

Using Cross Training to Stabilize Muscular Fitness and Energy Fitness During Transition Period for Female Basketball Players

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Abstract: Muscular fitness and energy fitness are the main components of physical fitness and separating these two components aims at better understanding for the training processes. If the player loses his/her physical fitness during the transition period, it is very difficult for him/her to recover it in a short period of time. Cross training is a training method that includes various sports activities, planned and organized to help enhancing the physical level and physiological variables of the player using variation, decreasing injury risk and using motivation. It is used during the transition period due to the importance of this period. This study aims at maintaining the muscular fitness and energy fitness levels during the transition period for female basketball players through designing a training program using cross training during the transition period for female basketball players and identifying the effect of the recommended training program on maintaining the muscular fitness and energy fitness levels during the transition period for female basketball players during the transition period. The researchers used the quasi-experimental approach with one group (pre-/post-measurement) on a sample of 15 female basketball players (under 14 years) in Tanta Sports Club. Most important results indicated that using the cross training program during the transition period maintained the muscular fitness and energy fitness levels of female basketball players and that the variance rate in muscular fitness is slightly higher than energy fitness.

Key words: Cross training • Physical fitness • Basketball

INTRODUCTION

Experts divide the training season into three periods: preparation, competition and transition periods [1]. Transition period is considered the linking bridge between completion period and good preparation period as it begins immediately after the competition period and lasts until the beginning of the new preparation period. This period aims at eliminating physical and mental stress resulting from overload during competitions to prepare the body for assimilating the upcoming training doses. It is the period of active rest after the competitive season that aims at recovery as a preparation for the next period through involving in various activities other than the main player's sports activity. It helps maintaining the physical fitness and physical preparation levels, relieving the nervous system of stress and eliminating boredom resulting from all-year-round training [2].

Muscular fitness and energy fitness are the main components of physical fitness and separating these

two components aims at better understanding for the training processes. This classification is a useful model for organizing physical characteristics development programs. The term "Muscular Fitness" includes all types of strength and flexibility. Strength endurance and muscle size are the bases of this type of training then comes maximum strength training for active muscles in the specific sports activity and finally comes power training, noting that flexibility training accompanies all these training phases [3].

If the player loses his/her physical fitness during the transition period, it is very difficult for him/her to recover it in a short period of time. This is why some players can not begin the new training cycle in a high level. This period is the best period for analyzing the previous program and completing the training plan for the upcoming year. Through this positive analysis and criticism, both the coach and the player can avoid the previous mistakes in the future. The transition period range from 3-4 week and should not exceed 5 week.

The player practices 3-5 times a week during this period [4]. The transition period received a large sum of arguments and different opinions as some experts think that it is a period of full rest without any physical activity. Other experts think that it should be an extended period of physical activity while a third part of experts think that it should be eliminated and players should directly begin the preparation period of training [5].

The researchers think that stopping training during the transition period leads to a drastic decrease in physical fitness due to negative rest given to players besides the increase of body weight over the normal range of players' weight during competitions. This indicates the importance of transition period as a major training period in planning training. This period did not receive enough attention from players or coaches and this negatively affects the limits of developing the physical and technical levels. This is in contradiction with concepts of continuity and organization of sports training. Cross training is a training method that includes various sports activities, planned and organized to help enhancing the physical level and physiological variables of the player using variation, decreasing injury risk and using motivation [6]. Cross training is used during the transition period due to the importance of this period. Cross training means including various sports activities, like jogging, swimming and tennis, in a physical fitness program. All these activities are aerobic in nature and use the same muscle groups in different ways [7]. Cross training helps players preparing the strengths of their body systems (heart muscle - muscles - bones - joints), besides achieving cardiac fitness, building muscles and decreasing obesity. For these reasons, players need cross training. Also, cross training helps adding new and various activities so that players can continue training during the transition period and enjoy alternative sports activities and at the beginning of the preparation period, leg muscles become stronger and motor performance increases [8].

According to the researchers' field experiences in the Egyptian Federation of Basketball, Tanta Sports Club, Al-Ahly Sports Club and Ettehad Al-Shorta Sports Club, they noticed that most coaches totally ignore the transition period and give their players a complete rest without any sports activity for 6-12 weeks. Due to this, players lose their physical fitness and this, in turn, affects negatively their technical levels. This negative effect is much worse in female players as they tend to gain weight due to the increase of negative rest periods during the season. This led the researchers to perform this study as

a scientific trial towards designing a training program using cross training to maintain the muscular fitness and energy fitness levels during the transition period for female basketball players.

This study is important as a scientific trial for formulating a multi-activity sports training program with moderate training loads that is suitable for forming the recovery load during the transition period to maintain the muscular fitness and energy fitness levels during the transition period for female basketball players and to decrease the loss, resulting from stopping training, to minimum. This study aims at maintaining the muscular fitness and energy fitness levels during the transition period for female basketball players through:

- Designing a training program using cross training during the transition period for female basketball players.
- Identifying the effect of the recommended training program on maintaining the muscular fitness and energy fitness levels during the transition period for female basketball players during the transition period.

The researchers hypothesize that there are no statistical significant differences between the pre- and post- measurements on the muscular fitness and energy fitness variables during the transition period for female basketball players. The researchers identified the term "Cross Training" as using a sport and activity or any training technique other than the player's main sport to help enhancing the performance level of the main sport or activity [9].

MATERIALS AND METHODS

The researchers used the quasi-experimental approach with one group (pre/post-measurement). Sample was purposefully chosen from female basketball players (under 14 years) in Tanta Sports Club, registered in the Egyptian Federation of Basketball in season 2010 - 2011 (n = 15 players). Table 1 describes the sample according to age, weight and height. Table 1 indicates that skewness and inflation coefficients for the sample on all variables ranged between ± 3 . Thus, the sample is under the moderate curve.

To identify the most important related tests and measurements, the researchers reviewed the related literature [10-13] and concluded the following tests and measurements:

Table 1: sample description according to age, weight and height

Variable	Measurement	Means	SD±	Median	Squewness	Inflation
Age	Year	13.85	0.54	13.40	-0.36	-1.55
Height	m.	1.64	0.15	1.56	-0.21	-0.74
Weight	Kg.	41.69	4.02	40.50	0.15	0.12

Table 2: The training program variables

Week	Units	Unit duration (minute)	Weekly duration (minutes)	Load percentage (%)	Work to rest rate	Weekly load cycle
1	3	45	140	45:50	1:1	1:1
2	3	50	160	50:55	1:1	1:1
3	3	55	180	55:60	1:1	1:1
4	4	60	200	60:65	1:1	1:1
5	4	65	220	65:70	1:1	1:1

Table 3: Difference significance and variance percentages between the pre- and post- tests on the Muscular Fitness and Energy Fitness variables during the transition period for female basketball players

Variables	Measurement	Pre-test		Post-test		Means difference	(t) value	Variance percentage	
		Means	SD±	Means	SD±				
Muscular Fitness	Half Squat	Kg	28.96	6.89	28.70	5.40	0.26	1.29	1.14 %
	Bench Press		20.32	4.41	19.85	5.12	0.47	1.86	1.56 %
	Power Clean		19.45	6.74	19.50	4.70	0.40	1.12	1.32 %
Energy Fitness	Cooper Test	Km	1.05	1.65	1.09	0.98	0.04	0.74	0.40 %
	VO2max	Mm/kg/min	14.30	3.55	14.61	2.98	0.31	0.65	0.54 %
	40 Yard Sprint	Sec	7.10	0.81	7.17	0.90	0.07	0.91	1.02 %

(t) table value on $p \leq 0.05 = 2.23$

Muscular Fitness: Using (1RM) for lifting a weight only once for the exercises of Half Squat (measuring muscular strength of lower limbs) - Bench Press (measuring muscular strength of upper limbs) - Power Clean (measuring muscular strength of whole body)

Energy Fitness: Cooper test (running as far as possible for 12 minutes) for measuring aerobic work (cardio-pulmonary endurance) and though this absolute VO2max is calculated - 40-yard-sprint test for measuring anaerobic work.

Pilot Study: The researchers held a meeting with the study sample at the end of the season inside the basketball court of Tanta Sports Club to explain the aims and phases of this study and to explain how to measure (1RM) and how to perform Energy Fitness tests. The pilot study resulted in:

- Assuring that the sample members understand the study aim.
- Assuring that the sample members understand how to perform tests.
- Assuring that research assistants understand measurement and recording procedures.

Pre-Test: The researcher applied the pre-tests on the sample on two consecutive days immediately after the pilot study (27-28/5/2010). Procedures were as follows: Stretching (10 minutes); stretches for body muscles. Warm-up (5 minutes); steady-steps running for preparing body systems to perform as previous studies indicated that steady running for 3-5 minutes regulates the work of internal body systems. Day (1) included Energy Fitness and the sample began with 40-yard-sprint then Cooper test, in the athletics track of Tanta Sports Club, with rest interval of (15) minutes between the two tests. Day (2) included Muscular Fitness in Tanta Sports Club Gym. Cool-down (3 minutes) and relaxation exercises to turn body systems into its normal conditions.

Through review of literature [14 - 21], the researchers identified the basics of developing the recommended training program using cross training during the transition period (aims - bases - duration - training load components - program content - methods of training).

The recommended training program was applied on the sample during the transition period from 29/5/2010 to 2/7/2010 for (5) weeks (3 units per week for 3 weeks and 4 units per week for two week).

Post-Test: Post-test was applied on the sample on two consecutive days immediately before the preparation phase (3-4/7/2010) using the same procedures of the pre-test. Table 3 shows the results of the pre and post- tests.

Statistical Treatments: The researchers treated data statistically using the following statistical treatments: means - standard deviation (SD) - (t) test.

RESULTS AND DISCUSSION

Table 3 indicates that (t) calculated value is below its table value on $p \leq 0.05$. This indicates that there are no statistically significant differences between the pre- and post- tests on all the studied variables during the transition period for female basketball players..Concerning physical fitness, there are no statistical significant differences on $p \leq 0.05$ between the pre- and post- tests on Half Squat as (t) values were 1.29 and Variance percentage (1.14%), Bench Press as (t) values was 1.86 and Variance percentage (1.56%) and Power Clean as (t) values was 1.12 and Variance percentage (1.32%). The researchers think that this is due to the recommended training program as it led to maintaining the muscular fitness level during this period. This is in agreement with previous studies in that cross training, especially during the transition period helps athletes maintaining their strength [9]. Some authors think that muscular strength decrease if training is stopped during transition period because of muscle fibers damage, due to motor units functional dysfunction. Slow twitch fibers usually lose its ability to produce strength first while Fast twitch fibers delay in dysfunction due to stopping training [10-22].

This is in agreement with previous studies in that the results of stopping training or shrinking the training program without any alternative well-developed training programs for maintaining physical fitness components (including strength) are usually severe and acute for athletes who depend greatly on strength as they can lose major percentages of physiological adaptations, built with regular training for long periods, in a very short time [9]. This is, also, in agreement with previous studies in that if a player stops training without alternatives during the transition period, he/she will lose strength in one or two weeks. If this lose continues, it will have a negative effect on performance [23]. Some authors indicated that if training stops for short periods (2-4 weeks) or long periods, this will lead to a decrease in muscular strength.

This decrease will be very clear at the beginning of stop. The percentage of lose depends on the training period, the used tests and the measured muscle groups [24]. This is in agreement with previous studies in that cross training maintains and enhances muscular strength [14-21].

The researchers think that continuous training during transition period leads to maintaining the muscular fitness level acquired during comprehensive preparation of the previous season. This proves the hypothesis of the current study in that there are no statistically significant differences between the pre- and post- measurements on the muscular fitness and energy fitness variables during the transition period for female basketball players.

Concerning energy fitness, Table 3 indicated that there are no statistically significant differences on $p \leq 0.05$ between the pre- and post- tests on Cooper Test as (t) values were 0.74 and Variance percentage (0.40%), VO₂max as (t) values were 0.65 and Variance percentage (0.54%) and 40-yard-sprint as (t) values were 0.91 and Variance percentage (1.02%).

The researchers think that this is due to the recommended training program as it led to maintaining the energy fitness level during this period. Some authors indicated that stopping training or shrinking the training program affects the following physiological variables (aerobic enzymes - mitochondria density - capillarity density - fat percentage - VO₂max). All these variables affect aerobic endurance [12]. Some authors indicated that stopping training during transition periods leads to gradual decrease in aerobic endurance (between 6-7%) in one week. This may reaches 25% in four weeks. To compensate this lose we need 4-6 weeks of training [25]. The researchers think that the decrease in muscular strength due to stopping training is naturally accompanied with a decrease in speed. This is in agreement with previous studies in that speed is the first physical ability to be affected by the decrease of strength due to stopping training. The nervous system is affected by stopping training and this has a negative effect on speed [26, 27]. This is in agreement with previous studies in that cross training maintains and enhances energy fitness (aerobic and anaerobic endurance) [14-21].

The researchers think that continuous training during transition period leads to maintaining the energy fitness level acquired during comprehensive preparation of the previous season. This proves the hypothesis of the

current study in that there are no statistically significant differences between the pre- and post- measurements on the muscular fitness and energy fitness variables during the transition period for female basketball players.

CONCLUSION

- Using the cross training program during the transition period maintained the muscular fitness and energy fitness levels of female basketball players.
- The variance rate in muscular fitness is slightly higher than energy fitness.

Recommendations:

- Using the recommended cross training program during transition periods to maintain the muscular fitness and energy fitness levels of female basketball players.
- Planning well designed programs during transition periods to maintain the muscular fitness and energy fitness levels of female basketball players.
- The muscular fitness and energy fitness maintenance programs should be a key component of all annual physical preparation programs for basketball players.

REFERENCES

1. Bompa, T.O., 2001. Periodization training for sports, high performance sport conditioning. Human Kinetics, U.S.A., pp: 60.
2. Harre, D., 2001. Principles of Sports Training. Sport Verlaog, 3rd edition, London, pp: 15.
3. Al-Nemr, A.A., 2001. Physical preparation of basketball players. Al-Asatetha for Sports Books, Cairo, Egypt, pp: 113 (In Arabic).
4. Al-Gebaly, O.A., 2001. Sports Training: Theory and Application. GMS press, Cairo, Egypt, pp: 78 (In Arabic).
5. Abd El-Maksoud, A., 1992. Sports Training Theories: basic of training process. Dar Al-Hasnaa Press, Cairo, pp: 62 (In Arabic).
6. Moran, M. and G.H. Meglyn, 2000. Cross Training for Sports. Human Kinetic books, San Francisco, pp: 212.
7. www.or/thoinfo.org/fact/thr.reportpowsCfm?threadID=214&mailname=pier.
8. www.runnersworld.com/home/0%2f200321-78-82-%2coontm.
9. Brekaa, M.G. and I.F. Al-Bwdey, 2004. Cross training: Basics, Concepts and Applications. Monshaat Al-Maaref press, Alexandria, Egypt, pp: 24 (In Arabic).
10. Radwan, M.N., 1998. Methods of measuring physical effort in sports. Markaz Al-Ketab press, 1st Ed., Cairo, Egypt, pp: 99 (In Arabic).
11. Al-Nemr, O.A., 1999. Effects of training program for muscular fitness and energy fitness on physical characteristics grows rate and basic basketball skills. M.Sc. Thesis, Faculty of Physical Education for Men, Helwan University, Egypt, pp: 46 (In Arabic).
12. Al-Nemr, A.A. and N. M. Al-Khateeb, 2000. Physical preparation and weight training for junior athletes before perpetuation. 1st Ed. Al-Asatetha for Sports Books, Cairo, Egypt, pp: 90 (In Arabic).
13. Al-Nemr, A.A. and N.M. Al-Khateeb, 2005. Sports training: weight training, designing strength programs and planning training season. Markaz Al-Ketab Press, Cairo, Egypt, pp: 115 (In Arabic).
14. Mahran, W.M., 2007. Effects of cross training during the transition period on physical demands, physiological variables and performance level of 400m runners. Theories and Application Magazine, 62: 55.
15. Al-Bedewy, I.F., 2004. Effects of a cross training program on some physiological and physical variables and on developing the performance level of chest curl in wrestlers. The scientific Journal, Faculty of Physical Education for Women, Helwan University, Egypt, 24: 72 (In Arabic).
16. Yahia, H.E., 2006. A cross training program during the transition period and its effects on the performance level of 100m runners. The scientific Journal, Faculty of Physical Education, Sadat, Minofia University, Egypt, 8: 328 (In Arabic).
17. Shadad, M.H., 2006. Effects of cross training during the transition period on developing the performance level of Judo performers. Theories and Application Magazine, Faculty of Physical Education for Men, Alexandria University, Egypt, 59: 67 (In Arabic).
18. Mohamed, Y.O., 2005. Effects of cross training on maintaining some physical and technical variables for soccer players during competitions. M.Sc. Thesis, Faculty of Physical Education for Men, Helwan University, Egypt, pp: 34 (In Arabic).

19. Ismaeel, I.S., 2004. Effects of developing muscular strength and flexibility using cross training of the performance level of swimmers. The scientific J. Physical Education Sciences, Faculty of Physical Education, Tanta University, Egypt, 16: 55 (In Arabic).
20. Gaweed, M.H., 2004. Effects of using cross training on the offensive tactical performance efficiency for volleyball players. Ph.D. Thesis, Faculty of Physical Education for Men, Alexandria University, Egypt, pp: 164 (In Arabic).
21. Ali, M.H., 2002. Using cross training in developing muscular strength in junior swimmers and its effect on performance level. Ph.D. Thesis, Faculty of Physical Education for Men, Alexandria University, Egypt, pp: 83 (In Arabic).
22. Hakkinen, S., 1991. Changes in Physical Fitness Profile during the competitive season in elite bandy players. J. Sports Medicine and Physical Fitness, 41: 312.
23. Frank, W.D., 1997. Sports Training Principles, Human kinetics, London, pp: 146.
24. Al-Gendy, T.M., 2000. Increase and decrease rates of muscular strength. Ph.D. Thesis, Faculty of Physical Education for Men, Helwan University, Egypt, pp: 52 (In Arabic).
25. Brent, W. and S. Haens, 1991. Training for sports and fitness. Macmillan, Hong Kong, pp: 215.
26. Hainaut, K. and E. Deutsch, 1989. Muscle Fatigue- Effects of Training and disuse muscle Nerve. Sports and Fitness, 12: 660-669.
27. Houmard, J.A., 1991. Impact of reduced training on performance in endurance athletes. Sports Medicine, 12: 380-393.