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Effect of (S.A.Q.) Training on Selected Physical Abilities andPerformance of Passing Skill and Jump Shotsin Handball among Female Students at the Faculty of Physical Education and Sports at Al-Aqsa University

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Abstract:
The study aimed to identify the effect of Speed, Agility and Flexibility (S.A.Q.) training on selected physical abilities, and performance of the passing skill and jump shots in handball among female students at the Faculty of Physical Education and Sports at Al-Aqsa University. The researchersfollowed the empirical approach. The research sample included all third-level students who were enrolled in the Handball (2) course (i.e. 13 students). The most important results included: improvement in the selected physical abilities; the hand ability change percentage reached %6.23, vertical jump %22.37, long jump %9.27, speed %8.96, agility %5.16,Flexibility %38.88, passing skill %20.52and jump shots %28.68.The researchers recommended the inclusion of S.A.Q. training in the education and training of handball players.

Keywords: *Sakyo (S. A. Q) Training,special Physical abilities, passing skill, jumping skill.*

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I. Introduction and Research Significance

The Ministry of Higher Education and Scientific Research has focused its attention on building the capacities and improving the skills of lecturers at the Palestinian universities. The lecturers are trained on using several modern methods in order to improve all aspects related to training and education. Their skills and physique are improved in order to positively impact the capacities of the students.

The more aware the teachers are of the different training methods, the better it is for achieving the educational and training process. This would develop the students' expertise regardless of their levels and the sorts of courses they study.

Helping the players reach high sports levels is one of the objectives of physical training. Players' performance levels in handball depend on the careful planning of the training process, which should be focused on improving the players' performance (Darwish, Abbas and Ali, 2011).

Coaches, players and academics seek to find new training methods that can improve the players' performance and increase their competitive advantage.S.A.Q training is the best for empowering the upper and lower limbs because it improves the players' motor abilities and makes them faster (Musbah, 2019).

All athletes, beginners or professionals, have been following the S.A.Q. training methods, which can be used in handball training due to the similarities that exist between them both (Mikhail and Hammam, 2017).

The abbreviation S.A.Q. stands for Speed, Agility and Quickness (Zoran Milanović et al., 2013). It is commonly followed in sports because it develops the physical and motor abilities of the players (Abu Al-Saud and Issa, 2019, 1; and Musbah, 2019).

Braiki' and Al-Sukari (2015) suggested that all sports activities require fast movements, whether the arms or legs; so it is essential for all players to develop their speed, agility and quickness(2015).

The current researchers believe that gaining new sports skills and merging between existing ones can be done through improving their physical abilities to avoid any discrepancy in their motor performance.

Some studies, as will be mentioned below, have confirmed the effectiveness of S.A.Q. training in developing players' physical abilities and improving their performance. Abu Al-Khair (2022) study results showed that following the S.A.Q. training had a notable impact on the physical and skill-related variables when

compared with the control group. Abu Al-Mal (2022) study revealed that S.A.Q. training improved the lower limbs' muscle balance and the physical abilities related to high jumps. Ahmad (2022) pointed to the importance of the S.A.Q. training in raising the levels of performance with relation to the physical variables; for which reason the research sample (swimmers) in the 200-m race managed to set a better record. Shaalan, Saleh and Kareem (2019) pointed to the importance of the S.A.Q. training in improving the players' speed-strength, and other key skills, under study, for handball players. The abovementioned confirms the validity of the current researchers' viewpoint about the importance and effectiveness of the S.A.Q. training on the general training process of different sports.

Research Problem

Performance in playing handball depends on the players' proficiency in performing the basic skills with or without the ball, and employing these skills during the planning stage. Handball perforamnce varies as it is related to sprints with or without the ball, running and stopping (Dariwsh, Abbas, and Ali, 1998).

The researchers, due to their experience in coaching and playing handball, noticed the players' slow movement, especially in offensive moves, during the execution of strategies.The researchers attribute such low-level performance to the low levels of physical abilities among the female players, who have shown inability to pass and accurately deliver the ball to their teammates.

The reason for this, the researchers suggest, is the low level of physical abilities among the female players, which negatively influences the passing and delivering of the ball to other teammates and aiming the ball during high jumps (i.e. the two skills under examination).

The idea, therefore, emerged as a scientific attempt to implement a new training method (the S.A.Q.) and identify its influence on players' physical abilities, passing skills and jump shots for the female students at the faculty of Physical Education and Sports at Al-Aqsa University. To the knowledge of the researchers, no research was found in the literature about the impact of the S.A.Q. training on the passing skills and jump shots hence confirming the recency of the research.

The main question of the research can be summed into: What is the effect of the S.A.Q. training on the physical abilities, and passing skillsand jump shots in handball for the female students at the Physical Education and Sports faculty at Al-Aqsa University?

Research Significance

First: Scientific Significance

After reviewing the existing literature on the issue, the researchers found little focus on the use of S.A.Q. training in developing the physical abilities and passing skills and jump shots in handball in Palestine and the Gaza Strip.

The researchers conducted this research to benefit from the S.A.Q. training in improving the physical abilities and skills of players through designing certain training strategies that suit the nature of S.A.Q and handball. This research draws the path for further studies in the field and enriches the Palestinian literature on handball and S.A.Q. training.

Second: Practical Significance

This research, which is the first of its type locally, enables the emperical examination of selecting a new training strategy (i.e. the S.A.Q.) in developing the physical abilities of handball players.

Research Objectives

This research aims to design a training program based on the S.A.Q. training to improve the physical abilities, and passing skills and jump shots for the female students at the faculty of Physical Education and Sports at Al-Aqsa university. Following are two sub objectives:

1- To identify the differences between the pre and post-measurement of the physical abilities of the experimental group.

2- To identify the differences between the pre and post-measurement of the performance of passing skills and jump shots for the experimental group.

Research Hypotheses

1- There are statistically significant differences between the pre and post-measurement of the physical abilities of the experimental group in favor of the post-measurement results.

2- There are statistically significant differences between the pre and post-measurement of the performance of passing skills and jump shots for the experimental group in favor of the post-measurement results.

Research Limitations

Temporal limitation**:** The research was conducted from Thursday 26-9-2019 until Thursday 12-12-2019.

Setting limitation: The playground and hall of the faculty of Physical Education and Sports at Al-Aqsa University.

Population limitation: Third-year female students at the Faculty of Physical Education and Sports in the first semester of 2019-2020.

II. Methodology

Research methodology: The researchers followed the empirical approach as it suits the nature of this research. Pre and post-measurement tests were applied to the experimental group.

Population: All the female students enrolled in Handball (1) course (i.e. 15 students) in the first semester of 2019-2020.

Sample: 13 female students enrolled in Handball (1) course out of 15 in the first semester of 2019-2020. Two female students were excluded due to their pregnancy.

Homogeneity in the sample

The researchers calculated the mean, standard deviation, median and the torsion coefficient of the variables under study.

The main variables are the age, height and weight.

The performance of passing skills and jump shots in handball. Appendix (1)

The skill variables are passing and catching on wall (30 seconds), passing and catching on wall (10 times), dribbling, aiming, and bouncing ball in zig-zag direction for 30 seconds. Appendix (2)

Physical variables: the abilities of arms and legs, speed, agility andFlexibility. Appendix (3)

Research Sample

Table (1)

The mean, standard deviation, median and the torsion coefficient of the variables under study.

n=13

Variables	Measurement unit	n=15		Median	Torsion coefficient
		Mean	Standard deviation		
Main variables					
Age	M Y	19.82	0.72	19.8	0.98
Height	Cm	158	4.01	159	0.47-
Weight	Kgm	58.8	5.26	58	0.09
Skill performance for skill variables					
Passing skill	Degree	6.08	0.57	6	0.57
Jump shots	Degree	5.62	0.46	5.5	0.21
Skill variables and tests					
Passing and catching on wall 30 s	No.	29.92	2.5	30	0.22
Passing and catching on wall 10 times	S	15.47	0.55	15.47	0.10
Dribbling and aiming	Degree	6.46	0.66	6.50	0.16
Zig-zag run with ball 30 s	S	31.28	1.19	31.76	0.43
Physical variables and tests					
Ability: Throwing 3-kg medicine ball	Cm	301	10.17	300	0.29-
Ability: vertical jump	Cm	34	5.68	35	0.63-
Ability: long jump	Cm	137	10.20	137	0.19-
Speed: running 3 m	S	5.11	0.42	5.21-	0.17-
Agility: shuttle run 4X9 m	S	15.07	1	15.33	0.51-
Flexibility: sit and reach	Cm	11	3.86	2	0.05-

Table (1) shows that the Torsion coefficient indicates the normal distribution of the population and sample. The Torsion coefficient ranges from (± 3) in all variables which confirms the homogeneity of the sample with relation to the variables under study.

Time frame: the research was conducted from Thursday 26-9-2019 until Thursday 12-12-2019.

Data collection tools

1- Relevant literature (sources and references).
2- Relevant previous studies.
3- Polls for experts' opinions.
4- Tests and measurements.

Pilot Studies

The researchers conducted two pilot studies after completing all administrative measures and preparing the proposed training program. The pilot studies aimed to confirm the validity and reliability of the data collection tools and calculations.

First Pilot Study

It was conducted on Thursday 26-9-2019 in order to confirm the validity of the tools and devices used in the data collection, and to identify the amount of time required for the tests and the possible mistakes or obstacles that could arise to avoid them during the original study. They also aimed to identify the suitability of the training location and measurement tests and the extent to which they can achieve the research objectives. Results showed that the selected tests were suitable for the sample, and so were the tools and location.

Second Pilot Test: Validity and Reliability of Tests

It was conducted from Sunday 29-9-2019 until Saturday 5-10-2019, and aimed at identifying the reliability and validity of the tests included in the original research.

First: Tests for Skills under Study in Handball – Appendix (2)

The researchers used the tests for main handball skills which were identified based on relevant literature (such as Abu Samra, 2015; Abu Shrar, 2014; and Ismael and Hassanin, 2002). These tests are:

1- Accuracy of passing test
2- Accuracy of aiming test

Coefficients of the skills tests

1- Skills tests validity

In order to identify the validity of the skills tests, the researchers used the discriminant validity test on a sample comprising 14 female students. The first discriminant group comprised 7 female students specialized in handball, and the non-discriminant group comprised 7 female students who took the Handball course. The validity test was conducted from Tuesday 1-10-2019 until Thursday 3-10-2019. The results showed the validity of the tests as shown in table (2).

Table (2)

The validity coefficient of the physical tests under study for the discriminant and non-discriminant groups with relation to the variables under study **n=14**

Skills Tests	Measurement unit	Discriminant group		Non-discriminant group		Median	T value
		Mean	Standard Dev.	Mean	Standard Dev.		
Passing and catching on wall 30 s	No.	32.1	1.68	34.81	1.17	2.71	3.52*
Passing and catching on wall 10 times	S	15.51	0.40	16.83	0.33	1.32	6.76*
Dribbling and aiming	Degree	5.93	0.35	5.21	0.27	0.72	4.33*
Zig-zag run with ball 30 s	S	31.02	1.14	33.67	1.10	2.65	4.42*

- **T value at 0.05 = 2.179**

Table (2) shows statistically significant differences between the discriminant and non-discriminant groups in the skills tests under study in favor of the discriminant group, which indicates the validity of the tests. The t value ranges between 3.52 (the least value) and 6.76 (the highest value). The calculated t value shows statistical significance when compared with the table t value. This indicates the high validity of the skills tests.

2- Tests Reliability

The researchers verified the reliability of the test through applying it twice on a sample of 7 fourth-level female students on Sunday 29-9-2019, and once again on the sample on 5-10-2019. The results were found as shown in table (3) below.

Table (3)
Correlation coefficient between the application and reapplication of the skills tests on the same sample n=7

Skills tests	Measurement unit	Application		Reapplication		r
		Mean	Standard dev	Standard dev	Mean	
Passing and catching on wall 30 s	No.	32.1	1.68	32.144	1.7	0.97*
Passing and catching on wall10 times	S	15.51	0.40	15.95	0.34	0.8*
Dribbling and aiming	Degree	5.93	0.35	6.21	0.49	0.85*
Zig-zag run with ball 30 s	No.	31.02	1.14	2.32	0.89	0.93*

- **R value at 0.05 = 0.582**

Table (3) shows statistical correlation at 0.05 between the application and reapplication of the skills tests, which indicates their reliability.

Coefficients of the physical variables tests

1- Validity of the physical tests

In order to identify the validity of the physical variables tests, the researchers used the discriminant validity test on a sample comprising 14 female students. The first discriminant group comprised 7 female students specialized in handball, and the non-discriminant group comprised 7 fourth-year female students who took the Handball course. The validity test was conducted from Tuesday 1-10-2019 until Thursday 3-10-2019. The results showed the validity of the tests as shown in table (4).

Table (4)
The validity coefficient of the physical tests under study for the discriminant and non-discriminant groups with relation to the physical variables under study n-14

Physical variables	Measurement units	Discriminant group		Non-discriminant group		Median	t value
		Mean	Standard dev.	Mean	Standard dev.		
Arms abilities	Cm	294	21	255	18.11	39	3.72*
Legs abilities	Cm	27	7.37	18	5.68	9	2.4*
Legs abilities	Cm	131	11.15	108	8.38	23	4.31*
Speed	S	5.56	0.61	6.86	0.45	1.30	4.38*
Agility	S	16.19	0.05	16.79	0.46	0.6	2.36*
Flexibility	Cm	9	2.31	5.71	1.6	3.29	3.09*

- **T value at 0.05 = 2.179**

Table (4) shows statistically significant differences between the discriminant and non-discriminant groups in the physical tests under study in favor of the discriminant group, which indicates the validity of the tests. The t value ranges between 2.36 (the least value) and 4.38 (the highest value). The calculated t value shows statistical significance when compared with the table t value. This indicates the high validity of the physical tests.

2- Physical test's reliability

The researchers verified the reliability of the test through applying it twice on a sample of seven fourth-level female students on Sunday 29-9-2019, and once again on the sample on 5-10-2019. The results were found as shown in table (5) below.

Table (5)
Correlation coefficient between the application and reapplication of the physical variables under studyn=7

Physical variables	Measurement units	Application		Re-application		R
		Mean	Standard dev.	Mean	Standard dev.	
Arms abilities	Cm	294	21	272	18.95	*0.97
Legs abilities	Cm	27	7.37	22	8.18	*0.88
Legs abilities	Cm	31	11.15	117	8.56	*0.95
Speed	S	5.56	0.61	5.97	0.78	*0.97
Agility	S	16.19	0.5	15.8	0.53	*0.96
Flexibility	Cm	9	2.31	7	2.36	*0.89

- **R value at 0.05 = 0.582**

Table (5) shows statistical correlation at 0.05 between the application and reapplication of the physical tests. The r value ranged from 0.97 (the highest value) and 0,88 (the lowest value), which indicates their reliability.

Designing the training program

- **Program objectives:** to identify the degree of impact of S.A.Q. training on the physical abilities and skills performance of the passing skill and jump shots in handball for female students at the faculty of Physical Education and Sports at Al-Aqsa University.
- **Training program content:** the researchers reviewed relevant studies (such as Abu Al-Khair, 2022; Abu Al-Mal, 2022; Ahmad, 2022; Shaalan, Saleh and Kareem, 2019)and identified the training programs that included the S.A.Q. strategies in order to include the trainings that suit the sample of this research. The training activities varied to include running, jumping, passing and aiming.
- **Program principles:** to achieve the desired objectives, suit the age of the female students, be inclusive and flexible during application, take into account safety measures, and follow gradual implementation in loads and difficulty levels.
- **Training program characteristics:** the researchers used high and low interval training and ensured that the training does not prevent the students from attending their lectures.
- **Training program duration:**the training lasted for seven weeks; each week included two training units, each unit 90 minutes.

Pre-measurements

The pre-measurements were applied to the research sample. The age, height and weight were noted down; the following skills were tested: catching the ball, front and high jump shots, and passing and catching; and the physical skills: muscle ability of legs and arms, speed, agility andFlexibility. The results were recorded in the forms which were designed by the researchers, and the tests were carried out in the closed halls, playgrounds and halls of the Faculty of Physical Education and Sports at the new university campus in Khan Younus in the Gaza Strip.

Research Implementation

The actual research was implemented from Thursday 26-9-2019 until Thursday 12-12-2019.

Post-measurements

The post-measurements for the abovementioned skills and physical variables were conducted from Sunday 8-12-2019 until Thursday 12-12-2019 in the same locations where the pre-measurements were conducted. The researchers added the results to the forums and submitted them for statistical processing to verify the research hypotheses.

Statistical processing:the researchers calculated the percentages, means, standard deviation, Pearson Coefficient, and the t test to identify the statistically significant differences.

1- **Discussion and analysis of the first hypothesis, "**There are statistically significant differences between the pre and post-measurement of the physical abilities of the experimental group in favor of the post-measurement results".

Table (6)
Statistical differences between the means of the pre and post-measurements of the physical abilities related to Handball among the experimental group members n=13

Experimental variables	Measurement unit	Pre-measurement		Post-measurement		Differences between the means	Change percentage	T value
		Mean	Standard dev.	Mean	Standard dev.		%	
Ability	Cm	301	17.10	321	19.63	20	%6.23	*8.595
Ability	Cm	34	5.68	44	11.49	10	22,37%	*4.516
Ability	Cm	137	10.20	151	9.75	14	%9.27	*11.569
Speed	S	5.11	0.42	4.69	0.43	-0.42	%8.96	*7.114
Agility	S	15.07	1	14.33	0.9	-.74	%5.16	*10.264
Flexibility	Cm	11	3.58	18	2.67	7	%38.33	*15.962

- **Statistical significance at 0.05 = 1.782**

Table (6) shows that the means of the pre-measurement of the ability of the legs reached 301 while the post-measurement reached 321; the difference between the two means equaled 20 and the improvement percentage reached %6.23. The mean of the ability to do vertical jumps reached 34 in the pre-measurement test

but reached 44 in the post-measurement test. The difference between the means equaled 10 and the improvement percentage reached %22.37.

The mean of the ability to do long jumps reached 137 in the pre-measurement test but reached 151 in the post-measurement test. The difference between the means equaled 14 and the improvement percentage reached %9.27. The mean of the speed reached 5.11 in the pre-measurement test but reached 4.69 in the post-measurement test. The difference between the means equaled 14 and the improvement percentage reached %8.96. The mean of the agility: shuttle run reached 15.07 in the pre-measurement test but reached 14.33 in the post-measurement test. The difference between the means equaled 14 and the improvement percentage reached %5.16. The mean of the Flexibility and reach reached 11 in the pre-measurement test but reached 18 in the post-measurement test. The difference between the means equaled 7 and the improvement percentage reached %38.88.

The researchers attribute the improvement in the physical abilities under study to the proposed S.A.Q. training program which included constant training on speed and agility; which improved the physical abilities related to the offensive skills in handball. The resistance exercises also had a positive impact on speed, especially that strong muscles do produce higher speeds.

The researchers confirm that the S.A.Q. training resulted in a positive impact in a comprehensive manner on the physical abilities included in the training program. It helped in creating harmony between the neurological system and the signals it sends to the muscles.

This was also confirmed in Ahmad (2022) study which revealed that the S.A.Q. training strategies positively and largely influenced the physical variables of the research sample.

Strong muscles are generally known for their ability to provide speed. Muscle strength is essential to developing the motor skill of the player; for such reason when the body carries training loads, it positively influences the different functions of the body.

The studies conducted by Musbah (2019) and Mikhail and Hammam (2017) also agree with the current results. The development in the physical abilities under study was the result of the application of the S.A.Q. training strategies.

Shaalan, Saleh and Kareem (2019) study also confirms that the training program influenced on and showed statistical significance for the improvement in speed and strength among handball players due to the nature of the S.A.Q. training exercises which were interval, gradual and repeated to suit the level of beginner players.

Both researchers agree that the execution of the S.A.Q. training program in a scientific manner helped improve the physical abilities under study as revealed in the tests results.

A study by Hamza, Al-Badri and Abdel-Samei' (2019) showed that the S.A.Q. training strategies helped improve the fitness and hence the skills of the players, due to the flexibility of the strategies and dynamism. S.A.Q training can be implemented independently because it includes constant running and explosive power.

Milanović et al. (2013) also explained that the S.A.Q. training strategies were important in developing the physical abilities related to speed, agility and power.

Discussion and analysis of the second hypothesis, "there are statistically significant differences between the pre and post-measurement of the performance of passing skills and jump shots for the experimental group in favor of the post-measurement results".

Table (7)
Statistical differences between the means of the pre and post-measurements of the skills performance related to Handball among the experimental group members (the passing skill and jump shots)n=13

experimental variables	Measurement unit	Pre-measurement		Post-measurement		Differences between the means	Change percentage	T value
		م	ع	م	ع		%	
Passing skills	Degree	6.08	0.57	7.65	0.83	1.57	%20.52	*16.51
Jump shots	Degree	5.62	0.46	7.88	0.71	2.26	%28.67	*18.66

- **Statistical significance at 0.05 = 1.782**

Table (7) shows that the mean of the pre-measurement of the passing skill reached 6,08 while the mean of the post-measurement reached 7.65. The difference between the means equaled 1.57, and the t value reached 16.51 (which is higher than the statistical value at 0.05 which equals 1.782).

The table also shows that the mean of the pre-measurement of the jump shots reached 5.62 while the mean of the post-measurement reached 7.88. The difference between the means equaled 2.26, and the t value reached 18.66 (which is higher than the statistical value at 0.05 = 1.782).

The researchers attribute the improvement in the passing skill and jump shots to the development of the muscles, increase in speed and decrease in duration.

Abu Al-Khair (2022) pointed to the suitability of S.A.Q. training for all sorts of sports, whether individually or in teams. The coaches can make use of the training strategies to focus on certain physical abilities such as strength and speed, which can influence the players' performance notably and positively.

Hamza, Al-Badri and Abdel-Samei' (2019) explained that speed-strength helped improve the skills of the players due to the application of S.A.Q. training strategies. Improving the speed plays a major role in improving the performance of skills among players.

Shaalan, Saleh and Kareem (2019) also mentioned this in their study. They said that the S.A.Q. training greatly influenced the level of skills (passing, catching and aiming) due to the development in the physical abilities under study.

Abu Al-Mal (2022) also confirmed that the S.A.Q. training developed the physical abilities of the players and their performance of skills in jumping, which positively influenced their performance in general.

The current researchers emphasize that the skills which require improvement should be supported with the improvement of the physical abilities that relate to them. Doing so would positively influence the performance of the skill.

This statement agrees with the results of Musbah (2019) study, which showed that the S.A.Q. training helped intrigue the neurological signals and reduced random and extra moves. The development in speed, agility and power improved the performance of skills in general. The results of Hamza, Al-Badri and Abdel-Samei'(2019) study showed that the S.A.Q. training strategies achieve great results in improving the performance of skills when they are trained on comprehensively; and that these strategies suit the beginner players well.

III. Conclusions

- There are statistically significant differences between the pre and post-measurement tests in favor of the post-measurement for the application of the S.A.Q. training strategies. The percentage of the physical abilities of the female handball students showed improvement: the arms ability reached %6.23, the legs ability (vertical jump) %22.37, the legs ability (long jumps) %9.27, speed %8.96, agility %5.16, Flexibility
- %38.88**.**
- There are statistically significant differences between the pre and post-measurement tests in favor of the post-measurement for the application of the S.A.Q. training strategies. The percentage of the passing skill and jump shots among the female handball students showed improvement: the passing skill improvement percentage reached skill %20.52 and jump shots %28.68.

IV. Recommendations

- S.A.Q. training should be applied in the coaching and teaching of female students as it has shown great positive impact on the physical abilities under study and performance.
- Age and nature of the targeted group should be taken into account when the S.A.Q. training strategies are applied. The increase in difficulty should be gradual and boredom should be avoided.
- S.A.Q. training should make use of modern training methods and strategies.
- S.A.Q. training should be given to different types of students and players in diverse sports clubs.
- S.A.Q. training methods should be merged with other strategies in order to improve the levels of performance among handball students and other sports players.

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