EFFECTS OF SPEED AGILITY QUICKNESS TRAINING PROGRAM ON EXPLOSIVE POWER AND HANDBALL HIGH JUMP SHOT ACCURACY

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ABSTRACT

Background*: The positive effects of using the SAQ training method in developing some elements of physical fitness and skills for professional players were determined, while the effect of this method on learners of sports skills has not been studied.*

Objective*: The presented study aims to identify Effects of Speed Agility Quickness Training Program on Explosive Power and Handball High Jump Shot Accuracy*

Methods*: 40 male Students of the Sports Sciences Faculty at Mutah University were randomly divided into two groups: experimental (EG) including 20 (mean ± SD: body mass: 70.60 ± 4.45; body height: 174.40± 3.70) and control (CG) including 20 (mean ± SD: body mass: 71.95 ± 4.45; body height: 175.65 ±3.13), The experimental group performed SAQ program(24 sessions: 8 weeks,3 sessions per week,60 mins per session, the total time would be 1440 mins) while the control group undertook the same volume of regular training) It is based on cardio and strength training exercises), after that, both groups performed a total of 12 sessions(4 weeks,3 sessions per week,60 mins per session) handball jump shot learning program, so that the total time of the handball jump shot learning program would be 720 mins, Outcome measures were assessed before and after a period of both TRAINING and handball jump shot learning program to measure Explosive Power and Handball High Jump Shot Accuracy, An Independent Samples T-Test and A Paired Samples T-Test were used to analyze data. $p<0.05$ was considered as statistically significant.*

Results*: The improvement observed in the experimental (EG) group was significantly greater compared to the control group(CG) in terms of the Explosive Power and Handball High Jump Shot ($p<0.05$).*

Conclusions: It appears that 8 weeks of speed agility quickness program provides greater benefit for improving the Explosive Power and Handball High Jump Shot in male Students of Sports Sciences Faculty at Mutah University

Keywords: Speed, Agility, Quickness, High Jump Shot, Explosive Power, Handball

INTRODUCTION

Handball is a sport that is growing in popularity and picking up foreign interests of millions of spectators and professionals all over the world (Cetin & Ozdol, 2012). The players should perform movements such as shooting, passing, dribbling, hopping, change of direction, and sprinting through preparation and competition.

Some essential handball techniques, such as shooting, are necessary to make a kind of throw to the opposite target (Sibila, 1997). To be accurate, the throws must be powerful and explosive in order to achieve quick ball motion in a short span of time.

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As a requirement for successful shooting from the jump, most parts of the body must intensify to work in harmony to shot the ball effectively., shooting from the jump is considered one of the most important offensive skills, and it is the final product of performing a series of skills in order to score the largest number of goals in the opponent's goal (Sujarwo & Aryanti, 2010). Motor ability, running, jumping, agility and coordination are the most important physical dimensions associated with shooting, In addition to these elements, accuracy and explosive power play an effective role for the player to gain better achievement in shooting (Siblia,1997),

Success in various sports depends majorly on the athlete's explosive power and muscular strength. The competitor should be able to use strength as quickly and forcefully as possible (Fathy, 2018). The jump shoot performance wanted accuracy, strength, power, speed, agility, balance, stability, and endurance The coaches Players Sports experts looking repeatedly on the roads of up-to-date training to improve the sport performance and to gain a competitive benefit, S.A.Q training is one of the latest of these methods used in the sports area. If check out all sports events almost without exception observed that it requires swift movements; SAQ training could improve the aptitude of the sports performance through the event of this feature (Amany & Gehad, 2017).

Exercise be composed of speed, agility, and quickness may be a training method aimed toward developing motor skills and body motion control through the event of the neuromuscular system. It targets to ameliorate the athlete's ability to perform multi-directional explosive power movements by reprogramming the neuromuscular system, so it can work more efficiently (Vallimurugan & Vincent, 2012). Speed, Agility, and Quickness (SAQ) It has become a mainstream technique for training athletes to vary the intensity of an entire sequence workout, from low intensity to high intensity.

Additionally, SAQ exercises are recommended to warm up, learn motor skills, and improve the physical condition of athletes (Sharma & Dhapola, 2015). Exercising speed, agility and agility may be a system of progressive exercises aimed at developing basic motor skills to enhance an athlete's abilities to be more skilled quickly and accurately. This exercise has become an approved method for training athletes to improve speed and strength to achieve maximum potency (Azmi & Kusnanik,) to enhance abilities of agility, speed, and explosiveness we use speed, Agility, and Quickness training (SAQ). At present, there is an overwhelming amount of information showing that SAQ training significantly reinforces explosive properties such as speed, agility, and explosive power (Miller et al., 2006; Bloomfield et al., 2007; Markovich et al., 2007; Jovanovic et al., 2011).

Most of the previous research has shown confident effects of using the SAQ training method in developing some elements of physical fitness and skills for professional players, but there is little scientific evidence to support the effectiveness of SAQ training for conditioning Samples of Motor skills learners such as Students of Sports Sciences Faculty at Mutah University Faculty. Therefore, the purpose of this study was to determine the effect of Speed, Agility, and Quickness (SAQ) training Program on Explosive Power and Handball High Jump Shot Accuracy for male Students of Sports Sciences Faculty at Mutah University, To achieve this aim, a hypothesis of the study was formulated as “There are statistically significant differences between the experimental and control groups in the level of Explosive Power and Handball High Jump Shot Accuracy”

METHODOLOGY

Participants

All participants were male Students of the Sports Sciences Faculty at Mutah University these were randomly divided into two groups: experimental (EG) including 20 (mean ± SD: body mass: 70.60 ± 4.45; body height: 174.40± 3.70) and control (CG) including 20 (mean ±

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SD: body mass: 71.95 ± 4.45; body height: 175.65 ±3.13) All participants were familiar with SAQ training. None of the participants was injured six months before or during the program's implementation. The study was approved by Sports Sciences Faculty, Participants were fully informed and signed a consent form and were aware that they could withdraw from the study at any time, The experimental group performed SAQ program (24 sessions: 8 weeks, 3 sessions per week,60 mins per session, the total time would be 1440 mins) while the control group undertook the same volume of regular training) It is based on cardio and strength training exercises), after that, both groups performed a total of 12 sessions(4 weeks,3 sessions per week,60 mins per session) handball jump shot learning program, so that the total time of the handball jump shot learning program would be 720 mins, Outcome measures were assessed before and after a period of both training and handball jump shot learning program to measure explosive power and handball high jump shot accuracy

Outcome Measures

High Jump Shot Accuracy

The Purpose of the Test: High jump shot accuracy.

Tools: (12) handball, a high jump device with a height of (150 cm) and the distance between the two posts is (2 m), a curtain made of strong cloth or wire completely covering the goal with (4) holes each of them (40 x 40 cm)representing the four corners of the goal. The jumping device is placed on the 6-meter line and the start of the movement is 11 meters from the goal.

Method of performance: The player stands behind the starting line (according to the domain hand) and directly in front of the jumping device, holding the ball, the player begins to take (2-3) steps and then leads the correction from jumping high to square (1) then to (2) then to (3) then to (4). The performance is repeated (3) times, *i.e.,* (12) balls three of them to each of the four squares

Rules: Take no more than three steps.

Scoring: A point is counted from entering the ball into the shot square. Counts zero for a shot outside the square. The result of a shot from which a player moves more than three steps will not be counted (Al-Khayyat & Al-Hayali, 2001).

Vertical Jump (Explosive Power)

The purpose of the test: maximum vertical jump (Explosive Power)

Tools: Wall, tape measure.

Method of performance: The subject stood beside a wall, started from a static standing position, reached up as high as possible with one hand and marks the wall with his fingertips (mark 1). The jump was preceded by flexing the knees to approximately 90º; the subject jumped up with maximum effort as fast as he could and made a sign on the wall again with the same hand (mark 2).

Rules: The knees should not bend more than 90 degrees, It is not allowed to swing the arms

Scoring: The difference between two marks (1 and 2) in centimeters was considered as the maximum vertical jump height the performance is repeated (3) times, The best attempt is counted (Akbari et al., 2018; Clemente-suarez, 2017).

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Interventions

The SAQ Training Method

Basic anthropometric parameters (body mass and body height) were registered in the study protocol, to prevent unnecessary fatigue accumulation, players and coaches were instructed to avoid intense exercise for 24 hours before each testing session. Immediately before testing participants performed a standard 25-minute warm-up consisting of 10 min of light running, 10 min of dynamic stretching, and 5 m x 30 m of running exercises. All tests were performed on an indoor multisport court.

subjects who fulfilled the criteria were assigned randomly to the experimental and control groups, The experimental group performed SAQ program (24 sessions: 8 weeks,3 sessions per week,60 mins per session, the total time would be 1440 mins) has been designed After viewing on a set of previous studies (Moselhy, 2020; Jovanovic et al.,2011) while the control group undertook the same volume of regular training) It is based on cardio and strength training exercises). We assumed that there would be no difference in the training volume, which represents an important factor when comparing the effects of these two groups (Jovanovic et al., 2011) After that, both groups performed a total of 12 sessions (4 weeks, 3 sessions per week, 60 mins per session) handball jump shot learning program, so that the total time of the handball jump shot learning program would be 720 mins, outcome measures were assessed before and after period of both training and handball jump shot learning program to measure Explosive Power and Handball High Jump Shot Accuracy, Table 2.

Application of the training program for both experimental and control groups in Mu'tah University indoor multisport hall .

Warming up time was determined as (10 mins.) and cool downtime as (5 mins). (Albasiti, 1998; Radwan, 2017)

The interval training method was used with an intensity ranging between (80%-100%) so that the loads used in the program are the medium load, sub maximum load, and maximum load (Saleh, 2019) The intensity of training was monitored using the polar heart rate monitors (Polar, Finland)

program start with 10 mins Dynamic Warm-Up followed by Rest/Water Break 2-3 minutes All speed drills Performed (6 reps total 10 to 30 seconds Rest time between reps & 2 mins between sets, Rest/Water Break 3-5 minutes)

All Agility and Quickness drills Performed (4 reps of each drill, Rest 45-60 seconds between reps & 1 minutes-2 minutes between sets, Rest/Water Break 3 minutes-5 minutes). All workouts were supervised by assistant coaches, before implementing the SAQ program, the experimental group undertook a week-long educational program to ensure the mastery of the technical performance of the exercises. The SAQ training are presented in Table 1.

Table 1
SAQ TRAINING PROGRAM

Time(mins)		**20**	**20**	**20**
Week	**Intensity**	**Speed**	**Agility**	**Quickness**
1	80%-85%	ARM Action	Zig zag	line hops 30 s
		Staggered Shuttle	N run	side line hops 20
		A-skip	W run	Single Leg Line Hops 10 s
		B-Skip	M run	Scissor Steps 20
2	80%-85%	ARM Action	Zig zag	line hops 30 s
		Staggered Shuttle	N run	side line hops 20
		A-skip	W run	Single Leg Line Hops 10 s

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		B-Skip	M run	Scissor Steps 20
3	85%-90%	Heel Flick Skip	A run	Tennis ball Drop
		Ground Starts	E run	Side To Side
		Falling Sprint	Return to the middle	Icky shuffle
		Run – Shuffle – Run	agility lateral mirror	burpees
4	90%-100%	Heel Flick Skip	A run	Tennis ball Drop
		Ground Starts	E run	Side To Side
		Falling Sprint	Return to the middle	Icky shuffle
		Run – Shuffle – Run	agility lateral mirror	burpees
5	85%-90%	Kick Up Starts	123 BACK	two foot forwards
		Jump Back Starts	L - DRILL. 3 CONE	lateral in and out
		Hurdle Starts	X – DRILL	Over Over Back Back 15 time
		Drop Acceleration	KAMIKAZE	gorilla jumps
6	90%-100%	Kick Up Starts	123 BACK	two foot forwards
		Jump Back Starts	L - DRILL. 3 CONE	lateral in and out
		Hurdle Starts	X – DRILL	Over Over Back Back 15 time
		Drop Acceleration	KAMIKAZE	gorilla jumps
7	90%-100%	Wall Sprints	Cone Figure 8	Tennis ball Drop
		Attack the Ground	T-Agility	POGO Hops 10 time
		Resisted Sprints	PRO AGILITY SHUTTLE. 5-10-5	two foot sideways
		Sprint and Release	Illinois agility drill	burpees
8	85%-90%	Wall Sprints	Cone Figure 8	Tennis ball Drop
		Attack the Ground	T-Agility	POGO Hops 10 time
		Resisted Sprints	PRO AGILITY SHUTTLE. 5-10-5	two foot sideways
		Sprint and Release	Illinois agility drill	burpees

RESULTS

Data analysis was performed using the Statistical Package for Social Sciences (v22.0, SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all experimental data. In addition, the Kolmogorov–Smirnov and Shapiro-Wilk test of the normality of distribution was calculated for all variables: body mass, body height, high jump, jump shoot before the analysis table 2.

An Independent Samples T-Test was used to determine the differences between the EG and CG of pre-measurement variables (body mass, body height, High Jump, Jump Shoot) in both groups (experimental n=20, control n=20) table 3. Figure 1

A Paired Samples T-Test was used to determine the differences between the pre and post-measurement variables(High Jump, Jump Shoot) for the experimental group n=20) in table 4 & Figure 2 .

A Paired Samples T-Test was used to determine the differences between the pre and post-measurement variables(High Jump, Jump Shoot) for the experimental group n=20) in table 5 & Figure 3.

An Independent Samples T-Test was used to determine the differences between the EG and CG of post-measurement variables (High Jump, Jump Shoot) in both groups (experimental n=20, control n=20) Table 6 & Figure 4.

Statistical significance was set at $p<0.05$.

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Table 2
TESTS OF NORMALITY IN PRE MEASUREMENT VARIABLES(BODY MASS, BODY HEIGHT, HIGH JUMP, JUMP SHOT) IN BOTH GROUPS (EXPERIMENTAL N=20, CONTROL N=20)

	Group	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
body height	Experimental	0.164	20	0.162	0.937	20	0.215
	Control	0.168	20	0.142	0.956	20	0.464
body mass	Experimental	0.120	20	0.200*	0.966	20	0.676
	Control	0.118	20	0.200*	0.960	20	0.552
High Jump	Experimental	0.098	20	0.200*	0.955	20	0.449
	Control	0.129	20	0.200*	0.942	20	0.261
Jump Shot (POINT)	Experimental	0.142	20	0.200*	0.954	20	0.430
	Control	0.140	20	0.200*	0.951	20	0.387

*. This is a lower bound of the true significance.

Table 3
MEAN, STD. DEVIATION, MEAN DIFFERENCE, AND T VALUES OF PRE MEASUREMENT VARIABLES(BODY MASS, BODY HEIGHT, HIGH JUMP, JUMP SHOOT) IN BOTH GROUPS (EXPERIMENTAL N=20, CONTROL N=20)

	Group Statistics				Independent Samples Test t-test for Equality of Mean			
	Group	N	Mean	Std. Deviation	Mean Difference	t	df	p
body height (CM)	Experimental	20	174.4000	3.70490	-1.25000	-1.152	38	0.256
	Control	20	175.6500	3.13344				
body mass (KG)	Experimental	20	70.6000	4.45327	-1.35000	-0.953	38	0.346
	Control	20	71.9500	4.50117				
High Jump (CM)	Experimental	20	21.4000	3.11870	-1.20000	-1.217	38	0.231
	Control	20	22.6000	3.11870				
Jump Shot (POINT)	Experimental	20	3.0181	1.06065	-0.03357	-0.090	38	0.928
	Control	20	3.0517	1.27648				

Statistical significance at $p<0.05$

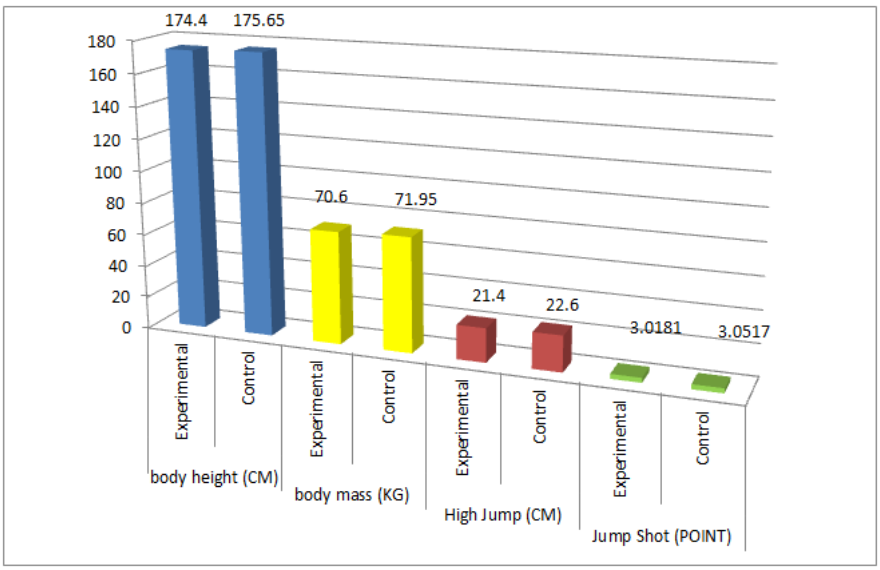

FIGURE 1
PRE MEASUREMENT OF BODY MASS, BODY HEIGHT, HIGH JUMP, JUMP SHOOT IN BOTH GROUPS (EXPERIMENTAL N=20, CONTROL N=20)

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Table 4
MEAN, STD. DEVIATION, MEAN DIFFERENCE, AND T VALUES BETWEEN PRE AND POST MEASUREMENT ON VARIABLES(HIGH JUMP, JUMP SHOOT) FOR EXPERIMENTAL GROUP N=20)

Paired Samples Statistics						Paired Samples Test				
						Paired Differences				
		Measurement	Mean	N	Std. Deviation	Mean	Std. Deviation	T	df	p
Pair 1	High Jump	Pre	21.4000	20	3.11870	-3.70000	2.36421	-6.999	19	*0.000
		Post	25.1000	20	3.33877					
Pair 2	Jump Shoot	Pre	3.0181	20	1.06065	-3.13191	1.24056	-11.290	19	*0.000
		Post	6.1500	20	0.81273					

*Statistical significance at p<0.05.

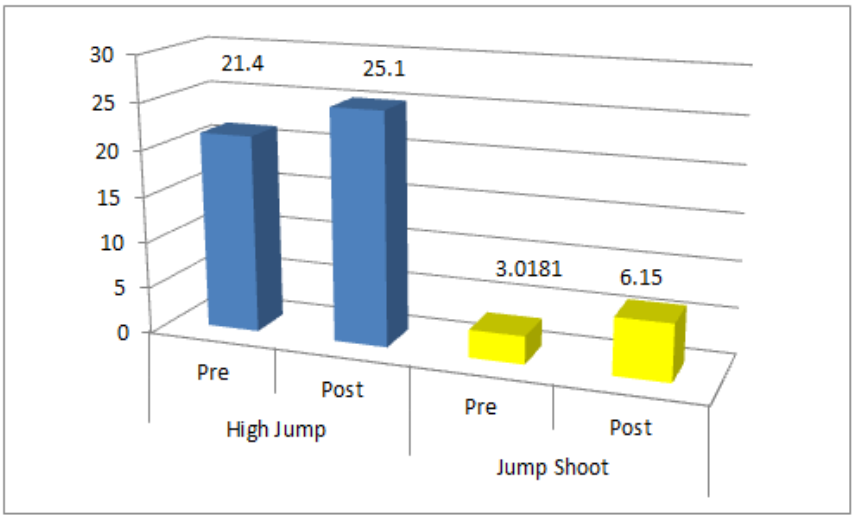

FIGURE 2
PRE AND POST MEASUREMENT OF HIGH JUMP, JUMP SHOOT (EXPERIMENTAL GROUP N=20)

Table 5
MEAN, STD. DEVIATION, MEAN DIFFERENCE, AND T VALUES BETWEEN PRE AND POST MEASUREMENT ON VARIABLES(HIGH JUMP, JUMP SHOOT) FOR CONTROL GROUP N=20)

Paired Samples Statistics						Paired Samples Test				
						Paired Differences				
		Measurement	Mean	N	Std. Deviation	Mean	Std. Deviation	t	df	p
Pair 1	High Jump	Pre	22.6000	20	3.11870	-0.30000	1.52523	-0.880	19	0.390
		Post	22.9000	20	2.46875					
Pair 2	Jump Shoot	Pre	3.0517	20	1.27648	-1.24834	1.21492	-4.595	19	*0.000
		Post	4.3000	20	0.65695					

*Statistical significance at p<0.05

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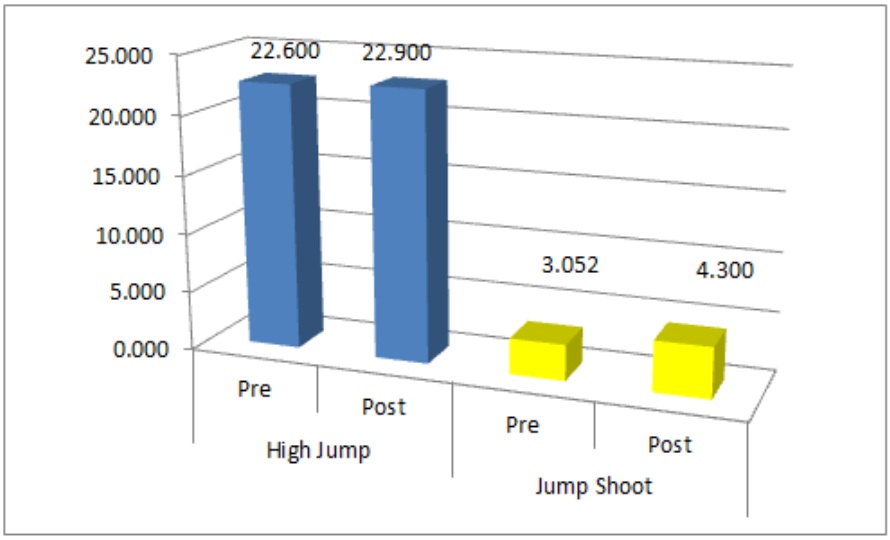

FIGURE 3
PRE AND POST MEASUREMENT OF HIGH JUMP, JUMP SHOOT (CONTROL GROUP N=20)

Table 6
MEAN, STD. DEVIATION, MEAN DIFFERENCE, AND T VALUES OF POST MEASUREMENT VARIABLES (HIGH JUMP, JUMP SHOOT) IN BOTH GROUPS (EXPERIMENTAL N=20, CONTROL N=20)

Group Statistics					Independent Samples Test t-test for Equality of Mean			
	Group	**N**	**Mean**	**Std. Deviation**	**Mean Difference**	**T**	**df**	**p**
Post High Jump (CM)	Experimental	20	25.1000	3.33877	2.20000	2.369	38	0.023
	Control	20	22.9000	2.46875				
Post Jump Shot (POINT)	Experimental	20	6.1500	0.81273	1.85000	7.917	38	0.000
	Control	20	4.3000	0.65695				

*Statistical significance at p<0.05

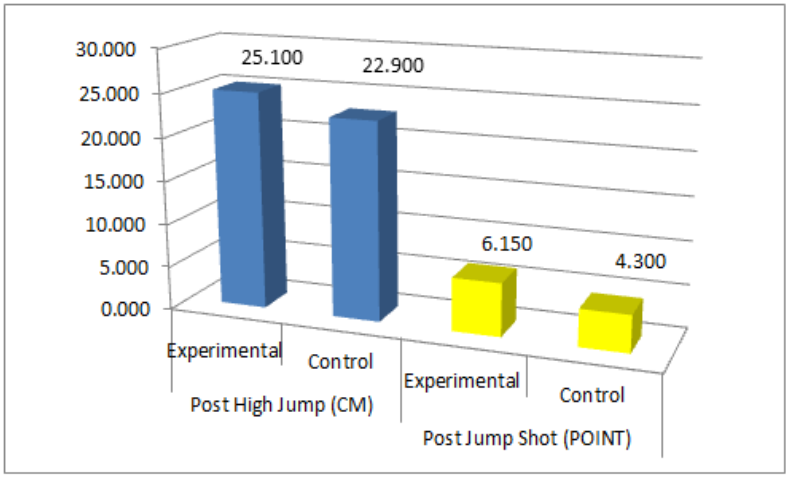

FIGURE 4
POST MEASUREMENT OF HIGH JUMP, JUMP SHOOT (BOTH GROUPS EXPERIMENTAL N=20, CONTROL N=20)

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Explosive Power

The experimental group showed a significant change before and after the intervention with Paired mean Differences=-3.70000, t value=-6.999; p<0.05 Table 4 & Figure 2.

Scores also showed a significant difference in post intervention between the study and control group with (Mean Difference=2.20000; t value=2.369); p<0.05) Table 6 & Figure 4.

Accuracy of High Jump Shot

The experimental group showed a significant change before and after the intervention with Paired mean Differences= -3.13191; t value=-11.290; p<0.05 Table 4 & Figure 2.

Scores showed a significant difference in post intervention between the study and control group with Difference =1.85000; t value=7.917; p<0.05 Table 6 & Figure 4.

DISCUSSION

The present study showed that 8 weeks of SAQ training program intervention had a significant(p<0.05)positive effect on the high jump, jump shoot accuracy in male Students of the Sports Sciences Faculty at Mutah University. (Table 4, Figure 2, Table 6 & Figure 4)

This result can be interpreted as follows:

Effects of SAQ on Explosive Power (High Jump)

Physical preparation is very important to improve the functional and physical ability of the trainee and this is done by raising the level of special components of physical condition such as speed, strength, power, agility, flexibility, and endurance. And interest in developing these elements Leads to muscle power output (DeVillarreal et al., 2013)

Sports training scientists are constantly looking for the most important scientific methods to improve the performance of the trainee in the preparation stages to obtain the best results during the competition stage, SAQ one of the modern technologies used in comprehensive preparations in the sports field. If we look at almost all sporting events without exception, note that it requires quick movements; SAQ It can significantly improve athletic performance by developing this aspect (Amany& Gehad, 2017).

The results of the present study (Table 4 and Table 5) revealed a beneficial effect on explosive power (jump height), It has been shown that 8 weeks of SAQ training produced a greater improvement in explosive power This result is in agreement with the study of. (Kanniyan et al., 2012) Which indicated that Saudi Arabia soccer college-level Amateur players improved their explosive after 8 weeks (2-3 sessions /week) of SAQ training compared with traditional training, It also agreed that the 8-week SAQ training program (3 sessions/week) SAQ achieved greater improvements in explosive force performance compared to the traditional training of a sample of Jordanian youth (Majali & Khahtatbeh, 2013). Additionally, the results also showed that training with SAQ for 10 weeks improved explosive power among handball players in Egypt (3 sessions/week) (Emish, 2015). Upon examining the effect of SAQ training for eight weeks (3 sessions/week) on the explosive power level in basketball for Omani amateur students, the results showed a positive effect (Kitani, 2018).

These improvements in explosive power and agility tasks is also explained partly by the varied specific power-related actions like jumps, blocks, stops, accelerations, and decelerations that passed off within the SAQ that were performed at high intensity and over multiple movements.

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Therefore, specific SAQ are often used as effective training thanks to positive effects on specific tasks and physical performance. Thus, SAQ appears to be an acceptable method for improving fitness while developing technical and tactical efficiency in sports.

Effects of SAQ on Jump Shoot Accuracy

Exercise of speed, agility, and quickness is a system of progressive exercises and instruction aimed at developing major motor skills to raise the level of the trainee to be more capable at faster speeds and with greater precision. This exercise has become a reliable training for development the speed, strength, or ability to maximum potency (Azmi & Kusnanik, 2018).

The results of the present study (Table 4 and Table 5) revealed a beneficial effect on jump shoot accuracy, It has been shown that 8 weeks of SAQ training produced a greater improvement in jump shoot accuracy, This result can be interpreted as indicated by (Mehrotra, et al., 2011) that SAQ training can be used to increase the speed or strength or the ability to exert maximum force during high-speed movements, as this method relies on the combination of multiple movements At a different level of difficulty and works on the efficiency of signals directed to the brain, which enhances the person's perception in the place and helps to generate rapid muscle resistance. The belief of SAQ exercises increase muscle power in multi-level movement pathways developing the efficiency of brain signals; Reducing reaction time; the development of these elements may have a positive effect on the development of jumping accuracy.

This result can also be explained by the fact that the development of the explosive force in the lower extremities had a positive effect on the vertical jump distance.

This, in turn, may increase the flight time, which may give a greater opportunity for the trainee to make a suitable decision for the angle and place of correction on the goal, which may increase the accuracy of the correction.

In addition, this result can be interpreted to that SAQ training is a comprehensive integrated training approach that works to achieve a set of goals and develop different physical capabilities in one training program, for it combines Quickness, is the ability to read and react quickly and thus in the ability to make the appropriate decision in the least time with the situation at a short distance, which is very important during sports events for teams and for complex movements (Bloomfield et al., 2007). As for Speed known as the ability to travel a straight line distance by moving at the fastest possible speed (Raines, 2015). Agility is the rapid and complete movement of an object with a change in speed or direction in response to a stimulus" (Sheppard & Young, 2006, p. 920), and it is The ability to move quickly and effectively in several directions (Raines, 2015) These three elements are very important to the performance of the motor skills that need coordination and accuracy(Mahmoud & Mahmoud, 2008). So, all of the Quickness, Speed and Agility are a requirement for the success of jump shot accuracy, This study agrees with the results of(Moselhy, 2020; Emeish,2015), which shown the effectiveness of SAQ in developing the performance of motor skills.

CONCLUSIONS

Depending on the aim, research hypotheses and methodology used, and within the sample of the research and through the statistical analysis, and created on the results reached, it was concluded that the SAQ training program has a more effective positive effect than the traditional training one in increasing the Explosive Power and Handball High Jump Shot Accuracy for male Students of Sports Sciences Faculty at Mutah University.

Therefore, applying SAQ training with male Students of Sports Sciences is recommended to improve the elements of physical fitness of Explosive Power, reflecting the impact of its effectiveness on the development of Handball High Jump Shot Accuracy.

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DECLARATIONS

Author Contribution Statement

Jazzazi Saleem: Conceived and designed the experiments
Alleimon Sofyan: Analyzed and interpreted the data.
A'mir Omar: Contributed reagents, materials, analysis tools, data.
Khatatbeh Mu'tasm: Performed the experiments. Analyzed and interpreted the data; wrote the paper.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing Interest Statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgments

The authors show their greatest appreciation to the participants in this study.

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Citation Information: Omar, A., Saleem, J., Mu'tasm, K., & Sofyan, A. (2021). Effects of speed agility quickness training program on explosive power and handball high jump shot accuracy. *Journal of Management Information and Decision Sciences, 24*(S1), 1-12

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Citation Information: Omar, A., Saleem, J., Mu'tasm, K., & Sofyan, A. (2021). Effects of speed agility quickness training program on explosive power and handball high jump shot accuracy. *Journal of Management Information and Decision Sciences, 24*(S1), 1-12