

## Balance Exercises as the Basis for Developing the Level of Physical and Skill Performance in Basketball Young Players

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**Abstract:** Balance is one of the important abilities for basketball young players because of its use in man to man defense during the game. This requires that they have the ability to control their bodies to reduce committing legal faults and to protect them from falling on the ground when changing directions and rapid turning movements which may not fit in some positions with body position. The age from 10-12 years is the best stages for developing the ability of balance. Therefore, the research aimed at using balance exercises as a basis for developing the level of physical and skill performance for basketball young players. The researcher used the experimental method on two groups, one of them was a experimental and the other one is a control group. Each one consisted of 12 young players using pre- and post test. Statistical results indicated the existence of significant differences between the two groups of experimental and control groups in both the level of physical and skill performance in favor of the experimental group. In the light of the results, the researcher recommends incorporating balance exercises in the programs of young players' preparation and deriving them from motor components for basic skills.

**Key words:** Balance % Balance exercises % Young players % Physical abilities % Basketball % Motor skills

### INTRODUCTION

Balance is one of the important co-ordination abilities in the field of sport in general and in basketball in particular. It enables young players to control the body whether in static or dynamic positions. It also protects them from falling and injury in performing rapid movements which are not suitable for the position of the body. Rates of dynamics of development of this ability change during the period from 6 -13 years, especially from 10 -12 years which is considered the best stage of intensive training as stated by Hasouna [1], Anrich [2], Neumaier [3] and Hirtz *et al* [4]. Young players' basic strategy in basketball is man-to-man defense which requires pressure on competitors. This necessitates a high capacity to control the body in order to avoid bodily contact and exposure to commit legal faults.

A young player who controls the body after performing the sequence movements can achieve/ defend good shooting, take the rebounding (defensive/ offensive), begin a counter attack, exploit defensive gaps through fast change in directions and re-orientation into positions of the following move. Any error in the balance

of the young player will lead to the opposite of the above. This was confirmed by results of previous studies [2, 5-8] as they indicated that the ability of a young players to control his body is done by maintaining the centre of gravity of body weight within the base of balance. The bigger the balance base is, the greater stability of the body is. The smaller, the greater effort the young player needs to control his body in order to reach a balanced position. Succeeding in performing a certain skill with small base of balance indicates a high level of fitness and creativity on part of the player. Hence, balance is a form of neuro-muscular control which contributes in developing physical and skill performance.

During training of young players' team in El-Minia Governorate, defects were found in performing the skills of passing, dribbling, shooting when they were associated with changing directions, stopping, jumping and faking. These skills were affected fundamentally by balance. Because of the scarcity of Arabic researches on this subject, the researcher conducted this study in order to use balance exercises to develop the level of physical and skill performance for basketball young players.

**MATERIALS AND METHODS**

The study sample consisted of 40 basketball young players of Young Muslims and youth clubs in El-Minia. The deliberate sample consisted of 24 young players aged between 10-12 years old representing 60% of the total sample of the study. They were divided into two equal groups. One of them is the experimental group and the other one is the control one. Each of them had 12 young players. The researcher made sure of a moderate distribution of the variables of the study in both research samples. Results showed that the values of coefficient of torsion for these variables ranged between -1.16 and 1.18 that meant that all variables were confined between  $\pm 3$ , referring to the moderation of distribution of young players in these variables. Equivalence in the variables was also found (growth rates - age - height - weight - function of inner ear measured by using the device of VNG and ENG (Fig. 1). The researcher has made a survey of references [5, 9-19] to achieve both appropriate physical and skill tests. The researcher translated them into Arabic and used the Muenchen Battery Test for Fitness (MTF) as used by Rusch and Irrgang [19] and

validated it for the Egyptian environment. The researcher also employed two other tests: One-Foot Balance Test for 1 min. (OFBT) and One-Foot Closed-Eyes Balance Test (OCBT) (Table 1).

Table 1 shows that there were no statistically significant differences between the control and experimental groups of the study in either the growth rates or physical and skill variables of the study where all the values (Sig. > 0.05) referred to equivalence in these variables.

**Time Plan and Basis of Balance Exercises:** Balance exercises were divided into two stages, one of them a preparatory stage that lasted 3 weeks including 5 units per week and the other was a specialized stage that lasted 5 weeks including 3 units per week. The time of the unit ranged between 15-25 min. The time of an exercise per unit is 15-30 sec. with 10 - 15 sec. intervals. The repetition of the group was 2-3 times with 30-50 sec intervals. Intensity and size of physical and skill exercises (through time and repetition) were specified. Exercises were performed on stability/ movement of the head, the body and the balance board, opening and closing the eye, using the balls and

Table 1: Significant statistical differences between control and experimental groups in both growth rates and physical and skill variables of the study (n = 24)

Variables	Control group N =12		Experimental group N =12		T test	Sig.
	Mean	SD±	Mean	SD±		
Growth rates						
Age (y)	11.18	0.39	11.03	0.53	0.78	0.440
Height (cm)	157.25	5.26	158.42	5.45	0.53	0.599
Weight (kg)	53.75	3.98	55.75	6.43	0.92	0.369
Training Age (y)	2.02	0.53	2.21	0.54	0.87	0.391
Inner ear function						
Right Ear (deg/ sec)	31.17	5.69	31.25	5.31	0.04	0.971
Left Ear (deg/ sec)	31.58	10.06	32.67	9.17	0.28	0.785
Difference between two ears (deg/ sec)	9.18	2.76	9.25	2.14	0.16	0.871
Physical performance						
Dribbling over a inverted Sweden 30 sec. (num)	41.17	3.21	41.42	5.02	0.44	0.667
Force Orientation Test (FOT) (cm)	8.50	0.85	8.71	0.89	0.58	0.564
Trunk Bending Test (TBT) (cm)	5.33	1.13	5.42	1.06	0.19	0.854
Vertical Jump Static Test (VJST) (cm)	19.58	3.40	20.33	3.11	0.56	0.854
Open-time Hanging Test (OHT) (sec)	8.25	0.97	8.08	1.16	0.38	0.590
One-minute Ups and Downs Test (UDT) (num)	30.00	3.69	30.25	3.60	0.17	0.868
One-Foot Balance Test for one minute (OFBT) (num)	15.42	2.15	15.17	2.37	0.27	0.789
One-foot, Closed-Eyes Balance Test (OCBT) (sec)	52.50	2.28	51.75	2.42	0.78	0.442
Skill performance						
Dribbling inside free zone through shot zone for 1 min (num)	19.58	1.08	18.75	1.54	0.28	0.140
Dribbling& passing on wall targets (pts)	20.58	3.58	21.42	3.29	0.80	0.433
Foot work 3 times x 20 m (sec)	25.87	0.75	25.92	1.17	0.17	0.897
Shooting underneath the board of basketball for 30 Sec. (num)	12.00	1.71	11.67	1.78	0.78	0.644
Shooting around the free through shoot zone (pts)	9.75	1.66	9.83	1.57	0.89	0.906
Dribbling round 20 cones all over the playground (sec)	35.95	0.44	35.37	1.19	0.08	0.313



Fig. 1: Test of functions of the inner ear

boards of different shapes and sizes, bending and extension of the knees, standing on the one/two feet, with or without equipments, under pressures (time/accuracy/a partner and changing the outer environment). These exercises were performed directly after the warm-up.

The researcher conducted a pilot study in the period of 5-10, June, 2010 to test the appropriateness of the proposed exercises, validity of the instruments and devices used (particularly the tests of the inner ear functions done with two devices, VNG and ENG, in El-Minia University Hospital). The researcher conducted pre-test for both of the sample groups on the variables of physical and skill performance in the period of 19-24, June, 2010. The proposed balance exercises were conducted on the experimental group in the period from 03, July, 2010 to 26, August, 2010 (8 consecutive weeks). Post-tests were conducted in the period from 28, August, 2010 to 2, Sept, 2010. In the light of the objective of this study, the researcher used the following statistical methods: average - mediator - standard deviation - coefficient of torsion - percentage - T test - correlation coefficient - ratio of improvement or change.

## RESULTS AND DISCUSSION

Table 2 shows significant differences between pre- and post tests for the control group in the variables of the study in favor of post-tests where all values were Sig. <0.05.

The researcher attributed the improvement in the level of the physical and skill variables in the control group for the suitability of the physical and skill exercises used. Moreover, it was asserted that the dynamics of the development of flexibility, speed and the strength of the muscle groups as to bending the elbow were large at the age of (10-12) years old [7, 8]. These exercises, which were

classified according to difficulty, diversity and competitiveness motivated young players for performance and helped them to be aware of the correct realization of motor skills which constituted the physical and skill tests of the study. This was confirmed by previous studies [20-23]. Miscellaneous training exercises with or without the ball stimulated the young players' sense of performance in a dynamic organization which helped them to recognize the dimensional space they move in (distance, direction, timing of body movements, coordinated sequence of skill performance). The various and changing sport movements they performed in this stage resulted in neurological stimulation affecting their dynamic body organs and eventually developing and improving the physical and skill level in the variables of the study (Table 2).

It is clear from Table 3 that there were significant differences between pre- and post test for the experimental group in the variables of the study in favor of post test where all value were Sig. <0.05.

The researcher attributed improvement in the level of the physical variables of the experimental group for the use of balance exercises with/without equipments. They had a positive effect in raising the level of physical performance because of the direct correlation between balance and the physical capacities required in basketball such as muscular strength, endurance, accuracy and its disproportional one with speed and agility. This was confirmed by results of other researches [4, 11, 13] as they asserted that the high capacity to control the body which resulted from the use of these exercises helped young players to perform movements of agility and speed in the shortest time possible time. Because these capacities were the main components of the tests of physical fitness of the study, there were improvements in the level of physical performance.

Table 2: Significant differences between the averages of pre- and post tests for the control group in the variables of the physical and skill performance of the study (n = 12)

Variables		Pre- test	Post test	Mean	Std. Error	T test	Sig.	Ratio of
				Difference	Difference			Improvement %
Physical performance	Dribbling over a inverted Sweden 30 sec. (num)	42.17	51.00	8.83	0.77	11.52	0.000	17.31
	Force Orientation Test (FOT) (cm)	8.50	10.63	2.12	0.18	11.43	0.000	20.04
	Trunk Bending Test (TBT) (cm)	5.33	7.67	2.33	0.26	8.58	0.000	30.51
	Vertical Jump Static Test (VJST) (cm)	19.58	23.25	3.67	0.80	4.57	0.001	15.78
	Open-time Hanging Test (OTHT) (sec)	8.25	12.67	3.42	0.23	19.29	0.000	34.89
	One-minute Ups and Downs Test (UDT) (num)	30.00	26.50	3.50	0.48	7.22	0.000	11.67
	One-Foot Balance Test for one minute (OFBT) (num)	15.42	13.33	2.08	0.34	6.20	0.000	13.55
skill performance	One-foot, Closed-Eyes Balance Test (OCBT) (sec)	52.50	56.83	4.33	0.70	6.19	0.000	7.62
	Dribbling inside free zone through shot zone for 1 min (num)	19.58	23.50	3.92	0.42	9.40	0.000	16.68
	Dribbling& passing on wall targets (pts)	20.58	24.67	4.09	1.14	3.57	0.004	16.58
	Foot work 3 times x 20 m (sec)	25.87	23.06	2.81	0.51	5.49	0.000	10.86
	Shooting underneath the board of basketball for 30 Sec. (num)	12.00	13.33	1.33	0.61	2.20	0.049	9.98
	Shooting around the free through shoot zone (pts)	9.75	11.92	2.17	0.52	4.17	0.002	18.20
	Dribbling round 20 cones all over the playground (sec)	35.95	33.83	2.12	0.28	7.45	0.000	5.90

Table 3: Significant differences between the averages of the pre- and post test for the experimental group in the physical and skill variables of question (n = 12)

Variables		Pre- test	Post test	Mean	Std. Error	T test	Sig.	Ratio of
				Difference	Difference			Improvement %
Physical performance	Dribbling over a inverted Sweden 30 sec. (num)	41.42	60.00	18.58	1.45	12.83	0.000	30.97
	Force Orientation Test (FOT) (cm)	8.71	12.21	3.50	0.17	20.11	0.000	28.67
	Trunk Bending Test (TBT) (cm)	5.42	8.13	2.71	0.32	8.40	0.000	33.33
	Vertical Jump Static Test (VJST) (cm)	20.33	26.75	6.42	0.96	6.70	0.000	24.00
	Open-time Hanging Test (OTHT) (sec)	8.08	18.33	10.25	0.49	20.74	0.000	55.92
	One-minute Ups and Downs Test (UDT) (num)	30.25	15.42	14.25	0.83	17.80	0.000	49.02
	One-Foot Balance Test for one minute (OFBT) (num)	15.17	9025	5.92	0.40	14.86	0.000	39.02
Skill performance	One-foot, Closed-Eyes Balance Test (OCBT) (sec)	51.75	70.00	18.25	0.70	26.16	0.000	26.07
	Dribbling inside free zone through shot zone for 1 min (num)	18.75	26.08	7.33	0.53	13.91	0.000	28.11
	Dribbling& passing on wall targets (pts)	21.42	30.75	9.33	0.39	9.93	0.000	30.34
	Foot work 3 times x 20 m (sec)	25.92	21.33	4.59	0.39	11.67	0.000	17.71
	Shooting underneath the board of basketball for 30 Sec. (num)	11.67	15.58	3.91	0.36	10.94	0.000	25.10
	Shooting around the free through shoot zone (pts)	9.83	14.67	4.84	0.47	10.19	0.000	32.99
	Dribbling round 20 cones all over the playground (sec)	35.37	30.63	4.74	0.50	9.53	0.000	13.40

Neumann [24] and Faigle [25] confirmed that the players who have high ability in body control enjoy a high of physical fitness because the ability of balance enables them to perform for long periods with the least effort possible without fatigue. They have increased physical and physiological competencies. Balance exercises in the study consolidated their ability of neuromuscular control during the performance and improved their Motor Sensory Perception (which is done through the signals sensory receptors quickly send to the brain through the nerves from the eye, ear and skin). This was confirmed by Gualtieri *et al.* [10].

The researcher attributes improvement in the level of the skill variables of the study of the experimental group to the use of balance exercises which helped an accurate

skill performance through improving leg orientation and body control. Efficient body control helps young players to perform skillfully and safely under many pressures (time, distance, competitors, physical endurance and accuracy) in all situations of the play. It also endorses body carriage in all the changing positions. This was confirmed by previous studies [5, 6, 11, 13].

Ears do not only realize sounds but they also transmit information to the brain about the speed of movement of the body through the sensory receptors located at the curves in the inner ear. So they have a greater role in the dynamic balance. When these receptors record a different position from the normal position of the body, the head, trunk and limbs make the required movements to correct the position of the body. They motivate joint receptors in

Table 4: Significant statistical differences between control and experimental groups in post tests on physical and skill variables of the study (n = 24)

Variables	Experimental group N =12		Control group N =12		T test	Sig.	Differences in Change Percentages
	Mean	SD±	Mean	SD±			
Physical performance							
Dribbling over a inverted Sweden 30 sec.	51.00	2.00	60.00	2.56	9.60	0.000	13.66
Force Orientation Test (FOT)	10.63	0.53	12.21	0.69	6.32	0.000	8.63
Trunk Bending Test (TBT)	7.67	0.89	8.13	0.80	1.33	0.198	2.82
Vertical Jump Static Test (VJST)	23.25	2.09	26.75	1.60	4.60	0.000	8.22
Open-time Hanging Test (OTHT)	12.67	0.56	18.33	1.50	12.02	0.000	21.03
One-minute Ups and Downs Test(UDT)	26.50	2.84	15.42	2.31	10.47	0.000	37.35
One foot Balance Test for one minute (OFBT)	13.33	2.42	9.25	2.86	3.77	0.001	25.47
One-foot, Closed-eyes Balance for a long time Test (OCBT)	56.83	1.64	70.00	1.60	19.92	0.000	18.45
Skill performance							
Dribbling inside free zone through shot zone for 1 min	23.50	1.98	26.08	2.07	3.13	0.005	11.43
Dribbling& passing on wall targets	24.67	2.81	30.75	2.96	5.17	0.000	13.76
Foot work 3 times x 20 m	23.06	2.01	21.33	1.54	4.25	0.000	6.85
Shooting underneath the board of basketball for 30 Sec.	13.33	0.78	15.58	0.90	2.98	0.007	15.12
Shooting around the free through shoot zone	11.92	1.68	14.67	1.23	4.58	0.000	14.79
Dribbling round 20 cones all over the playground	33.83	0.96	30.63	1.22	7.13	0.000	7.50

the neck which in turn feed the muscles of the trunk with necessary signals to move the body in a straight line with the head. Balance and correct reactions of body position play a major part in performing most motor offensive/defensive skills in basketball. Inner ear perceptions are responsible for identifying pressure on the muscles, tendons, muscular tensions, determining angles of joints and their movements and the forces of pushing and pulling of body muscles. A good realization of the body and its surrounding contributes in performing movements safely and economically in effort. This improves the motor sense which in turn leads to improvement of skill level.

It was clear from Table 4 that there were significant differences between both control and experimental group in all the physical and skill variables of the study in favor of the experimental group where all values were Sig. <0.05 except the variable "bending the trunk" whose results indicated that there were statistically insignificant differences between control and experimental groups in this variable where the value was Sig. > 0.05.

The researcher attributed the excellence of the experimental group in comparison to the control group in post tests on physical variables for the use of balance exercises which increased their inner perception which in turn endorsed their motor sense. Finally, this lead to an evolution of the physical level as reflected in the high ability to balance on the Sweden Seat Inverted Test

(SSIT) by young players. They enjoyed a higher sense of the status of their bodies and of the strength and the time of ball rebounding which in turn reduced vibration on the Sweden seat and increased the number of dribbling in this test. The increase of the ability to estimate distance and direction of force instantaneously raised the accuracy of targeting in the Force Orientation Test (FOT). The heightened internal and external co-ordination of muscles increased the distance in the Vertical Jump Static Test (VJST). There was an improvement in the one minute Ups and Downs Test (UDT) over the Sweden Seat because of the better perception of the seat height and the dynamic balance which provided the power necessary for the test. This resulted in a reduced pulse difference measured two minutes after the test which is an indicator of increase in recovery ratios. The augmented inner perception increased the self-confidence of young players thus reducing the frequency of the free leg touching the ground and increasing the stability of the players on the balance panel. The increased perception of body position reached its maximum in the stability of the young players in One-foot Closed-eyes Balance (OCBT). This indicated that there is a direct relationship between balance and physical abilities such as muscle endurance and accuracy. The greater the balance is the greater the level of performance. Moreover, there is a disproportional relationship between balance and speed and agility. The greater the balance is the lower the time of performance. This was confirmed by prior studies [1, 10, 11].

The Trunk Bending Test (TBT) was not statistically significant in the study despite the improvement in the experimental group than the control group. This may be due to flexibility exercises which were carried out in each training unit to enlarge the motion range of the joints. This was also confirmed by anterior researchers [1, 13, 20] who affirmed that the developing flexibility is affected by the type of exercises and motor activity practiced by the player through the training unit.

The researcher attributed improvement in the level of the skill variables to balance exercises which helped to develop accurate skill performances and improve the ability to orient and control the body. This goes in agreement with previous studies [6,11, 15] which mentioned that upgrading and training the sensory receptors for young players, especially in the age from (10-12) years contributed in developing the skills associated with visual, tactile and inner perceptions. For example, the player's ability to estimate distance and the direction of the goal/ ball, his ability to anticipate the moment the ball touches or leaves the hand, the time the feet touches the ground, or the hands the ball, also his ability to push the ball by one arm or the two arms together. In addition to enhancing the strength of muscular push of one or two legs, muscular push for each part of the body during movement and the capacity to determine the position and angles of the body while moving for the external objectives. This also includes specifying the position of each organ of the body in relation to the other organs while moving and estimating the speed of the body and its organ.

All the skills acquired through balance exercises constitute the main components of the tests of the study which contributed to the improvement of the experimental group. Hammad [26] confirmed that involving numerous various motor experiences of multi-directions and varied intensity in the training of young players leads to development of skill performance. Glassuer [17] stated that the nimble basketball player should be able to use his limbs well while moving and that there should be rhythm and motor consecutiveness between the limbs. Because they are to be used continuously and strongly in sudden stopping, jumping, changing of directions and speeds in combination with other basketball skills that require high level of accuracy organization, targeting and differentiation. This proves the importance and criticality of balance for the basketball player especially in this age group. Alawi and Radwan [8] stated that young players enjoying high level of balance have greater capacity to improve the performance level of many of the movements and the positions in most sports activities.

## CONCLUSION

1. Balance exercises in the study led to improving physical variables of the experimental group more than that of the control group, the percentage ranged between 8.22% and 37.35% in favor of the experimental group.
2. Balance exercises led to improving skill variables of the experimental group more than that of the control group, the percentage ranged between 7.50% and 13.76% in favor of the experimental group.

## RECOMMENDATION

- C Balance exercises should be incorporated in the preparation programs of young players. Their components should be derived from sports motor skills.
- C Similar studies should be conducted on young female basketball players with different other ages.
- C Balance boards of different shapes and sizes should be used to select the best choice for each age group.
- C Various balance programs should be applied on younger/older age groups to identify the age group which benefits most from them.

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