

Development of Footwork by Using "The Rug" diversity exercises and its Effect on Reactive Agility and the Level of some Defensive Skills for Young Female handball Players

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Abstract

The purpose of the current study was to develop footwork by using the rug diversity drills to know its effect on the level of reactive agility and the level of defensive skills in young female handball players. The researcher applied the experimental method of one experimental group with the pre and post measurement technique to a sample of (12) players from young female handball players at Zamalek Sporting Club born in (2002). The exercises were applied in (8 weeks) by (3 training units) per week of a total of (24 training units). exercise on the 5-point rug, 9-point rug, and also to help make a layout of the 18-point rug. The researcher used the reactive agility test of her design and tests of the skill level for handball defensive skills. The results showed that the rug diversity exercises led to improve the level of the reactive agility in young female handball players of the research sample.

Research terminology:

Footwork, rug exercises, reactive agility, handball defensive skills.

Introduction and research problem:

Athletic training remarkably contributes to achieving the progressed levels through planning its programs very well. Recently physical fitness and its components have been considered increasingly as they are the most important requirements of performance in various sports and consequences of the progress of the level of physical and skill performance and the development of planning performance resulted from them that leading to reach the world competitions.

Essam Abdel Khaleq (2005) indicated that means, equipment and assisting tools played a significant role within the training process as they helped recognize the training objective

clearly, economize time and effort for the coach, enhance motivation and enthusiasm and strengthen self-confidence in players.

Mohammed Lotfy (2006) thought that the term of assisting means indicated to tools and methods enabling the player to get sensational experiences and physical, motor and skill training situations for acquisition of motor or skill duty to help upgrade the performance.

Yahya Al-Sayed (2002) and Mohammed Abdel Ghani Othman (2004) agreed that training programs took a form, structure and organization matching the new development in equipment and means used during the training process that became necessary

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for physical, skill and psychological rehabilitation for players. It was confirmed experimentally that using such facilities would lead to rising athletic levels in different individual and team sports.

Essam Abdel Khaleq (2005) and Nahed Eid (2008) were in agreement that equipment and assisting tools had an active role as they could provide the player from the beginning with clear visualization of the technical performance without boredom coming to mind and adding the thrill element to training on equipment being used in addition to acquisition of physical and motor characteristics.

Mohammed Ahmed Abdullah (2007) stated that nowadays there were a huge number of varied innovations serving different physical scopes and their importance was due to the development of the training process through facilitating getting, recording and analyzing information. Also it is so easy to recognize the importance of sporting tools and equipment through a quick overview of physical, Olympic and world achievements that related to the great progress helping resolve numerous problems and barricades and provide ideal solutions to upgrade the physical level and to actively contribute to establishing the best physical results needed.

Early and good skill preparation of different essential skills for young players and mixing of such skills with fast tempo is considered as the perfect way to reach the highest physical performance levels as motor skills represent the essential base on which

the method of performance depends during the game. The extent of mastering such skills by the player will decide the result of the game (Mohammed, 2007).

The importance of footwork herein lies as Yasser Dabour (2014) confirmed that without good footwork defenders would not bounce back quickly towards their goal for defensive coverage with their techniques of close control and follow-up and pressure on attackers and the ball to prevent any attempt for fast break or widened attack from rushing attackers. Also the footwork would help the player carry out his individual defensive duties (control, attack, coverage, handing and receiving, jostling towards the ball) that could be the essential base on which any defensive skill would be built within an integrated framework with the team defensive duties and representing an essential base against the team attacking planning formations. He insisted that many players, who were suffering from extrinsically weak defensive performance, really had problems in footwork. If the coach wanted to actually improve defensive skills he had to exercise footwork very well.

Footwork exercises were performed by using rug diversity tion of (five, nine and eighteen points, sequentially) on a small and then a bigger area with different forms then with irregular sequence in accordance with performance requirements for the handball defensive skills.

The 5 point rug is a rectangular containing 5 circles drawn inside it representing the most famous tool used to test and to measure agility and speed in the USA. But the 9 point rug is a rectangular containing 9 circles drawn inside it having numbers (1 to 9) and distributed on three rows starting from the upper left and ending to the lower right having 4 main directions where it depends on the three dimensional exercise concept that was visual targets to place the foot, to reach and to touch with hand. It is a overall functional training system. The 18-point rug was designed on five rows having numbers from (1 to 18).

Amr Hamza *et al.*, (2016) thought that the reactive agility was considered as a modern concept in physical education as it had the ability to change the traditional view of agility known by coaches to a modern view incorporating the traditional concept of recognition and factors of making the decision in a specialized form. The reactive agility is the ability of most specialization of agility. It is greatly used to describe the motor type of agility that appears in physical activities (an active change in direction and speed of the movement as a response to a visual motivation of unknown time).

Delex Trat *et al.*, (2015); Young *et al.*, (2015); Chatzo Poulos *et al.*, (2014); Locki *et al.*, (2013); Milanovic *et al.*, (2013); Henry G. *et al.*, (2011); Safaric & Bird (2011) and Oliver & Meyers (2009) indicated that there was a modern trend classifying agility to agility that had been pre-planned and

its concept was the pre-planning the closed motions performed by the athlete who knew when and where to move prior to moving to change his direction. As the game situations are characterized by the continuous and quick change, another type of agility appears called the reactive agility where the player should re-change his direction quickly (re-activate the agility) once again while moving to coordinate his actions with changing stimulants (such as movement of the opponent, team mate, the ball or his position in the playground) around him recognized by his brain through kinesthetic recipients in eyes representing (70%) of human body. They added that (80%) of information around the player could be transferred through eyes and consequently, the player would be able to carry out motor and planning duties successfully.

Young & Farrow (2006) explained that the reactive agility was the nature of the correlation among the three training factors (transitional speed, agility and motor speed) because they were multiple skills including the ability to change directions quickly starting at explosive speed followed by stopping, deceleration, changing direction and acceleration once again together with keeping dynamic balance during the performance.

Viewing the rug exercises as physical exercises that should be listed in the training units as good means of warm up or a group of basic exercises mainly contributing to developing

agility, transitional speed, motor speed and strength of leg joints representing fundamentals of the footwork skill. They are varied exercises performed in different forms and very similar to the nature of performance of defensive steps in handball.

Reviewing references and studies on handball, it was concluded that the speed and agility elements were the most important constituents necessary for defensive skills due to the speed tempo of the game, the quick bounce from the attack to defense and the quick player's reaction towards the attacker's movements in order to control the game events and requirements together with the capacity of cardiorespiratory system to bear the performance over the game duration and keeping the physical and skill level suitable for the performance till the end of the game as Sheppard *et al.*, (2006) agreed that the level of speed and agility could classify the skill performance to high and low grades.

Through her following up handball games for young females born in (2002), the researcher noticed that the defensive skill level of girls was varied and she related it to inability to move with the proper steps and speed required to get to the suitable place and time to stop the attacker's movement or to interrupt and to possess the ball. Searching for different training techniques and perusal of references and studies related to footwork (Reham, 2008), (Mohammed, 2013), (May, 2016), (Aldo, 2002), (Roozen, 2012) and (Young, 2006), the researcher thought that it was necessary to make a layout of training units for young female

handball players to develop their footwork by using exercises of the rug diversity as they were innovated and allowing to move through it in more than one angle to improve the speed, agility and skill performance. Such exercises would be very similar to footwork of the handball defender, could be applied and suitable for this age category.

Research objective:

The purpose of the current research was to make a layout of a program to develop footwork by using the rug exercises to identify their effect on the following:

- The level of reactive agility of young female handball players born in (2002).
- The level of performance of some defensive skills of young female handball players born in (2002).

Research hypotheses:

- There are significant differences and improvement in percentages of rates of variation between means of the pre and post-measurements in the level of reactive agility of young female handball players born in (2002) in favor of the post-measurement.
- There are significant differences and improvement in percentages of rates of variation between the pre and post-measurements in the level of performance of some defensive skills of young female handball players born in (2002) in favor of the post-measurement.

Research scheme and procedures:

Method:

The researcher used the experimental method of the pre and post-measurements of one experimental group to suit the nature of the research.

Research people:

They were represented by young female handball players born in (2002) enlisted with Egyptian Handball Federation in 2020/2021 sporting season.

Sample:

It was chosen intentionally from young female handball players born in (2002) at Zamalek Club in 2020/2021 sporting season. It consisted of (22) players.

Table (1)
Distribution of the research sample

Sample	Total No.	Main res. sample	Pilot sample	Players excluded (goalkeepers)
	22	12	8	2
Percentage	100%	54.54%	36.36%	9.1%

Data in Table (1) show that the main research sample includes (12) players by (54.54%) and (8) players are taken to carry out the pilot study and (2) goalkeepers are excluded.

Sample choosing conditions:

- Players should accept to participate in exercises of the proposed program.
- Coaches should accept to apply the part of the program to the team players.
- The presence in exercises should be regular by (80%) of the total training units of the program.
- The sample players should not take part in any other physical activity inside or outside the club.

The researcher chose Zamalek Sporting Club for the following reasons:

- Availability of a suitable number of young female handball players in the club.

- Officials in charge of this age category welcomed to apply the program during training sessions.

- Availability of capabilities, facilities and suitable areas for application in respect of the hall, equipment, tools and playgrounds.

Research sample homogeneity:

The sample skewness coefficients were computed in height, weight, chronological age, training age, reactive agility and some defensive skill variables in handball. Tests were applied to the research sample on Saturday and Sunday, 6 and 7/3/2021 as illustrated in Table (2).

Table (2)

Statistical description of the research sample in height, weight and chronological and training ages and physical and skill variables under investigation (n=12)

Variables		Units	X̄	Median	SD	Skewness Coefficients
Height		cm.	173,6	5,560	174.00	-0.240
Weight		kg.	64,67	65,11	5.66	0.39
Age	Chronological	Y	19,66	1,155	20,000	-0,866
	Training	Y	10,20	10,76	2,56	0,23
Physical variables	Test of reactive agility	sec.	13,28	13,25	0,63	0,142

Follow Table (2)
Statistical description of the research sample in height, weight and chronological and training ages and physical and skill variables under investigation (n=12)

	Variables	Units	X	Median	SD	Skewness Coefficients
Skill variables	Defensive moves to the two sides, measurement of speed of defensive moves to the two sides in (30sec.)	Rep.	18,62	18,60	1,20	0,055
	Short range moves (forward, backward, sideway) in (30 sec.)	Rep.	9,56	9,50	0,74	0,243
	Defensive movement forward and backward with an inclination	sec.	8,87	8,85	0,47	0,127
	Side defensive steps	sec.	5,23	5,20	0,64	0,140
	Side defensive steps with making a blocking wall.	sec.	6,22	6,20	0,61	0,098
	Compound and skill	sec.	13,61	2,13	13,00	0,859

Data in Table (2) show that values of skewness coefficients of the research sample of height, weight, chronological and training ages, physical and skill variables range from (-0.886 to 0.859) i.e. between (± 3) indicating that the research sample is homogenous in such variables.

Tools of collecting data:

Perusing the main data:

Some personal data of the research sample were collected concerning (name, date of birth and training age).

Scientific references and related studies:

The researcher used some scientific references and related studies of (Mohammed Hassan, 2001),

(Mohammed Sobhi, 2001), (Rania, 2008), (Holmberg, 2009), (Kaitlin, 2013), (Nining, 2019) and (Nebojsa, 2020) to outline tests of reactive agility and defensive skills in handball.

International web sites:

The researcher used some web sites on the internet to help her make a layout of the rug exercises to develop footwork under investigation as she used images and videos displayed and specialized to exercise on the 5-point rug 9-point rug in the site of procedos.com, and also to help make a layout of the 18-point rug to develop footwork to improve the level of reactive agility and the level of

defensive skill performance in handball.

Tools used in the research:

- Medical balance to measure weight.
- Restameter to identify height.
- Adhesive tape to put marks on the ground.
- Stopwatch.
- Measuring tape.
- Funnels.
- Fixed training signs with visual stimulus.
- Fixed and mobile signs.
- A 5-point rug, 9-point rug and a layout of 18-point rug.

Forms and interview:

The researcher carried out a referential scan for scientific references and previous Arabic and foreign studies specialized in the field of athletic and handball training on purpose to outline the most important and suitable test of reactive agility and tests of defensive skills. She put a schema of the following:

- 1- Exploring form of opinion of experts to define the test of reactive agility, tests of defensive skills in

handball, the extent of suitability of the proposed exercises by using the rug diversity and also defining the overall framework to conduct the proposed exercises in respect of duration – numbers of training units – time of the training unit. Names of experts and conditions of choosing them are illustrated in.

- 2- Form of recording data of each female player.

Tests used in the research:

- 1- Test of reactive agility.
- 2- Tests of defensive skills in handball:
 - Defensive moves to both sides, measuring the speed of moves to both sides in (30 sec.).
 - Short range defensive moves (forward, backward, sideway) in (30 sec.)
 - Forward and backward with inclination defensive move.
 - Sideway defensive steps.
 - Sideway defensive steps with making a blocking wall.
 - Compound skill test.

Table (3)

Relative importance of the proposed physical and skill tests according to opinions of experts (n1=n2=4)

Variables	Tests	Units	Percentage
Reactive agility	Test of reactive agility	sec.	100%
Defensive skills	Defensive moves to both sides, measuring the speed of moves to both sides in (30 sec.).	Rep.	100%
	Short range defensive moves (forward, backward, sideway) in (30 sec.)	Rep.	87,5%
	Forward and backward with inclination defensive move.	sec.	100%
	Sideway defensive steps.	sec.	100%

Follow Table (3)
Relative importance of the proposed physical and skill tests according to
opinions of experts (n1=n2=4)

Variables	Tests	Units	Percentage
	Sideway defensive steps with making a blocking wall.	sec.	87,5%
	Sideway defensive steps with making a blocking wall.	Rep.	50%
	Compound skill test.	sec.	100%

Data in Table (3) illustrate that percentages of opinions of experts on the proposed tests for the research sample individuals range from (100% to 50%) and the researcher was satisfied with (80%) and more to accept the proposed exercises. Scientific coefficients of physical and skill tests under investigation:

I. Reality of differentiation:

To compute the validity of physical and skill tests under investigation, the researcher used the reality of differentiation as she applied the tests to a pilot sample of (8) female players outside the main research sample on Monday, 1/3/2021 as stated in Table (4).

Table (4)
Significance of differences between differentiated and undifferentiated groups in
physical and skill variables under investigation (n1=n2=4)

	Tests	Units	Upper quartile n=4		Lower quartile		t-value s
			\bar{x}	SD	\bar{x}	SD	
Physical variables	Reactive agility test	sec.	12,10	0,10	13,35	0,12	4,28*
Skill variables	Defensive moves to both sides, measuring the speed of moves to both sides in (30 sec.).	Rep.	20,20	0,45	19,26	0,20	4,85*
	Short range defensive moves (forward, backward, sideway) in (30 sec.)	Rep.	10,10	0,63	9,10	0,32	4,62*
	Forward and backward with inclination defensive move.	sec.	8,70	0,36	9,25	0,20	4,19*
	Sideway defensive steps.	sec.	5,20	0,21	5,30	0,20	4,62*
	Sideway defensive steps with making a blocking wall.	sec.	5,85	0,26	6,31	0,17	4,64*
	Compound skill test.	sec.	10,58	2,49	12,63	1,79	2,88*

Tabulated t-value at (0.05) significance level = 1.730

Data in Table (4) show that there are significant differences in favor of the differentiated group in physical and skill variables under investigation indicating such tests are reliable in measuring what they have been established for.

Stability of tests:

To assure of the stability of tests the researcher used the application and re-application of the test method to the pilot sample. She used data of computing reliability of tests as the first application on Monday, 1/3/2021 and the second application after days from the first application on Thursday, 4/3/2021 as illustrated in Table (5).

Table (5)
Correlation coefficient between the first and second application in physical and skill variables under investigation (n=8)

Tests	Units	1 st application		2 nd application		<i>r</i> -values	
		\bar{x}	SD	\bar{x}	SD		
Physical variables							
Reactive agility test	sec.	13,25	0,10	13,22	0,17	0,958	
Skill variables	Defensive moves to both sides, measuring the speed of moves to both sides in (30 sec.).	Rep.	18,67	0,14	19,70	0,20	0,967
	Short range defensive moves (forward, backward, sideway) in (30 sec.)	Rep.	9,65	0,13	9,61	0,22	0,947
	Forward and backward with inclination defensive move.	sec.	8,90	0,31	8,85	0,18	0,910
	Sideway defensive steps.	sec.	5,30	0,20	5,25	0,31	0,945
	Sideway defensive steps with making a blocking wall.	sec.	6,30	0,17	6,35	0,62	0,978
	Compound skill test.	sec.	10,50	2,15	11,00	2,78	0,687

Tabulated *r*-value at (0.05) significance level = 0.632.

Data in Table (5) illustrate that all correlation coefficients between the first and second application are higher than the tabulated *r*-value meaning that they are acceptable.

The proposed program by using the rug diversity exercises:

According to the research objective and after using scientific references, previous studies and related researches, a program of exercises was

placed to improve footwork by using the rug diversity . The program was carried out in (8) weeks by (3) training units a week of total of (24) training units. It was applied in the outlined duration for physical preparation within the main training unit for young girls in the research sample. Training on the 5-point rug lasted (3) weeks of total of (9) training units, whereas training on the 9-point rug lasted (3)

weeks of total of (9) training units and training on the 18-point rug lasted (2) weeks of total of (6) training units.

The 5-point rug: It is a rectangular of (60x90cm), (2x3ft.) where 5 circles are drawn up of (10cm) in diameter for each circle that is used mostly to test and to measure agility and speed in USA (procedural definition by the researcher).

The 9-point rug: It is a rubber rug of (100x130cm) where a group of numbers are printed from (1 to 9) and distributed in 3 rows starting at the upper left and ending at the lower right and directions are divided into 4 main directions (procedural definition by the researcher).

The 18-point rug: It is a rug of (8x8m) drawn up on the ground schemed by the researcher where a group of numbers are drawn up from (1 to 18) and distributed in 5 rows starting at the upper left and ending at the lower right (procedural definition by the researcher).

Constituents of the training unit:

a. Warm-up and stretch: This part was for general preparation and to stretch all body joints and muscles. It included exercises of running, hopping and flexibility of joints. The warm-up lasted (15 min.) of the total time of the training unit.

b. Physical preparation: This part was to establish the main target of the program including exercises for special physical preparation (20 min.) according to the special program of the coach of physical fitness of the team and exercises of the proposed program by using the rug (20 min.) that it lasted

(40 min.) of the total time of the training unit.

c. Cool down: This part was to bring the female players back to their normal state through light running and stretching to prepare them to the skill preparation part with the coach of the team lasting (5 min.).

Bases of placing the program:

After perusing and searching the researcher considered the following technical bases to place the program of exercises of the rug diversity:

1- One training unit contained (3 to 5) exercises.

2- One training unit was performed with (6) repetitions for exercises with two feet.

3- Number of times of repetition of the exercises (groups) for exercises with two feet, the right foot and left foot was (5 to 6) groups.

4- Outlining the training intensity was as follows:

-Performance for (50 sec.) (Maximum speed).

-From (50 to 60 sec.) (Less than max. speed).

-From (60 to 70 sec.) (Intermediate speed)

-From (70 to 80 sec.) (Less than intermediate speed).

-More than (80sec.)(Slow).

-Rest intervals between groups were from (30 to 45 sec.) and from (60 to 80 sec.) between an exercise and another.

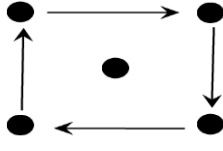
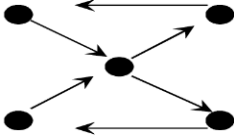
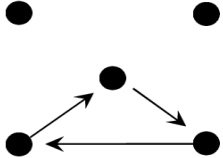
-The program was characterized by flexibility and the ability to modify it according to conditions that may arise during application.

-Considering scaling from easy to difficult and from simple to complex.

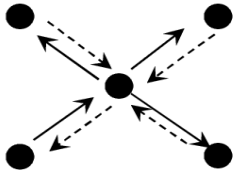
- Availability of suspense and seriousness of the proposed exercises.
- Considering similarity of performing the proposed exercises with the nature of performance of handball defensive skills.
- Considering the principle of individual differences and variation of exercises within the training unit.

The proposed program was presented to experts to assure of its content, validity for application and suitability for the research sample. The experts approved it by 100% without any modification. Table (6) illustrates a model of a training unit from the proposed program.

Table (6)
A form of a training unit from the proposed training program to improve footwork by using the rug diversity

Unit parts	Duration min.	Performance time	No. of groups	Intr.	Training	Exercise form
Warm-up	15				Preparation and stretch exercises	
Special physical preparation	20	—	—	—	Special physical preparation exercises as per the program of the team physical fitness coach.	
The rug exercises	20	60-70sec.	5	30 sec.	-Stand up with two feet to the left toward the lower left point, jump with two feet in the direction of the arrow. -Repeat the same exercise once again with changing the performance direction.	
		60-70sec.	5	30 sec.	-Stand up with two feet to the left toward the lower left point, Jump with two feet in the direction of the arrow on the shape of No. 8.	
		60-70	5	30 sec.	-Stand up with two feet to the left toward the lower left point, jump with two feet in the direction of the arrow. -Repeat the exercise once with the left foot and one more with the right foot.	

Follow Table (6)
A form of a training unit from the proposed training program to improve footwork by using the rug diversity

Unit parts	Duration min.	Performance time	No. of groups	Intr.	Training	Exercise form
		60-70sec.	5	30 sec.	-Stand up with two feet on the midpoint, jump with two feet toward the left "the lower left point", return to the midpoint and rotate clockwise, jump in the direction of the arrow and return to the starting point.	
Final part	5	—	—	—	Cool down exercises	

Research executive procedures:

Pilot study:

The researcher conducted it on (8) female players of the pilot study sample on Tuesday, 9/3/2021 for the following purposes:

- Making sure that exercises of the proposed program were suitable for the research sample.
- Finding out difficulties that may face the application of the exercises.
- Availability of equipment and tools necessary for applying the exercises.
- Defining the validity of the equipment and tools used.
- Workout a training unit to assure of understanding its content and correctness of time classification.

1- Pre-measurements:

The researcher carried out the pre-measurement on the research sample in all variables under investigation (test of reactive agility and tests of defensive skills in handball) on Thursday, 11/3/2021.

2- Application of the program:

The exercises of developing footwork by using the rug diversity were

applied to the research sample in (8) weeks by (3) training units a week on (Saturdays, Mondays and Wednesdays) of total of (24) training units from Saturday, 13/3/2021 to Wednesday, 5/5/2021 in the covered hall at Zamalek Sporting Club.

3- The post-measurements:

The researcher carried out the post-measurement on the research sample in all variables under investigation (test of reactive agility and tests of defensive skills in handball) on Thursday, 6/5/2021 with the same technique that has been previously applied in the pre-measurement and under the same terms and conditions.

Statistical treatments:

The researcher used the following statistical treatments:

- Arithmetic mean.
- Standard deviation.
- Median.
- Skewness coefficient.
- Test of significance of differences *t*-test.

-Person's correlation coefficient.
-Percentage.

-Improvement percentage.
Presentation and discussion of results:

Table (7)

Significance of differences between the pre and post-measurements in the level of reactive agility in young female handball players of the research sample (n=12)

Variables	Unit	Pre-measurement		Post-measurement		\bar{x} differences	Improvement %	t-value
		\bar{x}_1	SD1	\bar{x}_2	SD2			
Reactive agility test	Sec.	13.28	0.63	10.20	0.28	3.08	23.19%	4.85*

Tabulated t -value at (0.05) significance level = 1.753

Data in Table (7) show that there are significant differences between the pre and post-measurements of young female handball players in the level of

reactive agility in favor of the post-measurement as the computed t value is higher than that of its computed value at (0.05) significance level.

Table (8)

Significance of differences between the pre and post-measurements in the level of some defensive skill variables in young female handball players (n=12)

Variables	Unit Sec.	Pre-measurement		Post-measurement		\bar{x} differences	Improvement %	t-value
		\bar{x}_1	SD1	\bar{x}_2	SD2			
Defensive moves to both sides, measuring the speed of moves to both sides in (30 sec.).	Rep.	18,62	1,20	26,20	0,28	7,58	28,93%	5,28*
Short range defensive moves (forward, backward, sideway) in (30 sec.)	Rep.	9,56	0,74	12,98	0,60	3,42	12,98%	4,32*
Forward and backward with inclination defensive move.	sec.	8,87	0,47	6,22	0,28	2,65	29,87%	4,29*

Foolow Table (8)
Significance of differences between the pre and post-measurements in the level of some defensive skill variables in young female handball players (n=12)

Variables	Unit Sec.	Pre-measurement		Post-measurement		\bar{x} differences	Improvement %	t-value
		$\bar{x}1$	SD1	$\bar{x}2$	SD2			
Sideway defensive steps.	sec.	5,23	0,64	4,49	0,31	0,74	14,14%	4,26*
Sideway defensive steps with making a blocking wall.	sec.	6,22	0,61	5,22	0,47	1,00	15,53%	4,62*
Compound skill variable	sec.	12,00	1,78	10,50	2,25	1,50	14,28%	3,26*

Tabulated *t*-value at (0.05) significance level = 1.753

Data in Table (8) indicate that there are significant differences between the pre and post-measurements in young female handball players in the level of defensive skill variables in favor of the post-measurement as the computed *t* values are higher than that of its tabulated value at (0.05) significance level.

Discussion of the results:

Data in Table (7) illustrate that there are significant differences between the pre and post-measurements in young female handball players in the level of reactive agility in favor of the post-measurement and the percentage of improvement mount to (23.19%). The researcher related this result to exercises applied under investigation by using the rug diversity that contained harmonic exercises for improving agility, motor speed and the reaction speed.

In this respect Fathi Al-Saqqaf (2010) stated in his study that agility was in need of proper central nervous system and as well as connect and response speed, as the coordination of the reversal conditional action of the movement (work of nerves) was improved, controlling performance and doing physical skills would be increased and the individual would gain new movements easily and consequently, the constituent of his agility would be developed. Thus the athlete would be able to have high fine level of kinesthetic sensation and possibilities of controlling the speed of motor change would be increased and so the fine movement and the results needed would be achieved.

That is in agreement with the study of Galpin (2008) where the study results proved that four weeks on the speed plate device were adequate to cause

development in the agility element and the reaction speed.

The researcher thought that the reactive agility played an important role in the ability to perform skills as it helped the athlete perform his motor duties characterized by diversity, difference and moving freely in the proper time. Also it played a role in clearing mind and the ability to expect and all could be considered as master keys to achieve superiority in any athletic activity.

That also agreed with Arjunan, (2015), Bento Devaraj, (2013) and Zoran Milanovic et al., (2012) using exercises of developing footwork within the training program would help improve the level of physical and skill performance.

The researcher attributed such differences to the range of effectiveness of items of the training program that were applied scientifically with a studied method in accordance with the referential theoretical framework of the research in line with opinions of some experts and specialists in this field based on carrying out duties of such program by the research sample over the duration of the training program depending on repetitions and intensity placed to suit the level of the sample individuals and giving the proper rest between exercises and groups. Meanwhile, exercises contained in the training program were a blend of physical and motor abilities accompanied by handball defensive skills, as the proposed exercises were given directly toward specific targets besides

repetitions with correcting faults resulting in causing noticeable development in young girls of the research sample through doing such exercises, as the young girl reached the performance automatically via constant repetition.

Therefore, the 1st hypothesis of the research is achieved stating, "There are significant differences and improvement in percentage of rates of variation among means of the pre and post-measurements in the level of reactive agility in young female handball players born in (2002) in favor of the post-measurement".

Also Data in Table (8) show that there are significant differences between the pre and post-measurements in young female handball players of the research sample in the level of defensive variables in handball under investigation in favor of the post-measurement and percentages of improvement range from (12.98%) to (29.87%). The researcher related this improvement to the proposed program by using exercises of the rug diversity where she considered connecting between the reactive agility and methods of the muscle work believing that increasing the volume of skills and motor techniques mastered by the athlete, his possibilities to learn new and complex motor pathways would be increased and consequently, the possibility of improving agility for young girls would be increased and that would be positively reflected to the level of skill performance of defensive skills under investigation.

That was in agreement with the study of Fathi Al-Saqqaf, (2013) where he indicated that agility could be closely associated with the skill aspect as well as physical abilities particularly speed, muscle strength and endurance and could be considered as an important base to improve motor skills.

Also the researcher related this positive effect to the training technique planned to raise the efficiency of physical and skill performance by using exercises of the rug diversity depending on exercises of footwork in the proper motor time. Also she has taken care of graduation in exercises of the rug as she started with the 5-point rug, 9-point rug and 18-point rug; respectively. She considered moving between two points or more of numbers of the rug points with increasing the speed of performance gradually and in case of inaccuracy of performance as required, the performance was repeated once again, diversifying motor pathways to affect the muscle groups that must be exercised, graduation from easiness to difficulty and repeating the performance more than one time.

Thus the 2nd hypothesis of the research is achieved stating, "There are significant differences and improvement in percentages of the rate of variation between the pre and post-measurements in the level of performance of some defensive skills in young female handball players born in (2002) in favor of the post-measurement".

Conclusions:

1- Using exercises of the rug diversity is effective in improving and developing footwork in handball.

2- Exercises of footwork by using the rug diversity (the 5-points, 9-points and 18-points) positively contributed to improve the level of reactive agility of young female handball players of the research sample.

3- There is a superiority in percentages of improvement in the post-measurement against the pre-measurement in the level of defensive skills in young female handball players of the research sample indicating the extent of the positive effectiveness of the proposed program by using exercises of the rug diversity on improving the skill variables.

Recommendations:

In the light of the results of the current study, the researcher recommended the following:

1- The development of the element of reactive agility should be greatly considered in general and specific physical exercises as an important element in developing young female handball players and its effective impact on developing their skills.

2- The proposed exercises in the current study should be used due to their positive effect on developing physical characteristics and hence developing the skill performance in handball.

3- The results of the current study should be directed to coaches of handball for the possibility of making use of the proposed exercises.

4- Creating and sketching exercises by using the rug diversity to improve

footwork and getting their ideas from motor pathways of basic skills of different physical activities.

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