

COMPARING SOME DISTANCES, HEIGHTS, AND PREFERENCES WITH THE ACHIEVEMENTS OF THE ADVANCED ARAB HIGH JUMP CHAMPIONS IN 2021

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Abstract

This research aimed to determine the role of some distances and heights and their preference for high jump achievement. It can be said that there is a preference for some distances and heights for high jump achievement, and the research sample was the arab champions in the advanced category of high jump in the arab championship on 6/22/16/2021 in tunisia (rades stadium). I used the descriptive method because it suits the nature of the research issue. He used five cameras in different directions and analyzed the attempt (2.16) meters for each vaulter and compared the two vaulters (husseinfalah and hamdiali) the best in the variables of distance and heights of the center of gravity(cog) of the body and compared the reasons for the success of the jump. He used five cameras installed on a tripod surrounding the player from all directions, and all cameras are at a speed of 120 images per second to adapt them to the speed of performance. Indicated that the player (husseinfalah) relies more on physical abilities than technique; if the technique had been corrected, he would have been able to take advantage of the lost height above the crossbar and break the iraqi record. The player (hamdiali) relies on technique and physical measurements that give hamdi an advantage in crossing the bar on the first attempt. We can recommend developing the technique to a height higher than 2.19, which was successfully jumped by husseinfalah, to identify and improve the weaknesses, whether physical or skill, conduct tests at intervals, and provide effective specialized trainers specializing in high jump.

Keywords

Distances: these are the distances measured by analysis programs for the approach, rise, and flight phases of **the high jump heights:** these are the heights measured by the approach, elevation, and flight phase analysis programs for the high jump at **radz stadium:** this is the name of the stadium in the capital city of tunisia where the 2021 senior athletics championships were held.

Introduction

the science of biomechanics has contributed to the scientific advancement of human movement performance in general and sports in particular because its main content in the field of physical education is the study of the causes of movement, i.e. attention to the internal and external forces causing it and providing the most appropriate solutions by using motor analysis (hassan&abdelghani, 2019) the use of various analytical and scientific programs, as well as the use of advanced and modern devices (hamid, 2019), facilitates the process of detecting the sources of errors in the motor path and adjusting movement paths better according to biomechanical laws (mohamedali et al., 2016) using science, whether it is here we stand that there is a glimmer of hope for the progress of this game leads us to wonder whether the world champions have better qualifications than the local champions and whether they adopt the correct methods of training, so we will conduct a study to find the best distance and height of the center of gravity in the technical and technical performance of the arab champions by filming the players participating in the arab championship 2021 for advanced.this study is important to determine the role of some distances and heights and their preferences in the achievement of the high jump event and whether there is a preference for some distances and heights in the achievement of the 2021 arab advanced high jump champions. Venue of the arab championships 2021/6/22-16. It was held in tunisia (rades stadium).

Methods and tools

Used the descriptive method because it suits the nature of the research issue. The research community selected by the random method is represented by the arab champions participating in the high jump event for strength games in the arab championship in 2021 ad, as shown in table 1. The names of the players participating in the arab championship high jump event on 2021/6/22-16 are 100% of the original community, and table 2 shows the specifications of each player in the arab championship in terms of weight, height, highest achievement, and training time

		1.9 m	1.95 m	2.00 m	2.05 m	2.10 m	2.13 m	2.16 m	2.19 m	2.21 m
1	Hussein falahibrahim (iraq)	-	-	-	Xo	O	Ox	O	Oxx	Xxx
2	Hashembouha noun (algeria)	-	O	Ox	O	Xxx				
3	Khaled al-masid (kuwait)	O	Ox	O	Xxx					

)									
4	Abdul rahman (kuwait)	O	Xxx							
5	Hamdialibakr (qatar)	-	-	-	O	O	O	O	Xxx	
6	Mohamed talaatabutalib (egypt)	O	O	O	Oxx	Xxx				

Table no. 1⁽¹⁾: names of players participating in the arab high jump championship on june 16, 2021

Table no 2: specifications of each player in the arab championship

1.	Hussein falahibrahim (iraq)	190 cm	79 kg	223 cm	25 years	8 years
2.	Hashembouhanoun (algeria)	180cm	73 kg	215 cm	24 years	15 years
3.	Uncle almaseed (kuwait)	182 cm	75 kg	210 cm	26 years	14 years
4.	Abdul rahman (kuwait)	181 cm	77 kg	200 cm	25 years	13 years
5.	Hamdialibakr (qatar)	192 cm	65 kg	227 cm	24 years	15 years
6.	Mohamed talaatabutalib (egypt)	198 cm	87 kg	220 cm	31 years	18 years

Various sources were used in collecting information: arab and foreign sources, observation, analysis, personal interviews the team, the world wide web (internet), software and applications used devices and tools miscellaneous cameras (5) (casio type, chinese-made) with speeds (from 30 photos/s to 1000 photos/s) (ibrahim, 2019) with a camera tripod. Documentation camera (2) and tape measure (1).lenovo laptop (1) and tape measure (2).drawing scale (1 m) (1).legal high jump (1). The researcher consulted many scientific sources and similar previous studies and took the opinions of experts in the field of biomechanics in athletics to determine the most important distances and heights for the stages of the high jump. He conducted photography at the arab championship held in tunisia for the high jump event on wednesday at 4 pm tunisian time by photographing the arab champions for the high jump event using five cameras in different directions as shown in the drawing above, analyzing the attempt (2.16) meters for each vaulter, and comparing the best vaulters (husseinfalah and hamdiali) in the variables of distance and heights of the center of gravity of the body and comparing them with the ingar. 16 meters for

each jumper and comparing the best jumpers (husseinfalah and hamdiali) in the variables of distance, heights, and center of gravity and comparing them to the explosion.

Variables (distances and heights) for the high jump

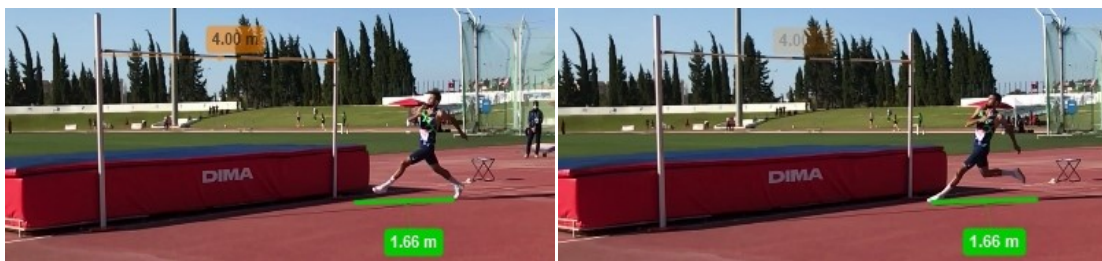
A. Distances

7. Last step distance (hussein, 2011)
8. The horizontal distance from the descending line of the body's center of gravity to the resting foot at the moment of elevation. (tan, 1997)
9. The distance of the resting point from the vertical line descending from the beam in the last step. (díaz-jiménez, 1993)
10. The horizontal distance between the line of gravity and the resting point.(mcnitt-gray, 2008)
11. Distance between the center of gravity of the body in the lift and the beam.(mcerlain-naylor et al., 2014).

B. Heights:

- 1- The height of the body's center of gravity at the moment of rest.(aragón-vargas&melissa gross, 1997)
- 2- The height of the center of gravity at the moment of propulsion.(vassiliospanoutsakopoulos and iraklis a. Kollias, 2012)
- 3- The height of the center of gravity of the body above the beam in flight.(king et al., 2006)

1- The distance of the last step:



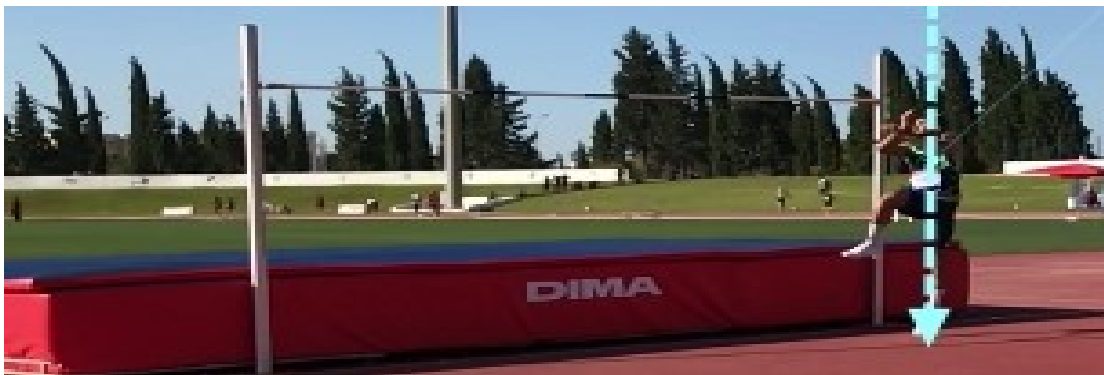
- 2- the distance from the vertical line descending from the body's center of gravity to the first contact with the foot of the support in the last step:



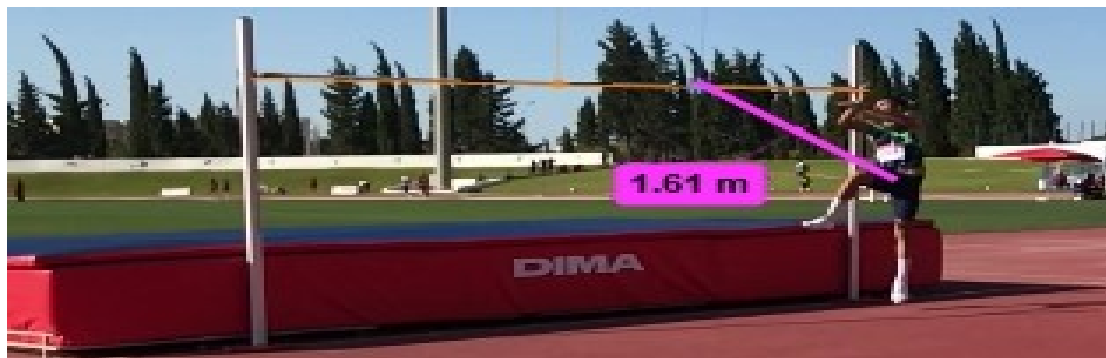
- 3- After the foot rests on the beam holder, it is close to the player:



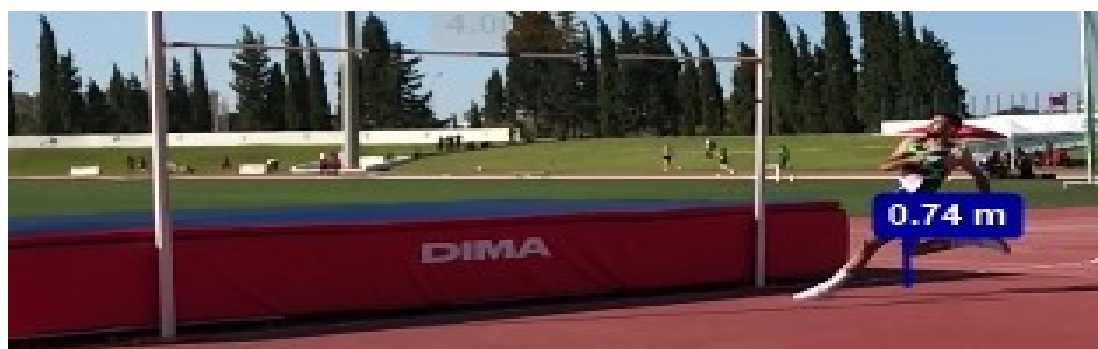
- 4- The horizontal distance during the propulsion phase between the object's center of gravity, the line of gravity, and the point of lift:



- 5- The distance between the center of gravity and the crossbar at the moment of the last contact with the support foot:



- 6- High center of gravity at the moment of impact:



7- the height of the center of gravity at the moment of impulse:



8- The center of gravity rises above the crossbar during flight:



As for the exploratory experiment, on wednesday at 10:00 am tunisian time (16/6/2021), the experiment tested the devices used in the research (cameras) on the players (women's heptathlon) in the morning period to know the obstacles that may be faced during the main experiment held in tunisia, the tools that need to be provided, the validity of the tools used, the permits that must be available, the number of members of the assistant team, the mistakes that could be made, and so on. He was able to determine and stabilize the locations of the cameras during this experiment and know the type of camera and the degree of zoom he needs, and then stabilize the method of performance photography by operating the camera and passing a clip in front of the camera to know the height, the number of the attempt and the player, as well as coordination with the supervisors of the tournament and the judges responsible for judging the event because the main experiment was in the evening period of the tournament for the same day and the time is taken for each attempt or each jump in each height approximately and whether it fits in the storage space of the cameras and charging the batteries. On behalf of video analysis, i used video imaging to determine the biomechanical variables and analyze the movement completely, as it is a way to divide the total sections into parts and study these parts in depth to reveal their subtleties, know the weaknesses and strengths, and obtain the biomechanical variables for each

stage of the performance. He used five cameras installed on a tripod that surrounds the player from all directions, as shown in figure 8, and all cameras are at a speed of 120 images per second (philpott et al., 2021) consistent with that to suit the speed of the performance.

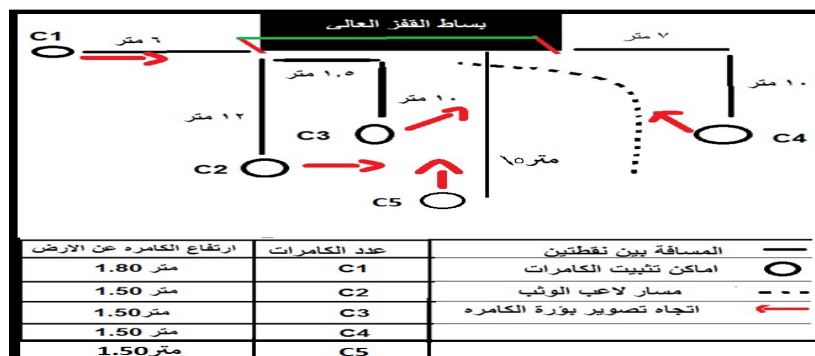


Figure no (1): shows where the cameras are installed inside the stadium and the direction of each camera

The research test was the achievement test for the effectiveness of the high jump (1) by rule (185) - by international law (čoh, 2010).

The researcher used appropriate methods to find out the differences between the players, discussing the results directly without statistics and using charts to illustrate the differences.

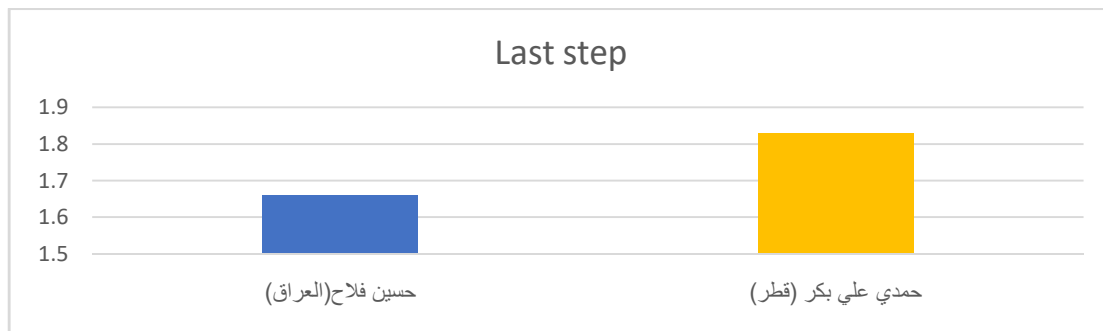
Discuss the results:

1. Discuss the distance results for arab champions2021

Table no. (3): distances taken from husseinfalah and hamdialibakr's 2.16-meter vault attempt

No.	Search variables	Hussein falah (iraq)	Hamdialibakr (qatar)
A	Distance		
1	Last step...	1.66 m	1.83 m
2	The distance from the vertical line descending from the center of gravity to the first touch of the foot of the last step	0.65 m	0.74 m
3	The angle of inclination of the torso at the moment of ascent	6.5 degrees	7.3 degrees
4	The horizontal distance between the line of gravity of the center of gravity and the point of elevation in the propulsion phase	11.29 cm	15.89 cm
5	After the foot of the beam holder is close to the player	0.60 m	0.50 m
6	The distance between the object's center of gravity and the beam at the moment of last contact with the support foot	1.61 m	1.33 m

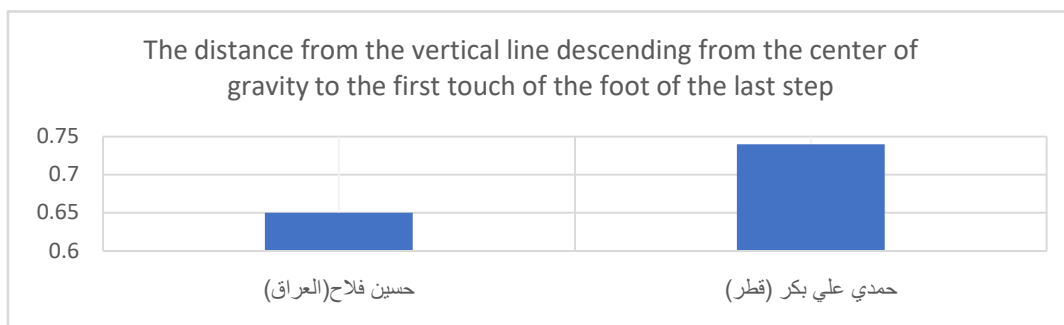
From the results in table (3), we can see that the difference in distances for both players (husseinfalah and hamdiali) is at a height of 2.16 meters, where the step of the player (husseinfalah) is 1.66 meters shorter than the step of the player (hamdiali) at 1.83 meters. We can take advantage of this figure to consider this stage as a negative moment, where the longer the length of this step, the closer the player's center of gravity to the ground, where he will need more force to overcome the negative moment, as agreed with hussein (2013) and increases the time confirmed by marsan (2010). Hussein falah has a better stride length than hamdi.



Hussein Falah (Iraq) Hamdi Ali (Qatar)

Figure no (1): last step

As for the distance from the vertical line descending from the m.w.g. to the first touch of the foot of the last step, the distance of the iraqi player was (0.65) meters and the distance of the qatari player was (0.74) meters.74) meters, where we see the difference between them (11) centimeters and attribute the reason to the difference between the two players in anthropometric heights and mass, where we notice the mass of the player (husseinfalah) (79) kg and the mass of the player (hamdiali) (65) kg, which hinders the player in this step from keeping the leg straight and exerting greater force to overcome his mass and also to maintain speed and agree with (mardan, 2003).



Hussein Falah (Iraq) Hamdi Ali (Qatar)

Figure no (3): the distance from the vertical line descending from the center of gravity to the first touch of the foot of the last step

It can also be said regarding the horizontal distance between the line of gravity and the point of elevation in the push phase with the angle of inclination of the body extracted at the same moment but from a camera with another angle, so we will see a difference in the degree of inclination where, the less inclination the player has, the greater the angle of departure and greater momentum to achieve the required angle to pass the crossbar (hussein, 2013), where the repulsive force will play a big role in directing the player's body to the crossbar where we notice the player (hamdiali) had a greater angle of inclination (7.3) degrees and the horizontal distance between the line of gravity and the point of elevation in the push phase (15.89) centimeters and the distance of the foot from the bar (0.5) meters less, which exposes the player to the direction towards the bar and drops it more as it happened in the height (2 meters 2.19), was not passed by the player hamdi, as he needed a greater momentum to achieve the required angle and obtain the highest height above the crossbar to reach the highest technique and confirm this (al-mohammad, 2001) and the player (hamdiali) passes the lower heights (2.19 meters) from the first attempt, which is an indication of the stability of performance for these heights, while the player (husseinfalah) had a lean angle (6.5) degrees lower than the player (husseinfalah). The horizontal distance between the line of gravity and the point of elevation in the propulsion phase (11.29) centimeters less than the player hamdi and the distance of the foot from the crossbar for the player hussein (0.6) meters greater than the player hamdi, where we notice that the player (husseinfalah) will need to exert less force to direct the body towards the direction above the crossbar and take advantage of the centrifugal force to direct the body and optimize the push time leading to the maximum possible push force is consistent with (taha, 2009).

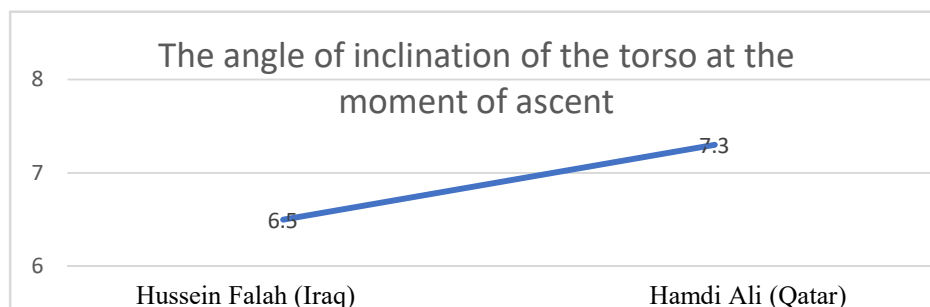


Figure no (4): the angle of inclination of the torso at the moment of ascent

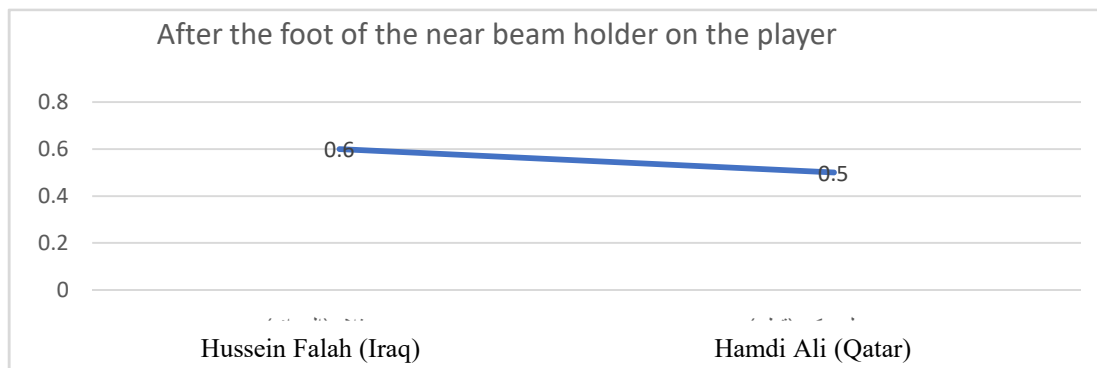


Figure no (5): after the foot of the near beam holder on the player

The researchers notice the horizontal dimension between the line of gravity and the point of elevation in the push phase, represented by the positive torque that the player (hamdiali) needs to maintain the speed and increase the push period necessary to reach the closest point of the crossbar, where the player (hamdiali) was (15.89) centimeters, while the player (husseinfallah) was (11.29) centimeters. Here we notice the difference in distance by (4.6) centimeters in favor of the player (hamdiali) in increasing the push period, as the player needs an ideal time to push.

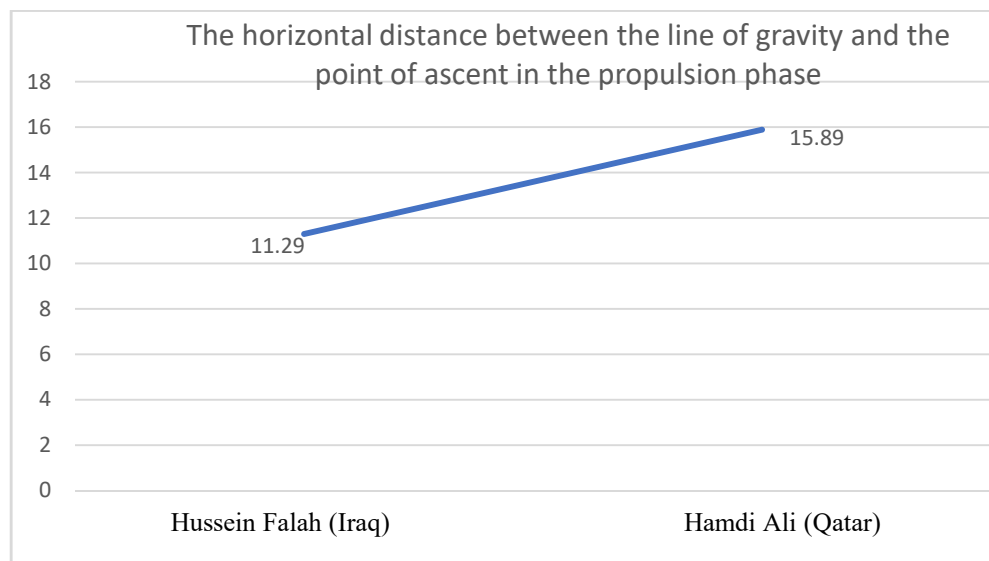


Figure no (6): after the foot of the near beam holder on the player

Regarding the distance of the body's center of gravity from the crossbar at the moment of the push, i.e. in the last touch, we see that the player (hamdiali) is closer to the crossbar by distance of (1.61) meters than the player (husseinfalah) (1.33) meters, and this allows the player (hamdiali) to cross the crossbar with less force than the player (husseinfalah) by (0.32) meters, which enables the player to traverse with greater ease by using the correct technique and taking

advantage of the momentum that the body has during the flight phase to achieve the ideal arc over the bar.

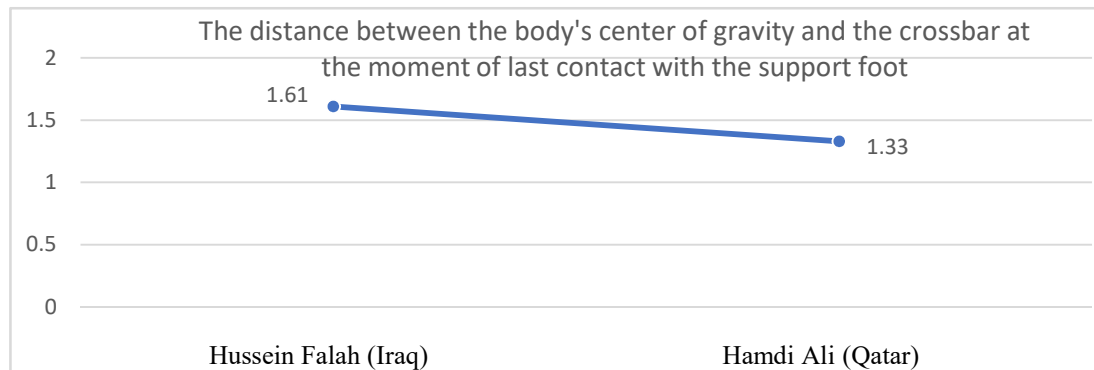


Figure no (7): the distance between the body's center of gravity and the crossbar at the moment of last contact with the support foot

2. Discuss the results of the heights for arab champions 2021:

Table (4) shows the difference in heights between the two players (husseinfalah and hamdiali) in the height (2.16 meters) for the arab championship in tunisia, but there are significant differences in heights that can be explained from a mechanical point of view according to mechanical laws.

Table no. (4): attempted heights of 2.16 meters by husseinfalah and hamdialibakr

No.	Search variables	Hussein falah (iraq)	Hamdialibakr (qatar)
1	The height of the cog at the moment of leaning	0.74 m	0.97 m
2	The height of the cog at the moment of payment	1.21 m	1.41 m
3	The height of the cog above the beam in flight	0.12 m	0.08 m

From here we can compare the height of the center of gravity of the player (husseinfalah) (0.74) meters lower than the height of the player (hamdiali) (0.97), where if we subtract the height of the player's center of gravity at the moment of rising from the moment of rest for both players, we will notice the following: the player (husseinfalah) ($1.21 - 0.74 = 0.47$ meters) is the amount of distance that the player (husseinfalah) could lift his body while the player (hamdiali) ($1.41 - 0.97 = 0.44$ meters), which is less than the player (husseinfalah), i.e. less time. ($1.41 - 0.97 = 0.44$ meters), which is less than the player (husseinfalah), that is, less time, that is, taking advantage of the speed of the line and trying to maintain it. In addition to the player (hamdiali), the height of his center of gravity is closer to the bar; if we subtract the height achieved from the

height of the center of gravity ($2.16 - 1.41 = 0.75$ meters), the player (hamdiali) will pass. As for the player (husseinfalah) ($2.16 - 1.21 = 0.95$ meters), which is a big difference compared to the player (hamdiali), although the player (husseinfalah) passed the bar, he has a loss of strength due to the drop in the center of gravity these points, if adjusted, are consistent with special training for the player (husseinfalah), where he can achieve a better achievement and break the iraqi record, and this is what we aspire to. as for the height of the center of gravity above the bar, here we will see that the player (hamdiali) had benefited from the flying arc more than the player (husseinfalah), as he reached the highest height of the center of gravity above the bar completely (0.08) meters. As for the player (husseinfalah), he had a high height above the bar by (0.12) meters, but he did not have the correct technique to eliminate and take advantage of this height, i.e., the player (husseinfalah) passed a higher height by (2.19) meters. 19) meters, but not by relying on technique, but rather relying on the physical qualities of strength and flexibility and agreeing with more than what is the technique, and this causes him to make mistakes and fail in the first attempts, while the player (hamdiali) is fully dependent on technique and appropriate timing to perform the appropriate movements to traverse with the least possible effort and agree with as we explained earlier in the difference in heights and distances between the two players and the bar.

Conclusions

Hussein falah relies more on physical abilities than technique; if the technique had been corrected, he would have been able to take advantage of the lost height above the crossbar and break the iraqi record. He also emphasized (al-karbouli, 2013) the necessity of some variables that were not available to the player husseinfalah. The player hamdiali relies on technique and physical measurements that give hamdi an advantage in crossing the crossbar on the first attempt.

Recommendation:

The technique must be developed to a height higher than the 2.19 that husseinfalah failed to identify and improve the weaknesses, whether physical or skillful. A complementary study should be done to this study and follow up on the player by the specialists in the biomechanics department in athletics directly, conduct periodic tests, and bring specialized trainers for this event, as agreed (abdullah, 2022).

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