The Dynamic of Development of Some Coordinative Abilities and Its Relationship with the Level of Some Volleyball Skill's Performance as the Basis for Designing a Training Program for Juniors Females less than 14 Years

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Abstract: The purpose of this study was to reveal the dynamic of the development of some volleyball skills for junior females less than 14 years, determine the proportion of the contribution of coordinative abilities in the level of the performance of some volleyball skills (underhand serve – overhead pass – forearm pass), and to determine the equations to predict the level of performance of those skills in terms of coordinative abilities, as well as design a recommended training program according to the dynamic of development of coordinative abilities for Junior Females less than 14 years. The descriptive approach was used to reveal of development using the cross-sectional method, Ninety-six of junior females from the registered in the Egyptian league of volleyball less than 14 years in several sports clubs (Tanta, Nasr City, Cairo, Maady, Arab Contractors, and Shooting) were recruited in this study. Subjects' mean (±SD) height and body weight were 151 ± 0.05 cm, 44.81 ± 3.86 kg respectively. Subjects has been divided into 8 age groups (12 to 14 yrs), age group capacity was three month that making it possible to track the dynamic of development. Fourteen coordinative ability were measured (total body coordination, leg-eye coordination, hand-eye coordination, coordination under time pressure, accuracy, arms muscular power, static balance, dynamic balance, reaction speed, movement speed, speed, Spatial routing and directional change, motor muscular sense and visual spatial perception), as well as underhand serve, Overhead pass and forearm pass were measured. Results indicated that the dynamic of the

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development of some coordinative abilities of underhand serve, overhead pass and forearm pass for junior female volleyball players less than 14 years were revealed. The eighth age group came first in growth leaps with 11 abilities in addition to superiority in performing all skills under investigation. Coordinative abilities of major contribution in underhand serve were arms muscular power, hand-eye coordination, accuracy and dynamic balance. Coordinative abilities of major contribution in overhead pass were arms muscular power, visual spatial perception, total body coordination, accuracy, reaction speed and dynamic balance. Coordinative abilities of major contribution in forearm pass were arms muscular power, visual spatial perception, total body coordination, accuracy, dynamic balance and reaction speed.

Key words: coordinative abilities – junior females – volleyball.

Introduction:

The ultimate goal for specialists in motor development is to understand the nature and dynamics of quantitative and qualitative variations in motor skills along the human life in addition to establishing clear standards for measuring them. This is the scientific and educational base for developing sports training programs for various age groups (Nahed Anwar Alsabagh, 1999). Growth and development from childhood to puppetry is very dynamic as the junior athlete passes through a series of clear changes in the rate of development for specific abilities of the concerned activity (Zaher, 2000). Coordinative abilities play a major role in achieving the highest possible level of performance according to the specific sports activity concerned. Each activity is characterized by a set of distinct coordinative abilities that distinguish it from other activities. Discovering these abilities in each activity according to the type of activity and the age group is a major problem that face sports specialists, especially in sports training and athletic selection (Michael, 1998).

Coordinative abilities are "general motor and mental conditions for athletic achievement through which an athlete can control motor performance in all sports activities. Theses abilities stem from athletic performance requirements and are specified with the amount of accuracy and mastery for motor skills (Khaliq, 2005). In addition, "they are physical abilities closely related to coordination with mutual affect between them and they are considered basic for sports activity in general" (Baligh, 1999). Furthermore, "they represent the athlete's ability to coordinate and link various motor tasks performed by the athlete simultaneously with other motor tasks performed by the opponent in a meaningful and coordinated unit" (Mustafa, 1998). The concept of coordinative abilities replaced the old concept of agility. These abilities never appear individually. Instead, they are always related other conditions of sports achievement like physical abilities, technique and tactic. They are also related to each other. Coordinative abilities serve the combination of total motion and partial motion in a coordinated way as they reflect the type of motor performance, the speed of motor learning, the effectiveness of motor items and the ability to adapt mental motor programs to changing conditions (Maksoud, 1985)

Coordinative abilities derive from the requirements of skills performance and differ from each other in the direction of the dynamic, and do not appear individually but always linked with each other to serve in their content the total motion in a coordinated manner, it is also linked to the abilities of physical and technical skills and tactical, and if they have been working between these abilities, coordination was possible to achieve the highest level of required motor coordination for the performance of motor skills that distinguished with exactly and motor control (Elsayd, 2006). The importance of coordinative abilities in game results increase with the increased demands of neuromuscular coordination of the specific sport (Ritter, 2004). Improving coordinative abilities lead to improvements of the quality of motor performance, learning speed and adaptation to changing conditions. Therefore, movement become smarter, more fluent and more effective (Khaliq, 2005). Components of coordinative abilities are different in each sport and each skill according to the requirements of coordinative abilities components (El-Din, 1997).

Volleyball depends on coordinative abilities for improving its skills in general, and especially attack skills as these skills need an estimation of the changing body position of the player, the teammate or the opponent in addition to relating various skill items like service, attack hit and attack block. Volleyball games are characterized of quick and continuous tempo. This requires good preparation of junior athletes in all physical and technical aspects, especially coordinative abilities (Abdel Atty Abdel-Fattah, 2001). Through observing junior females volleyball players while training or in competitions, the researcher noticed a decrease of the performance level of some skills like underhand serve, overhead pass and forearm passe. This led the researcher to pause the following questions: what is the relation between performance degrees and growth leaps of coordinative abilities concerning the performance level of these skills? What are the dynamic of the development of these coordinative abilities? What is the relative contribution of coordinative abilities in each of these skills? Can we formulate predictive equations for the performance levels of each of these skills as a function of coordinative abilities? These questions led the researcher to perform the current research to answer them.

Current study is of major importance as it tries to direct the training and motor learning processes in addition to acquiring valuable information about natural growth of coordinative abilities of female junior volleyball players. This type of information can be used in answering questions about the aims and suitable components of the programs according to natural growth leaps in addition to improving achievement levels to optimum. So the current research aims to:

1. Reveal the dynamic of the development of these coordinative abilities of female

junior volleyball players less than 14 years.
2. Determine the relative contribution of coordinative abilities in underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years.
3. Determine predictive equations for the performance levels of underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years in terms of coordinative abilities.
4. Design a recommended training program according to the dynamic of the development of coordinative abilities for female junior volleyball players less than 14 years.

Research questions:

1. What are the dynamic of the development of these coordinative abilities of female junior volleyball players less than 14 years?
2. What is the relative contribution of coordinative abilities in underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years?
3. What are predictive equations for the performance levels of underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years in terms of coordinative abilities?
4. Could a recommended training program be designed according to the dynamic of the development of coordinative abilities for female junior volleyball players less than 14 years?

Methods:

Descriptive approach to the problem:

A cross-sectional descriptive designe was used to reveal the dynamic of the development of coordinative abilities of female junior volleyball players less than 14 years.

Subjects:

Study community includes female junior volleyball players less than 14 years registered in the Egyptian Federation of Volleyball during 2014-2015 seasons. Ninty-six female junior were purposefully chosen from teams of female junior volleyball players less than 14 years in several sports clubs (Tanta, Nasr City, Cairo, Maady, Arab Contractors, and Shooting). They were divided into 8 age groups (12 to 14 yrs), age group capacity was 3 month that making it possible to track the dynamic development. (Table 1)

Table (1)
Descriptive data of participants n=96

Club		Age Groups (year. month)								Sum
		1	2	3	4	5	6	7	8	
		12 :> 12.3	12.3 :> 12.6	12.6 :> 12.9	12.9 :> 13	13 :> 13.3	13.3 :> 13.6	13.6 :> 13.9	13.9 :>14	
Tanta		1	2	1	2	2	2	2	5	17
Nasr City		3	2	2	1	3	3	1	1	16
Cairo		2	-	2	1	4	2	3	2	16
Maady		1	2	-	3	2	1	2	5	16
Arab contractors		3	1	3	2	-	1	-	2	15
Shooting		2	3	2	-	1	1	3	4	16
Sum		12	10	10	9	12	10	11	22	96
Height (cm)	Mean	1.51	1.50	1.52	1.51	1.51	1.49	1.52	1.52	1.51
	SD±	0.40	0.43	0.58	0.50	0.40	0.03	0.06	0.06	0.05
	Median	1.50	1.50	1.50	1.50	1.52	1.50	1.54	1.53	1.51
	Skewness	0.60	1.51	0.26	-0.10	1.22	-0.11	-0.20	-0.58	0.15
Weight (kg)	Mean	44.58	44.90	44.10	44	45	44.40	45.09	45.50	44.81
	SD±	3.85	3.93	3.73	4.80	3.67	3.84	4.16	4.08	3.86
	Median	43.50	44	42.50	44	45	45	45	46	45
	Skewness	1.03	0.71	0.35	1.15	0.25	-0.38	-0.14	-0.31	0.24

Skewness values for weight and height are between 3±, this clearly indicated that sample is free of radical distributions.

Tests of coordinative abilities and skills:

Through letruture review (Ahmed, 1996; Ahmed Ali Hussein, 2000; Ahmed Mohammed Khater, 1996; Atiyah, 2001; Baligh, 1999; Hassanein, 1999; Ibrahim Gabr, 2005; Lutfi, 1996; Mohamed Hassan Allawi, 1994; Mustafa, 1998; Nahed Anwar Alsabagh, 1999; Suleiman, 2003), the researcher identified 24 coordinative abilities with its tests. These abilities were presented to 11 experts of volleyball training and instruction to identify the most important coordinative abilities related to the performance level of underhand serve, overhead pass and forearm pass that are suitable for the age group under investigation. The researcher accepted all abilities with agreement percentage of 90% and over. Experts agreed on total body coordination (rope jumping test) (Mohamed Sobhi Hassanein, 1997), leg-eye coordination (jumping in numbered circles) (Hassanein, 1999), hand-eye coordination (throwing and receiving balls in 30 sec) (Hassanein, 1999), coordination under time pressure (Lutfi, 1996), accuracy (aiming with hand in overlapping circles) (Hassanein, 1999), arms muscular power (throwing medicine ball) (Hassanein, 1999), static balance (standing on one foot) (Hassanein, 1999), dynamic balance (octagon test) (Hassanein, 1999), reaction speed test (ruler test) (Hassanein, 1999), movement speed (leg velocity test) (Hassanein, 1999), speed (running 30m from movement) (Hassanein, 1999), spatial routing and directional change (Lutfi, 1996), motor muscular sense (Lutfi, 1996), visual spatial perception (walking the path) (Lutfi, 1996).

The following skills tests have used to evaluate skills under consideration, underhand serve (accuracy of short serve), overhead pass (accuracy of overhand pass to the wall), forearm pass (accuracy of forearm pass to the wall) (Mohamed Sobhi Hassanein, 1997)

Test sessions:

All subjects have performed all tests (17 tests) in two consecutive days. Thereafter, the subjects performed 9 tests on the 1st session and 8 tests on the 2nd session, with a random and counterbalance order to tests. On the day of test session, the subjects attended to the court, wearing sports clothes, and performed a warm-up which included 5 min of light running and 5 min stretching exercises. The subjects were verbally encouraged for maximum performance in all the tests. The test sessions took place from 18-2-2015 to 18-3-2015 on the courts of sports clubs under investigation. To minimize circadian variations in all variables, all subjects performed their sessions at the same hour of the day (from 5:00 to 8:00 p.m.). All testing sessions were supervised and conducted by the author, in addition to 3 post-graduate students.

Statistical analysis:

The statistical calculations were performed using STATISTICA software version 10 (StatSoft, Tulsa, OK, USA). All variables presented normal distribution and homoscedasticity. The coordinative abilities and skills were evaluated for 8 age groups, so one way analysis of variation (ANOVA) was used to identify difference between age groups, and when statistical significance ($P \leq 0.05$) was found, the Scheffe test for comparisons was applied to compare the coordinative abilities and skills between the 8 age groups. Stepwise Regression Analysis was used to determine the relative contribution of coordinative abilities in selected skills, and to determine predictive equations for the performance levels of selected skills in terms of coordinative abilities.

Results:

To reveal the dynamic of the development of these coordinative abilities for 8 age groups all data were presented as mean and standard deviations (±SD) (Table 2), and (Figures 1, 2, and 3) shown the dynamic of the development of these coordinative abilities. One way analysis of variation (ANOVA) (Table 3) was shown statistically significant differences among age groups on all research variables except for three abilities (static balance, speed, spatial routing and directional change).

The comparison between the 8 age groups in coordinative abilities and skills showed in tables 4 and 5. The relative contribution of coordinative abilities in selected skills showed in tables 6, 7, and 8. Predictive equations for the performance levels of selected skills in terms of coordinative abilities have been identified also from Tables 6, 7, and 8.

Table (2)
Mean, SD, Median and Skewness of all research variables (n=96)

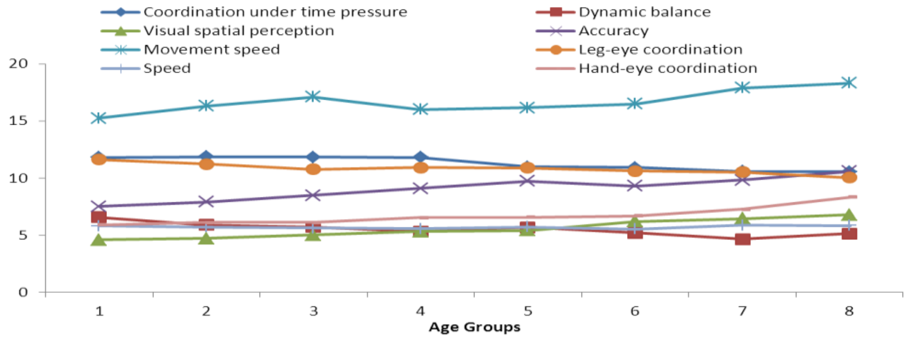

Figure1. The dynamic of coordinative abilities (8 abilities)

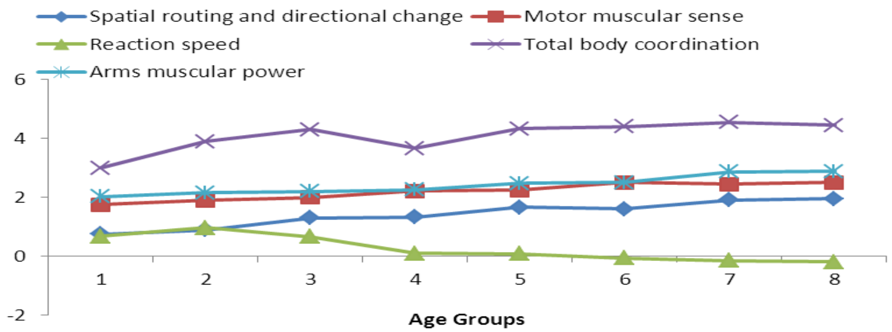

Figure2. The dynamic of coordinative abilities (5 abilities

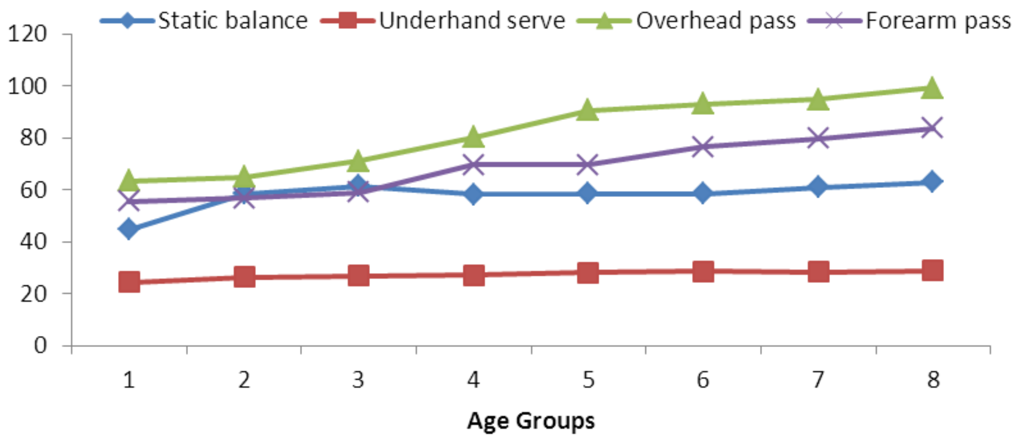

Figure3. The dynamic static balance and skills

Table (3)
Variance Analysis of all age groups on all research variables (n=96)

	Variables	Variance	Sum of	Freedom	Mean	F
Coordinative abilities	Total body coordination	Inter–	28.74	7	4.11	5.62*
		Intra–	64.52	88	0.73	
		sum	92.99	95		
	Leg-eye coordination	Inter–	23.95	7	3.42	7.49*
		Intra–	40.43	88	0.46	
		sum	94.38	95		
	Hand-eye coordination	Inter–	72.83	7	10.40	12.91*
		Intra–	70.91	88	0.81	
		sum	143.74	95		
	Coordination under time pressure	Inter–	30.94	7	4.42	10.02*
		Intra–	38.84	88	0.44	
		sum	69.78	95		
	Accuracy	Inter–	106.90	7	15.27	5.63*
		Intra–	238.60	88	2.71	
		sum	345.49	95		
	Arms muscular power	Inter–	997	7	1.42	24.49*
		Intra–	5.12	88	0.06	
		sum	15.09	95		
	Static balance	Inter–	2863.55	7	409.08	2.01
		Intra–	17928.67	88	203.74	
		sum	20792.22	95		
	Dynamic balance	Inter–	28.67	7	4.10	4.43*
		Intra–	81.32	88	0.92	
		sum	109.99	95		
	Reaction speed	Inter–	16.43	7	2.35	7.39*
		Intra–	27.96	88	0.32	
		sum	44.39	95		
	Velocity	Inter–	107.40	7	15.34	6.34*
		Intra–	213.10	88	2.42	
		sum	320.50	95		
	Movement speed	Inter–	1.35	7	0.19	0.83
		Intra–	20.44	88	0.23	
		sum	21.79	95		
	Spatial routing and directional change	Inter–	17.81	7	2.54	1.80
		Intra–	124.18	88	1.41	
		sum	141.99	95		

Follow Table (3)
Variance Analysis of all age groups on all research variables (n=96)

	Variables	Variance	Sum of	Freedom	Mean	F
	Motor muscular sense	Inter–	7.27	7	1.04	2.43*
		Intra–	37.68	88	0.43	
		sum	44.95	95		
	Visual spatial perception	Inter–	66.11	7	9.45	17.27*
		Intra–	48.12	88	0.55	
		sum	114.24	95		
Skills	**Underhand serve**	Inter–	7	187.21	26.75	7.28*
		Intra–	88	323.43	3.68	
		sum	95	510.65		
	Overhead pass	Inter–	7	18283.74	2611.96	113.33 *
		Intra–	88	2028.1	23.05	
		sum	95	20311.8		
	Forearm pass	Inter–	7	11148.70	1592.67	77.22*
		Intra–	88	1815.13	20.62	
		sum	95	12963.83		

F table value on P≤0.05 = 2.17, * significant on P ≤0.05

Table (4)
Scheffe test for total body coordination, leg-eye coordination, hand-eye coordination, coordination under time pressure accuracy, arms muscular power, dynamic balance and reaction speed

	Age groups	12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
Total body coordination	12 : < 12.3		-0.90	-0.30	-0.67	-1.33	-1.40	-1.55*	-1.45*
	12.3 : < 12.6			0.60	0.23	-0.43	-0.50	-0.65	-.055
	12.6 : < 12.9				-0.37	-1.03	-1.10	-1.25	-1.15
	12.9 : < 13					-0.67	-0.73	-0.88	-0.79
	13 : < 13.3						-0.07	-0.21	-0.12
	13.3 : < 13.6							-0.14	-0.05
	13.6 : < 13.9								0.09
	13.9 : < 14								
Leg-eye coordination	12 : < 12.3		0.38	0.85	0.70	0.73	1.01	1.11*	1.58*
	12.3 : < 12.6			0.47	0.32	0.35	0.63	0.73	1.20*
	12.6 : < 12.9				-0.15	-0.12	0.16	0.26	0.73
	12.9 : < 13					0.03	0.30	0.40	0.88

Follow Table (4)
Scheffe test for total body coordination, leg-eye coordination, hand-eye coordination, coordination under time pressure accuracy, arms muscular power, dynamic balance and reaction speed

Age groups		12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
	13 : < 13.3						0.27	0.37	0.85
	13.3 : < 13.6							0.10	0.58
	13.6 : < 13.9								0.48
	13.9 : < 14								
Hand-eye coordination	12 : < 12.3		-0.18	-0.18	-0.64	-0.67	-0.78	-1.36	-2.40*
	12.3 : < 12.6			0.00	-0.46	-0.48	-0.60	-1.17	-2.22*
	12.6 : < 12.9				-0.46	-0.48	-0.60	-1.17	-2.21*
	12.9 : < 13					-0.03	-0.14	-0.72	-1.76*
	13 : < 13.3						-0.12	-0.69	-1.73*
	13.3 : < 13.6							-0.57	-1.62*
	13.6 : < 13.9								-1.05
	13.9 : < 14								
Coordination under time pressure	12 : < 12.3		-0.07	-0.04	-0.02	0.82	0.89	*1.21	*1.24
	12.3 : < 12.6			0.03	0.05	0.88	0.96	*1.258	*1.31
	12.6 : < 12.9				0.03	0.86	0.94	*1.25	*1.28
	12.9 : < 13					0.83	0.91	*1.23	*1.26
	13 : < 13.3						0.08	0.40	0.43
	13.3 : < 13.6							0.32	0.35
	13.6 : < 13.9								0.03
	13.9 : < 14								
Accuracy	12 : < 12.3		-0.40	-1	-1.61	-2.25	-1.80	-2.32	-3.09*
	12.3 : < 12.6			-0.60	-1.21	-1.85	-1.40	-1.92	-2.96*
	12.6 : < 12.9				-0.61	-1.25	-0.80	-1.32	-2.10
	12.9 : < 13					-0.64	-0.19	-0.71	-1.48
	13 : < 13.3						0.45	-0.09	-0.84
	13.3 : < 13.6							-0.52	-1.29
	13.6 : < 13.9								-0.77
	13.9 : < 14								
Arms muscular power	12 : < 12.3		-0.14	-0.18	-0.24	-0.47*	-0.49*	-0.84*	-0.86*
	12.3 : < 12.6			-0.04	-0.09	-0.32	-0.35	-0.70*	-0.72*
	12.6 : < 12.9				-0.05	-0.28	-0.31	-0.66*	-0.68*

Follow Table (4)
Scheffe test for total body coordination, leg-eye coordination, hand-eye coordination, coordination under time pressure accuracy, arms muscular power, dynamic balance and reaction speed

Variable	Age groups	12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
	12.9 : < 13					-0.23	-0.25	-0.61*	-0.63*
	13 : < 13.3						-0.03	-0.38*	-0.39*
	13.3 : < 13.6							-0.35	-0.37*
	13.6 : < 13.9								-0.02
	13.9 : < 14								
Dynamic balance	12 : < 12.3		0.68	0.88	1.25	0.92	1.38	*1.95	*1.45
	12.3 : < 12.6			0.20	0.57	0.23	0.70	1.26	0.76
	12.6 : < 12.9				0.37	0.03	0.50	1.06	0.56
	12.9 : < 13					-0.33	0.13	0.70	0.20
	13 : < 13.3						0.47	1.03	0.53
	13.3 : < 13.6							0.65	0.06
	13.6 : < 13.9								0.50
	13.9 : < 14								
Reaction speed	12 : < 12.3		-0.28	0.01	0.59	0.59	0.74	0.82	0.88*
	12.3 : < 12.6			0.30	0.87	0.87	1.02*	1.11*	1.16*
	12.6 : < 12.9				0.57	0.58	0.72	0.81	0.86*
	12.9 : < 13					0.01	0.15	0.23	0.29
	13 : < 13.3						0.14	0.23	0.29
	13.3 : < 13.6							0.09	0.14
	13.6 : < 13.9								0.06
	13.9 : < 14								

* Significant on P ≤0.05

Table (5)
Scheffe test for movement speed, motor muscular sense, and visual spatial perception, underhand serve, overhead pass and forearm pass

Variable	Age groups	12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
Movement speed	**12 : < 12.3**		**-1.05**	**-1.85**	**-0.75**	**-0.92**	**-1.25**	**-2.66***	**-3.07***
	12.3 : < 12.6			**-0.08**	**0.30**	**0.13**	**-0.20**	**-1.60**	**-2.03**
	12.6 : < 12.9				**1.10**	**0.93**	**0.60**	**-0.81**	**-1.22**
	12.9 : < 13					**-0.17**	**-0.50**	**-1.91**	**-2.32**
	13 : < 13.3						**-0.33**	**-1.74**	**-2.15***
	13.3 : < 13.6							**-1.41**	**-1.82**
	13.6 : < 13.9								**-1.41**
	13.9 : < 14								

Follow Table (5)
Scheffe test for movement speed, motor muscular sense, and visual spatial perception, underhand serve, overhead pass and forearm pass

Variable	Age groups	12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
Motor muscular sense	**12 : < 12.3**		**-0.15**	**-0.25**	**-0.47**	**-0.50**	***-0.75**	**-0.70**	***-0.75**
	12.3 : < 12.6			**-0.10**	**-0.32**	**-0.35**	**-0.60**	**-0.55**	**-0.60**
	12.6 : < 12.9				**-0.22**	**-0.25**	**-0.50**	**-0.45**	**-0.50**
	12.9 : < 13					**-0.03**	**-0.28**	**-0.23**	**-0.28**
	13 : < 13.3						**-025**	**-0.20**	**-0.25**
	13.3 : < 13.6							**-0.05**	**0.00**
	13.6 : < 13.9								**-0.05**
	13.9 : < 14								
Visual spatial perception	**12 : < 12.3**		**-0.12**	**-0.42**	**-0.75**	**-0.83**	**-1.62**	**-1.87**	**-2.19**
	12.3 : < 12.6			**-0.30**	**-0.63**	**-0.72**	***-1.50**	***-1.75**	***-2.07**
	12.6 : < 12.9				**-0.33**	**-0.42**	**-1.20**	***-1.45**	***-1.77**
	12.9 : < 13					**-0.08**	**-0.87**	**-1.12**	***-1.44**
	13 : < 13.3						**-0.78**	**-1.04**	***-1.36**
	13.3 : < 13.6							**-0.25**	**-0.57**
	13.6 : < 13.9								**-0.32**
	13.9 : < 14								
Underhand serve	**12 : < 12.3**		−1.90	−2.30	2.68	−3.50*	−4.16*	−3.86*	−4.29*
	12.3 : < 12.6			−0.40	−0.78	−1.59	−2.27	−1.96	−2.39
	12.6 : < 12.9				−0.38	−1.19	−1.87	−1.56	−1.99
	12.9 : < 13					−0.81	−1.48	−1.19	−1.60
	13 : < 13.3						−0.67	−0.36	−0.79
	13.3 : < 13.6							0.30	−0.12
	13.6 : < 13.9								−0.43
	13.9 : < 14								

Follow Table (5)
Scheffe test for movement speed, motor muscular sense, and visual spatial perception, underhand serve, overhead pass and forearm pass

Age groups		12 : < 12.3	12.3 : < 12.6	12.6 : < 12.9	12.9 : < 13	13 : < 13.3	13.3 : < 13.6	13.6 : < 13.9	13.9 : < 14
Overhead pass	**12 : < 12.3**		**−1.50**	**−7.50**	**−16.72***	**−27.17***	**−29.70***	**−31.41***	**−35.77***
	12.3 : < 12.6			**−6**	**−15.22***	**−25.67***	**−28.20***	**−29.91***	**−34.27***
	12.6 : < 12.9				**−9.22***	**−19.67***	**−22.20***	**−23.91***	**−28.27***
	12.9 : < 13					**−10.44***	**−12.98***	**−14.69***	**−19.05**
	13 : < 13.3						**−2.53**	**−4.24**	**−8.61***
	13.3 : < 13.6							**−1.71**	**−6.07**
	13.6 : < 13.9								**−4.36**
	13.9 : < 14								
Forearm pass	**12 : < 12.3**		**−1.30**	**−3.50**	**−14.06***	**−14***	**−21.10***	**−24.32***	**−28.32***
	12.3 : < 12.6			**−2.20**	**−12.76***	**−12.70***	**−19.80***	**−23.02***	**−27.07***
	12.6 : < 12.9				**−10.56***	**−10.50***	**−17.60***	**−20.82***	**−24.82***
	12.9 : < 13					**0.06**	**−7.04**	**−10.26***	**−14.26***
	13 : < 13.3						**−7.10**	**−10.32**	**−14.32***
	13.3 : < 13.6							**−3.22**	**−7.22***
	13.6 : < 13.9								**−4**
	13.9 : < 14								

* Significant on P ≤0.05

Table (6)
Stepwise regression for coordinative abilities contributing in the performance of underhand serves for junior female volleyball players less than 14 years

Step	Coordinative abilities	R	F	Standard error	Constant	Regression correlations				Contribution percentage
						b1	b2	b3	b4	
1	Arms muscular	0.474	27.24	2.05	39.85	20.21				**22.5%**
2	Hand-eye coordination	0.573	22.69	1.92	34.97	14.24	0.804			**32.8%**
3	Accuracy	0.626	19.73	1.84	30.73	12.11	0.67	0.328		**39.2%**
4	Dynamic balance	0.661	17.61	1.78	33.04	10.58	0.577	0.295	-0.483	**43.6%**

The coordinative abilities contributing in the performance level of underhand serve are as follows:

1st contributor: arms muscular power

Arms muscular power is the first contributor in underhand serve with contribution percentage of 22.5%. F value indicates statistically significant differences among coordinative abilities.

2nd contributor: hand-eye coordination

Hand-eye coordination is the second contributor in underhand serve as it increased contribution percentage from 22.5% to 32.8% (10.3%). F value indicates statistically significant differences among coordinative abilities.

3rd contributor: accuracy

Accuracy is the third contributor in underhand serve as it increased contribution percentage from 32.8% to 39.2% (6.4%). F value indicates statistically significant differences among coordinative abilities.

4th contributor: dynamic balance

Dynamic balance is the fourth contributor in underhand serve as it increased contribution percentage from 39.2% to 43.6% (4.4%). F value indicates statistically significant differences among coordinative abilities.

Table (7)
Stepwise regression for coordinative abilities contributing in the performance of overhand passes for junior female volleyball players less than 14 years

Step	Coordinative abilities	R	F	Standard error	Constant	Regression correlations						Contribution percentage
						b1	b2	b3	b4	b5	b6	
1	Arms muscular strength	0.711	96.35	10.33	19.55	26.10						50.6%
2	Visual spatial perception	0.795	80.11	8.96	9	17.13	5.76					63.3%
3	Total body coordination	0.838	72.28	8.11	0.847	16.36	4.59	4.17				70.2%
4	Accuracy	0.826	65.51	7.59	59.78	13.92	3.86	3.46	1.09			74.2%
5	Reaction speed	0.867	55.52	7.43	69.22	12.88	3.03	3.18	0.86	-3.08		75.5%
6	Dynamic balance	0.875	48.49	7.31	70.21	12.69	2.61	2.99	0.64	-3.24	0.11	76.6%

The coordinative abilities contributing in the performance level of overhead pass are as follows:

1st contributor: arms muscular power

Arms muscular power is the first contributor in overhead pass with contribution percentage of 50.6%. F value indicates statistically significant differences among coordinative abilities.

2n contributor: visual spatial perception

Visual spatial perception is the second contributor in overhead pass as it increased contribution percentage from 50.6% to 63.3% (12.7%). F value indicates statistically significant differences among coordinative abilities.

3rd contributor: total body coordination

Total body coordination is the third contributor in overhead pass as it increased contribution percentage from 63.3% to 70.2% (6.9%). F value indicates statistically significant differences among coordinative abilities.

4th contributor: accuracy

Accuracy is the fourth contributor in overhead pass as it increased contribution percentage from 70.2% to 74.2% (4%). F value indicates statistically significant differences among coordinative abilities.

5th contributor: reaction speed

Reaction speed is the fifth contributor in overhead pass as it increased contribution percentage from 74.2% to 75.5% (1.3%). F value indicates statistically significant differences among coordinative abilities.

6th contributor: dynamic balance

Dynamic balance is the sixth contributor in overhead pass as it increased contribution percentage from 75.5% to 76.6% (1.1%). F value indicates statistically significant differences among coordinative ab ilities.

Table(8)
Stepwise regression for coordinative abilities contributing in the performance of forearm passes for junior female volleyball players less than 14 years

Step	Coordinative ability	R	F	Standard error	Constant	Regression correlations						Contribution percentage
						b1	b2	b3	b4	b5	b6	
1	Arms muscular	0.748	119.05	7.8	25.17	7.96						55.90%
2	Visual spatial perception	0.833	105.64	6.53	8.05	5.27	13.1					69.40%
3	Total body coordination	0.869	94.24	5.88	1.98	4.4	12.52	3.1				75.40%
4	Accuracy	0.885	82.49	5.55	42.25	3.9	10.85	2.61	2.8			78.40%
5	Dynamic balance	0.893	70.63	5.41	51.68	3.65	10.5	2.4	2.7	-1.34		79.90%
6	Reaction speed	0.902	64.82	5.21	61.78	2.85	9.49	2.11	2.72	-1.54	-2.84	81.40%

The coordinative abilities contributing in the performance level of forearm pass are as follows:

1st contributor: arms muscular power

Arms muscular power is the first contributor in forearm pass with contribution percentage of 55.9%. F value indicates statistically significant differences among coordinative abilities.

2ed contributor: visual spatial perception

Visual spatial perception is the second contributor in forearm pass as it increased contribution percentage from 55.9% to 69.4% (13.5%). F value indicates statistically significant differences among coordinative abilities.

3rd contributor: total body coordination

Total body coordination is the third contributor in forearm pass as it increased contribution percentage from 69.4% to 75.4% (6%). F value indicates statistically significant differences among coordinative abilities.

4th contributor: accuracy

Accuracy is the fourth contributor in forearm pass as it increased contribution percentage from 75.4% to 78.4% (3%). F value indicates statistically significant differences among coordinative abilities.

5th contributor: dynamic balance

Dynamic balance is the fifth contributor in forearm pass as it increased contribution percentage from 78.4% to 79.9% (1.5%). F value indicates statistically significant differences among coordinative abilities.

6th contributor: reaction speed

Reaction speed is the sixth contributor in forearm pass as it increased contribution percentage from 79.9% to 81.4% (1.5%). F value indicates statistically significant differences among coordinative abilities.

Discussion:

The dynamic of the development of these coordinative abilities of female junior volleyball players less than 14 years:

Tables (2, 3, and 4) indicated an increase in the means of total body coordination between each two age groups in favor of the older group. Statistically significant differences among age groups in total body coordination for 2 comparisons out of 28 comparisons have showen. All these differences were statistically significant in favor of older age group. A growth leap in total body coordination appeared in favor of the seventh age group (13.6: <13.9). Therefore, training in this age group should be directed to improve this coordinative ability as it affects smash hit (spiking), attack preparation and court defense in volleyball. Total body coordination appears in movements requiring the use of different muscle groups working together in different directions but in full harmony. This was confirmed by **Talha**

Hossam El-Din (El-Din, 1997) that total body coordination affects performance accuracy. This is clear in sensing distance, direction and timing. Specific coordinative abilities should be improved during early stages of practicing sports activities to improve technical performance level. A decrease in the performance time of leg-eye coordination between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in leg-eye coordination for 3 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. The highest growth leap in leg-eye coordination was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve leg-eye coordination as it affects floor defense, ball receiving and smash hit. In addition, it appears in the approach phase of smash serve, smash hit and block. **Sergei, Pulonski** (Sergei, 1996) indicated that leg-eye coordination is very important for integrating leg muscles working together with vision. This is clear in most volleyball skills. An increase in hand-eye coordination between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in hand-eye coordination for 6 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. The highest growth leap in hand-eye coordination was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve hand-eye coordination as it affects serve, passing, preparation, court defense, ball receiving and smash hit. **Sergei, Pulonski** (Sergei, 1996) indicated that hand-eye coordination is very important for integrating leg muscles working together with vision and this is clear in most volleyball skills. An increase of coordination under time pressure between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in coordination under time pressure for 8 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. The highest growth coordination under time pressure was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve coordination under time pressure as it affects serve, smash hit and block that need synchrony to be performed effectively, this is consistent with **Anwar Abdel Kader** (Kader, 2006). An increase of accuracy between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in accuracy for 2 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. The highest growth leap in accuracy was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve accuracy as it affects most volleyball skills in general and especially serve and smash hit, this is consistent with what **Mohamed Sobhi Hassaneinand Hamdi Abdel-Moneim** (Mohamed Sobhi Hassanein, 1997) referred to the importance of Accuracy in volleyball skills . An increase of arms muscular power between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in arms muscular power for 12 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. The highest growth leap in arms muscular power was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve arms muscular power as it affects most volleyball skills in general and especially serve and smash hit, this is consistent with what **Atef Rashad et al.** (Atef Rashad, 2006) referred to that volleyball requires arms muscular power as it plays a major role in all types of serve, pass and smash hit. An increase of static balance between each two age groups in favor of the older group has shown. No statistically significant differences among age groups in static balance have shown. The highest growth leap in static balance was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve static balance as it affects most volleyball skills in general and especially underhand serve, pass and court defense, this is consistent with what indicated by **Abdel Atty Abdel-Fattah, Khaled Mohammed Zeada** (Abdel Atty Abdel-Fattah, 2002) that the balance one of the important ability for volleyball players and needs in many skills such as hitting, block and other. An increase in the means of dynamic balance between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in dynamic balance for 2 comparisons out of 28 comparisons have shown. All these differences were statistically significant in favor of older age group. A growth leap in dynamic balance appeared in favor of the seventh age group (13.6: <13.9). Therefore, training in this age group should be directed to improve dynamic balance as it affects smash hit, serve and block in volleyball, this is consistent with what indicated by **Abdel Atty Abdel-Fattah, Khaled Mohammed Zeada (**Abdel Atty Abdel-Fattah, 2002) that the balance one of the important ability for volleyball players and needs in many skills such as hitting, block and other. A decrease in reaction speed time between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in reaction for 5 comparisons out of 28 comparisons have shown. The highest growth leap in reaction speed was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve reaction speed as it affects most volleyball skills in general and especially block, court defence and directing smash hit to holes in the opponent's block, This is consistent with what indicated by **Ellen Wadeaa Faraj** (Faraj, 1990) That the reaction speed on of the most important special abilities for volleyball players because of the speed of the rhythm of the game and shows the importance of speed in switching from defense to attack and contrary.

Tables (2, 3, and 5) indicated an increase in movement speed between each two age groups in favor of the older group. Statistically significant differences among age groups in movement speed for 3 comparisons out of 28 comparisons have shown. The highest growth leap in velocity was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve movement speed as it affects most volleyball skills in general and especially smash serve, block and smash hit, this is consistent with what indicated by **Abdel Atty Abdel-Fattah** (Abdel-Fattah, 1998). A decrease in speed between each two age groups in favor of the older group has shown. No statistically significant differences among age groups in speed have shown. The highest growth leap in speed was during the sixth age group (13.3: <13.6). Therefore, training during this stage should be directed to improve speed as it affects most volleyball skills in general and especially smash, court defence and running for the ball in defense, this is consistent with what indicated by **Mohamed Allawi, Mohamed Nasr El-Din Radwan** (Mohamed Hassan Allawi, 1994) that the speed is very important for the volleyball players and affect the level of performance, this also is consistent with what **Abdel Atty Abdel-Fattah** (Abdel-Fattah, 1998) referred to that the speed players need it to sprint inside the court to reach the ball before contact with the ground in some defensive positions. An increase in spatial routing and directional change between each two age groups in favor of the older group has shown. No statistically significant differences among age groups in spatial routing and directional change have shown. The highest growth leap in placement and directional change was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve spatial routing and directional change as it affects most volleyball skills in general and especially court defence and block, this is consistent with **Mahmoud Abdel-Karim** (Abdel-Karim, 2009). An increase in motor muscular sense between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in kinesthetic ability for 2 comparisons out of 28 comparisons have shown. The highest growth leap in motor muscular sense was during the sixth age group (13.3: <13.6) and the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve motor muscular sense as it affects all volleyball skills, this is consistent with **Muhannad Mounir** (Mounir, 2014). An increase in visual spatial perception between each two age groups in favor of the older group has shown. Statistically significant differences among age groups in visual spatial perception for 7 comparisons out of 28 comparisons have shown. The highest growth leap in visual spatial perception was during the eighth age group (13.9: <14). Therefore, training during this stage should be directed to improve visual spatial perception as it affects most volleyball skills in general and especially passing, smash serve and smash hit, this is consistent with **Muhannad Mounir** (Mounir, 2014). According to these results the first question was answerd.

The relative contribution of coordinative abilities in underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years:

Table (6) indicated that arms muscular power is the first contributor in underhand serve with contribution percentage of 22.5%. This is consistent **Mohamed Allawi, Mohamed Nasr El-Din Radwan** (Mohamed Hassan Allawi, 1994) that arms muscular power is important for pushing and throwing, this also is consistent with what **Mohamed Lutfy Elsayd** (Elsayd, 1990) referred to that hitters need arms muscular power. Hand-eye coordination is the second contributor in underhand serve as it increased contribution percentage from 22.5% to 32.8% (10.3%). The researcher thinks that underhand serve depends on hand-eye coordination to direct the ball, this is consistent with **Louay Ghanem** (Sumaidaie, 2002) refeered to that the importance of hand-eye coordination for volleyball performance as neuromuscular signals move on to facilitate neuromuscular coordination. Accuracy is the third contributor in underhand serve as it increased contribution percentage from 32.8% to 39.2% (6.4%). Successful serve depends on accuracy which means the ability to direct voluntary muscles towards a specific goal. This requires high efficiency of neuromuscular system. Dynamic balance is the fourth contributor in underhand serve as it increased contribution percentage from 39.2% to 43.6% (4.4%). Dynamic balance maintains body balance during serve, this is consistent with **Mohamed Lutfy Elsayd** (Elsayd, 1990) who indicated that balance enables players to maintain control during attack.

Table (7) indicated that arms muscular power is the first contributor in overhead pass with contribution percentage of 50.6%, this is consistent with what indicated by **Muhannad Mounir** (Mounir, 2014) that passing should be quick as it requires strong fingers and wrests in addition to fast extension of elbows and arms. Visual spatial perception is the second contributor in overhead pass as it increased contribution percentage from 50.6% to 63.3% (12.7%). The researcher indicates that when players passing, they should identify the teammate's place in addition to ball place so that the pass becomes accurate. Total body coordination is the third contributor in overhead pass as it increased contribution percentage from 63.3% to 70.2% (6.9%). The researcher believes that the overhead pass needs total body coordination, both in the hands and arms movements when touching the ball of the fingers, and extending the arms, and between the trunk movements and between the legs movements from knees extending and take a step in the direction of passing in the moment of contact with the ball and fired away. Accuracy is the fourth contributor in overhead pass as it increased contribution percentage from 70.2% to 74.2% (4%). The researcher believes that the overhead pass needs to be accurate so the players reach the ball at the right time and right place, this is consistent with what indicated by **Mohamed Sobhi and Hamdi Abdel-moneim** (Mohamed Sobhi Hassanein, 1997) that accuracy is an important factor in the passing, player must have accuracy of the timing and direction and must be developed with the development of maximum movement speed. Reaction speed is the fifth contributor in overhead pass as it increased contribution percentage from 74.2% to 75.5% (1.3%). The researcher believes that overhead pass needs fast reaction to change the passing decision according to the opponent's position, this is consistent with **Mohamed Lutfy Elsayd** (Elsayd, 1990) who indicated that reaction speed is a basic requirement for offensive and defensive volleyball skills. Dynamic balance is the sixth contributor in overhead pass as it increased contribution percentage from 75.5% to 76.6% (1.1%), the researcher believes that volleyball players usually pass during the move; therefore they need dynamic balance to pass accurately.

Table (8) indicated that Arms muscular power is the first contributor in forearm pass with contribution percentage of 55.9%, the researcher believes that arms muscular power affect passing accuracy greatly as its lack means failure to pass the ball to the teammate. Visual spatial perception is the second contributor in forearm pass as it increased contribution percentage from 55.9% to 69.4% (13.5%). the researcher believes that good passing means that the player can see and visually spatial perception teammates' positions to accurately pass the ball to them, and also see the players of the opposing team so that can take the right decision by passing the ball to a teammates or at the direction the ball to the opponent's court. The same table indicated that total body coordination is the third contributor in the performance level of forearm pass as it increased the contribution percentage to 75.4%, the researcher thinks that forearm pass requires total body coordination beginning with putting palms together when touching the ball with forearms, extending body and legs high and pushing the ball hard and return to normal position of receiving the ball. If this harmony among body parts is missing, the pass will fail, this is consistent with **Mohamed Sobhi and Hamdi Abdel-moneim** (Mohamed Sobhi Hassanein, 1997).

Accuracy is the fourth contributor as it increased the contribution percentage to 78.4%. The researcher thinks that accuracy affects the success or failure of the forearm pass. This is in agreement **Mohamed Sobhi and Hamdi Abdel-moneim** (Mohamed Sobhi Hassanein, 1997). Dynamic balance is the fifth contributor of the forearm pass as it increased the contribution percentage to 79.9%, the researcher believes that volleyball player should maintain balance during passing so as not to affect the accuracy or speed of passing negatively. Reaction speed is the sixth contributor as it increased the contribution percentage to 81.4%, the researcher thinks that volleyball players should enjoy quick reaction during passing to decide either to pass to a teammate or to direct the ball to the opponent's court, this is consistent with **Mohamed Lutfy Elsayd** (Elsayd, 1990) who indicated that reaction is a major requirement for all attack and defense skills in volleyball. According to these results the second question was answerd.

Predictive equations for the performance levels of underhand serve, overhead pass and forearm pass for female junior volleyball players less than 14 years in terms of coordinative abilities:

According to tables (6, 7 and 8), the following predictive equations were concluded:

- **Performance level of underhand serve =** 33.04 + (10.58 x arms muscular power in meter) + (0.577 x hand-eye coordination in repetition) + (0.295 x accuracy in degree) + (0.483 x dynamic balance in repetition).
- **Performance level of overhead pass =** 70.21 + (12.69 x arms muscular power in meter) + 2.61 x visual spatial perception in degree) + (2.99 x total body coordination in degree) + (0.64 x accuracy in degree) + (- 3.24 x reaction speed in cm) + (0.11 x dynamic balance in repetition).
- **Performance level of forearm pass =** 61.78 + (2.85 x arms muscular power in meter) + (9.49 x visual spatial perception in degree) + (2.11 x total body coordination in degree) + (-1.54 x dynamic balance in repetition) + (-2.84 x reaction speed in cm).

The designe of training program

According to the dynamic of coordinative abilities that have been reached, it has the researcher to design a training program for developing coordinative abilities based on those dynamics. Through letruture review (Abdel Atty Abdel-Fattah, 2001; Abdul Aziz Elnemr, 2000; Elnemr, 2010; Elsayd, 2006; Lutfi, 1996; Mounir, 2014) that has design of programs for the developing coordinative abilities, researcher has designe a recommended programe for female volleyball players less than 14 years (Attachment 5), the duration of program 10 weeks, with 4 session / week, duration of session 60-90 min. The following bases have been taken into account when designing the program:-

- Suitable program content to study age phase.
- Designing the program to develop the coordinative abilities of the skills.
- Identify the content and times of the training sessions.
- Determine the appropriate time periods, training loads, and rest period of the program.
- Determine the training methods used.
- Using the principles of training (specificity - overload - Adaptation – graduation).
- Starting the development of coordinative abilities at an early age.
- Performing many, varied and purposeful movements of the purpose for the coordinative abilities development.
- Development of coordinative abilities using general training first and then using special aids progressively.
- Increased training requirements and the difficulty of the exercises consistently.
- Diversity in development of coordinative abilities (separate - interconnected), in accordance with the goal of exercise.
- Diversity in using training aids.

Conclusions:

In the context of this study aims, methods and results, the researcher concluded the following:

1. The dynamic of development of some coordinative abilities for underhand serve, overhead pass and forearm pass for

female volleyball players less than 14 years are revealed

2. The eighth age group came first in growth leaps with 11 abilities in addition to supremacy in performing all skills under investigation

3. Highest leap in total body coordination was in favor of the seventh age group (13.6<13.9). Highest leap in leg-eye coordination was in favor of the eighth age group (13.9<14). Highest leap in hand-eye coordination was in favor of the eighth age group (13.9<14). Highest leap in accuracy was in favor of the eighth age group (13.9<14). Highest leap in arms muscular power was in favor of the eighth age group (13.9<14). Highest leap in static balance was in favor of the eighth age group (13.9<14). Highest leap in dynamic balance was in favor of the sixth age group (13.3<13.6). Highest leap in reaction speed was in favor of the eighth age group (13.9<14). Highest leap in movement speed was in favor of the eighth age group (13.9<14). Highest leap in speed was in favor of the fourth age group (12.9<13). Highest leap in spatial routing and directional change was in favor of the eighth age group (13.9<14). Highest leap in motor muscular sense was in favor of the sixth age group (13.3<13.6) and eighth age group (13.9<14). Highest leap in visual spatial perception was in favor of the eighth age group (13.9<14). Highest leap in underhand serve was in favor of the eighth age group (13.9<14). Highest leap in overhand pass was in favor of the eighth age group (13.9<14). Highest leap in forearm pass was in favor of the eighth age group (13.9<14).

4. Coordinative abilities of major contribution in underhand serve were arms muscular power, hand-eye coordination, accuracy and dynamic balance.

5. Coordinative abilities of major contribution in overhead pass were arms muscular power, visual spatial perception, total body coordination, accuracy, reaction speed and dynamic balance.

6. Coordinative abilities of major contribution in forearm pass were arms muscular power, visual spatial perception, total body coordination, accuracy, dynamic balance and reaction speed.

7. Design a program to develop coordinative abilities according to the dynamic of the development of coordinative abilities for female junior volleyball players less than 14 years.

Recommendations:

1. The dynamic of development of coordinative abilities and skills under investigation should be considered when planning training programs for junior female volleyball players less than 14 years.
2. Coordinative abilities contributing in the technical level of underhand serve, overhead pass and forearm pass should be improved.
3. Predictive equations concluded should be used when selecting junior female players for volleyball.
4. Predictive equations concluded should be used for predicting the performance level of underhand serve, overhead pass and forearm pass.
5. The recommended training program should be applied due to its positive effects on improving coordinative abilities of junior female volleyball players less than 14 years.

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