscle strength. shedding light on the significance of the trait of special muscle strength, along with other traits, and its influence on young athletes' ability to improve their high jump shooting accuracy. In order to determine whether there are statistically significant differences between the pre and post tests of the special force's characteristic (maintenance force, the force characterized by speed, explosive force) and the skill of shooting accuracy in favor of the post tests of the two study groups. The WadSulay team's Chlef was used as the study's intentional sample, which included (20) players. It was homogeneous in terms of age, weight, height, and special strength tests because it was determined that there were no statistically significant differences for these characteristics. The sample was then split into two groups, each with ten players. The repetitive training method and the high-intensity interval training method were designed as part of the study procedures, and the researcher used an experimental approach that was suitable for the study's purpose. The findings showed that the experimental group using the high-intensity interval training method performed better than the group using repetitive training in terms of developing and maintaining strength, as well as strength characterized by speed and explosive strength. These differences were statistically significant at the level of significance (0.05). And the development of strength characterized by speed using the method of repetitive training resulted in statistically significant differences in favor of the experimental group.

1.4.3. AzaliKhalifa and Tautao Zahra (2019)

Under the title: *The effect of training in clay courts on the explosive strengthof soccer players under 19 years old*.The purpose of the study was to shed light on the process of training on sand as well as the differences between the effects of training on floors (sandy and artificial grass) and explosive power.The study's hypotheses centered on whether there were statistically significant differences between the pre and post measurements of the explosive force of the experimental group in favor of the post measurement, as well as whether there were statistically significant differences between the pre and post measurements of the explosive force of the control group in favor of the post measurement, and whether there were significant differences between the two groups. The experimental group won the statistical comparison between the two dimensions of explosive force between the two research groups. Due to the experimental methodology's suitability for the study's purpose, it was used. A sample of (16) players, divided into two groups of (08 control players and (08 experimental players), was chosen at random for the study. For eight weeks, the researchers used a training program .The researchers came to the conclusion that the experimental group's rate of improvement in explosive strength was higher, indicating that training on clay courts was effective in helping middle-class soccer players develop this trait.

1.4.4. Mehrez Hammami et al. (2020)

Under the title: *The effect of the sand surface on the nature of the performance responses of handball players to plyometric training* .The purpose of this study was to determine how seven weeks of training affected the sand and the types of responses that handball players made during plyometric exercises. The study sample consisted of 30 people and was split into two groups: a control sample with ten players and an experimental sample with ten players trained in the sand and on a flat surface. According to the study, there was a noticeable increase in the direction of change in the experimental sample, favoring the sandy floor. The study also found that jumping with movement significantly increased vertical jump for both experimental samples at the level of significance of 0.005, with a value of 0.170, while jumping without movement significantly increased vertical jump at the level of significance of 0.001, with a value of 0.172.The results also showed that the sandy ground and the two experimental groups had an advantage in the rapid repeated running test, and the two plyometric groups found a significant improvement in the dynamic balance (0.005).

2. Methodology and study limits

2.1.Study community

The Study sample was specifically chosen to represent the team of under-20 players from the Biskra Handball Federation, which consisted of (14) players. Taking into account the conditions of weight, age, height, and training age as shown in the following table, we divided the research sample into two equal and homogenous groups, one of which is a control group of (07) players and the other an experimental group of (07) players.

Table 1. Explain the characteristics and variables of the study

Characteristics	Arithmetic average	standard deviation
age (years)	**19.7** years old	**3. 4**
length (cm)	**182.21** cm	**2.36**
weight (kg)	**72** kg	**9.57**
Training age (years)	**4.5** years old	**0.5**

Source: Prepared by the researcher

2.2.Study variables

- The independent variable: training on sandy ground.
- Dependent variable 01: speed of motor response and explosive power.
- Dependent variable 02: aiming from elevation.

2.3.Study fields

- **Spatial field:** The study was carried out in the city of Biskra, in the sports hall of February 18, Al-Alia.
- **Temporal field:** This field study was conducted in the period from December 15, 2021 to February 27, 2022.

2.4.Field study process

- **Exploratory study:** Before beginning the experiment, we visited the site to inspect the equipment used and learn more about the team's training schedule. This allowed us to determine the best way to conduct the tests while avoiding potential stumbling blocks and issues.
- **Pre-measurement of the research sample:** On December 2, 2021, the players underwent a performance recording that included the Nelson test and a shooting test from an elevated position. Then, at a rate of two sessions per week, we implemented an 8-week training program that included exercises to improve reaction time and strength that are characterized by speed on a sandy and flat floor. The training program began on December 10 and ran until February 12 of 2022.
- **Post-measurement of the research sample:** To determine the impact of training for the prepared program, as well as the impact of various floors on the speed of response and explosive strengthand their relationship to shooting from ascent, post-measurement was carried out following the conclusion of a set of training sessions. All pre- and post-measurements of the control and experimental samples were recorded while adhering to the same protocols for pre-measuring and recording the players' performance.

2.5.The tests used

- Response speed test: Nelson audio and visual.
- Explosive force test, vertical jump test (cmj), horizontal jump test (cd).
- The take-off shoot test at the level of (09) meters and at the level of (06) meters.

2.6.Statistical processing

For the purpose of producing scientifically reliable results, we used the statistical method for our research, because statistics is the real means and tool by which we treat the results on an actual basis on which the research and survey is based. In light of this, we used the SPSS statistical analysis program to analyze and present the results. As for the tests that we used:

- Student distribution test.
- standard deviation.
- Pearson correlation coefficient
- Arithmetic average .

3. Presenting and discussing the results

3.1. Presentation, evaluation, and discussion of the first hypothesis' results

That states training on sandy ground has an effect on developing response speed in handball players under the age of 20.

Table 2. Shows the differences between the response speed test values on a sandy and a hard ground

Statistical variables /Test		Control Group		Experimental Group		Calculated T-value	Tabular T-value	Significance Level
		SMA	**SD**	**SMA**	**SD**			
Nelson test	Pre	**4.57**	**1.83**	**5.42**	**2.02**	**1.3**	**0.7**	Sig
Audio (sec)	Post	**4.18**	**0.15**	**4.01**	**1.72**	**0.82**	**0.7**	Sig
Nelson test	Pre	**3.22**	**0.41**	**3.49**	**1. 31**	**1.96**	**0.7**	Sig
Visual (sec)	Post	**3.01**	**0.3**	**2.52**	**0.7**	**1.31**	**0.7**	Sig

SMA = Arithmetic average , SD = Standard Deviation .
Degree of freedom n -1 = 13, significance level 0.05
Source: Prepared by the researcher

Through Table No. (02), we can see that the experimental group's arithmetic mean and standard deviation in the post-measurement of the Nelson audio test were estimated to be (4.01 ± 1.72), whereas the control group's arithmetic mean and standard deviation were (4.18 ± 0.15). There is statistical significance because the calculated t-value was (0.82), which is higher than the tabular t-value (0.7) at the degree of freedom (13) and the significance level (0.05).

In the Nelson visual test, we also observed that the experimental group's arithmetic mean and standard deviation were estimated to be (2.52 ± 0.7), compared to (3.01 ± 0.3) for the control group. There is statistical significance because the calculated t-value was (1.31), which is higher than the tabular t-value (0.7) at the degree of freedom (13) and the significance level (0.05).

Due to the effectiveness of the proposed training program's content, which included a set of exercises for reaction speed and motor speed that aim to develop motor response speed, in addition to the duration of Training in classes (60 minutes) and continuity for a period of (08) weeks, the experimental and control sample members' timing improved in the audio-visual Nelson response speed test.The researchers attribute this to the nature of the sandy floor and its unique characteristics, the most significant of which is the amount of work exerted, and they also used a variety of exercises in the response of all kinds. It is evident from Table (02) that the experimental group was more improved than the control group by comparing the arithmetic mean.Newton's law states that there is an equal-in-strength and opposite-direction reaction to every action. As a result, the player's legs sinking into the sand creates a counterforce to the friction process, which prevents him from moving and causes him to change directions. This forces his muscles to work harder and faster, which has a significant impact on his ability to move quickly. The answer This outcome was in line with what (Latoura, Cédric, & Éric, 2010) had predicted (Hammami, et al., 2020). And (kharoubi & kheiredine, 2018)

This confirms the validity of the hypothesis that states that Training on sandy ground has an effect on developing response speed in handball players under the age of 20.

3.2. Presentation, evaluation, and discussion of the second hypothesis' results

That states training on sandy ground has an effect on the development of explosive strengthin handball players under the age of 20.

Table 3. Shows the differences between the explosive strength test values on a sandy ground and a hard ground

Statistical variables/ Test		Control Group		Experimental Group		Calculated T-value	Tabular T-value	Significance Level
		SMA	**SD**	**SMA**	**SD**			
Explosive strength test (cmj)	Pre	**23.2**	**2.64**	**42**	**2.33**	**7.25**	**5.24**	Sig
	Post	**26**	**1.81**	**28**	**1.45**	**6.82**	**5.24**	Sig
Explosive strength test (cd)	Pre	**151.55**	**2.22**	**149.21**	**3.82**	**6.13**	**5.24**	Sig
	Post	**160.34**	**1.77**	**172.12**	**2.89**	**5.32**	**5.24**	Sig

SMA = Arithmetic average , SD = Standard Deviation .

Degree of freedom n -1 = 13, significance level 0.05

Source: Prepared by the researcher

We can see from Table No. (03) that the experimental group's arithmetic mean and standard deviation were estimated to be (28 ± 1.4) during the post-measurement for the vertical jump test (cmj), whereas the control group's arithmetic mean and standard deviation were (26 ± 1.81).The calculated t-value was (6.82), which is greater than the tabular t-value (5.42) at the degree of freedom (13) and the level of significance (0.05), which means that there is a statistical significance.

In the explosive force test (cd), the experimental group's arithmetic mean and standard deviation were estimated to be (172.12 ± 2.89), compared to (160.34 ± 1.77) for the control group. The calculated t (5.32) is greater than the tabular t value (5.24), which means that there are statistically significant differences at the significance level (0.05).

The research attributed this to the contents of the training program, which contained a set of exercises intended to develop explosive power, and it appears that the improvement happened in both groups in the post-measurement. This is in addition to the training's 60-minute lessonlength and its continuity over an eight-week period. By forcing the muscle to perform better, deep jumping and bouncing exercises helped develop explosive power. This development was more pronounced in the experimental group on the sandyground. The researchers theorize that this results from the nature of the sandy ground and its unique qualities, such as providing resistance while training on it, which is characterized by a decrease in the hardness of the ground due to a lack of cohesion of the sand grains, and

which requires the players to exert more effort to overcome the resistance, in addition to conducting two training sessions on the sand each week. In physically active individuals, 72 hours of rest between these sessions is sufficient to inducesignificant explosive strength adjustments and allow for adequate recovery. Where it can be considered a type of training that can be used to improve the athlete's muscular performance and thus influence the muscular strength of the legs, as well as increase the distance of the vertical jump from stability and the long jump from stability.

This is consistent with the studies of (Khalfia & Zahra, 2019), and (Jafarnezhadgero, Amir, Sheykholeslami, Valdeci, & Akrami, 2021)and (Qader & Kazem, 2020), where they indicated that the explosive force can be increased, developed, and upgraded. byincreasing the resistance to which the working muscle isexposed. This supports the current study's findings, which demonstrate how training on sand affects the growth of explosive power.

3.3. Presentation, evaluation, and discussion of the third hypothesis' results

That states there is a correlation between the speed of the motor response and the explosive strength of take-off shot of handball players less than 20 years.

Table 4. Explains the differences between the values of take-off test on a sandy ground and a hard ground

Statistical variables /Test		Control Group		Experimental Group		Calculated T-value	Tabular T-value	Significance Level
		SMA	**SD**	**SMA**	**SD**			
Shooting test 09 m	Pre	**4.21**	**0.21**	**4.3**	**0.64**	**4.01**	**3.2**	Sig
	Post	**6.9**	**0.66**	**7.8**	**0.52**	**3.92**	**3.2**	Sig
Shooting test 06 m	Pre	**5.5**	**0.34**	**5.4**	**0.73**	**5.12**	**3.2**	Sig
	Post	**7.6**	**0.51**	**0.82**	**1.2**	**4.43**	**3.2**	Sig

SMA = Arithmetic average , SD = Standard Deviation .

Degree of freedom n -1 = 13, significance level 0.05

Source: Prepared by the researcher

According to Table No. (04), the arithmetic mean and standard deviation of the experimental group in the post-measurement of the shooting test from the height (09 meters) was estimated to be (7.80 ± 0.52). The control group's arithmetic mean and standard deviationwere (6.90 ± 0.66). The calculated t-value (3.92) was greater than the tabular t-value (3.20) at the degree of freedom (13) and the level of significance (0.05), indicating statistical significance.

The experimental group's arithmetic mean and standard deviation for the shooting test fromascent (06 meters) was estimated at (0.82 ± 1.20), while the control group's was estimated at (7.60 ± 0.51), and the calculated t-value (4.43) was greater than the tabular t-value (3.20), indicating statistically significant differences at the significance level (0.05).

It is clear that there has been a clear development in both groups in the post-measurement, with the experimental group improving more on the sandy floor. The researcher sbelieve this is due to the training

program's content, which included a series of exercises aimed at developing take-off shot .This is in addition to the sandy floor's nature and the special characteristicsit has, the most important of which is the amount of work exerted, so that immersion of the legs in the sand forces the muscle to exert a double effort and at a faster rate thanitg reatly worked to raise the stock of the muscles' rubber energy, and the rubber is considered a special part of the properties of muscle fibers. This is accomplished through muscle contraction following relaxation and elongation, resulting in significant work for the lower extremities, as demonstrated by the study(Hammami, et al., 2020).And the speed of response of the upper limbs during training, which in turn works to develop the take-off shoot efficiency resulting from this system, as indicated by both (Hakim & Sharifi, 2017).

Table 5. Explains the relationship between the speed of response and take-off shot

	speed of response	Take-off shot
Pearson Correlation speed of response	**1**	****765.**
sig (bilateral)	**0**	**0**
N	**13**	**13**
Pearson Correlation Take-off shot	****765.**	**1**
sig (2-tailed)	**0**	**0**
N	**13**	**13**

Source : Prepared by the researcher

Table 6. Demonstrates a relationship between explosive strength and take-off shot

	Explosive power	Take-off shot
Pearson Correlation Explosive power	**1**	****844**
sig (bilateral)	**0**	**0**
N	**13**	**13**
Pearson Correlation Take-off shot	****844**	**1**
sig (2-tailed)	**0**	**0**
N	**13**	**13**

Source: Prepared by the researcher

The Pearson correlation coefficient between response speed and take-off shotreached a value of (0.0765) at the level of significance (0.005) and a degree of freedom (13), indicating that there is a direct relationship. This is shown in tables No. (05) and (06), as well as figures (01) and (02).There is a direct correlation between the explosive force and take-off shot, as shown by the Pearson correlation coefficient, which has a value of (0.0844) at the level of significance (0.005) and a degree of freedom (13).The effect of the incoherent sand grains, which acted as a dampening tool for the movement of the legs when jumping, is thought to be the cause of the direct correlation between response speed and explosive strength with take-off shot. To perform the skill, the players must strike a specific balance, which required them to exert more concentration and accuracy in order to perform the skill with the concentration and speed necessary for shooting from an ascent.

What is explained by (Majid & Shreen, 2020) is that poor balance affects the psychological state of the player, such as what leads to poor attention and focus. Movement and imbalance at the moment of shooting weaken the shooting accuracy by (50%) to (70%), when compared to shooting during equilibrium and stability .This work is based on the individual's muscular and mental capabilities. The speed of the motor response is always related to the reaction and the speed of response to the stimulus.

The accuracy of aiming and calculating the dimensions in terms of distance, timing, and forces increases with movement and maneuverability .Additionally, improving the lower extremity's muscle strength enhances shooting performance from the ascent, as demonstrated by (Boumaza & Muhammad, 2022). The main factor influencing motor output is the explosive strength of the lower extremities, which has a direct and significant impact on how well the shooting skill is executed from a height.

We also observe that the explosive strength and speed of response exercises aim to achieve neuromuscular compatibility between the work of the legs and arms, which increases driving force and enhances take-off shoot performance, which is consistent with the findings of the studies by (Hakim & Sharifi, 2017) and (Hamada & Muratat , 2017), (Alearabi, Brahimi, & Iad, 2018), and (Feghouli & Muhammad, 2020), (ahmed & mouniai, 2018) Through scientific studies, they demonstrated how consistent training for quick thinking and explosive strength on a scientific basis helps to improve the level of skilled performance .Through the foregoing, it can be said that there is a direct correlation between the variables of the study, which confirms the third hypothesis.

4. CONCLUSION

In the light of the results obtained in the applied side and with the aim of identifying the effect of training on a sandy ground in developing the response speed and explosive strength and the nature of their relationship to take-off shoot of handball players under 20 years old, and after presenting, analyzing, discussing and comparing them with hypotheses using appropriate statistical methods, we concluded the following :

- The sandy ground has an effect on the development of response speed in handball players under the age of 20.
- The sandy ground influences handball players' explosive strength development.
- There is a direct correlation between response speed and explosive strength on take-off shot of the handball players.
- The ability for handball players to train on sand through the growth of particular physical traits and particular abilities.

4.1. Suggestions and recommendations

- Using the method of training on the sandy ground as one of the methods affecting the physical and skillful qualities during the preparation period in all sports.
- To get rid of the impact of the training load on the body, the trainer must program several training units on a sandy ground.
- Urging team officials and specialists to pay attention to the hopeful categories, while providing the various structures and capabilities necessary for training and competition.
- Conducting other similar studies in different specializations.

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