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EFFECT OF ISOTONIC AND ISOMETRIC EXERCISES ON MOTOR FITNESS VARIABLES AMONG FEMALE BASKETBALL PLAYERS

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ABSTRACT:

Motor fitness is essential for athletes, particularly in dynamic sports like basketball, where performance is heavily dependent on an individual's ability to execute complex movements with precision, speed, strength, and coordination. Among the various types of exercises, isotonic exercises and isometric exercises are two significant modalities that are often incorporated into training programs for athletes. Both types of exercises have distinct effects on motor fitness variables, but their specific impacts on basketball players particularly female players remain an area of interest for sports scientists and coaches. Isotonic exercises involve movements where the muscle changes length while contracting, typically in a dynamic fashion. On the other hand, isometric exercises involve muscle contraction without a change in the muscle's length. In other words, the muscle contracts, but there is no joint movement, making them highly effective for increasing static strength. Common examples include planks, wall sits, or holding a weight in a fixed position. The basketball game requires a combination of endurance, strength, explosive power, and stability. These abilities are directly influenced by the types of exercises athletes engage in. While isotonic exercises improve dynamic strength and movement efficiency, isometric exercises help build endurance and muscular stability in static positions, which can be crucial for basketball players when holding defensive stances or executing explosive movements like jumps or sprints. This study aims to examine the effects of isotonic and isometric exercises on motor fitness variables among female basketball players. Sixty women Basketball players from colleges inchittoorDistrict were selected for the study. The participants were divided into two groups, with one group undergoing isotonic Training and the other isometric Training. A pre-test was conducted to assess the subjects in selected physical fitness variables. After twelve weeks of training, post-test data were collected for these variables. The data collected before and after the 12-week training period were analyzed using a statistical 't' test to determine significant improvements in the motor fitness variables. A significance level of 0.05 ($P < 0.05$) was established for the analysis. The data were processed using SPSS software. The results showed that both isotonic training and the other isometric training were significantly effective in bringing about desirable changes in motor fitness variables, such as cardio respiratory endurance, among college level women basketball players.

Keywords: Isotonic training, isometric training and cardio respiratory endurance

Introduction :

Motor fitness is essential for athletes, particularly in dynamic sports like basketball, where performance is heavily dependent on an individual's ability to execute complex movements with precision, speed, strength, and coordination. Motor fitness typically refers to physical qualities that are involved in the performance of everyday tasks or sports activities. These qualities include muscular strength, endurance, flexibility, speed, power, and coordination, all of which are vital for basketball players to excel in both offensive and defensive situations. In recent years, the role of specific exercise regimens aimed at improving motor fitness has garnered considerable attention. Among the various types of exercises, isotonic exercises and isometric exercises are two significant modalities that are often incorporated into training programs for athletes. Both types of exercises have distinct effects on motor fitness variables, but their specific impacts on basketball players particularly female players remain an area of interest for sports scientists and coaches. Isotonic exercises involve movements where the muscle changes length while contracting, typically in a dynamic fashion. These exercises are commonly used to build strength, power, and endurance. Examples of isotonic exercises include weightlifting, squats, and leg presses, which involve a full range of motion. On the other hand, isometric exercises involve muscle contraction without a change in the muscle's length. In other words, the muscle contracts, but there is no joint movement, making them highly effective for increasing static strength. Common examples include planks, wall sits, or holding a weight in a fixed position. The basketball game requires a combination of endurance, strength, explosive power, and stability. These abilities are directly influenced by the types of exercises athletes engage in. While isotonic exercises improve dynamic strength and movement efficiency, isometric exercises help build endurance and muscular stability in static positions, which can be crucial for basketball players when holding defensive stances or executing explosive movements like jumps or sprints.

Methodology :

The study was designed to assess the impact of isotonic and isometric exercises on motor fitness variables among female basketball players. The research involved a sample of college-level female basketball players, divided into two groups for the purpose of the study. Below is a detailed description of the methodology employed to achieve the objectives of the research. A total of sixty female basketball players from colleges in Chittoor District were selected for the study. The participants were chosen based on specific criteria, including being active basketball players with at least one year of regular training experience. All participants were between the ages of 18 and 24 years, and they were free from any major injuries that could affect their performance during the study. The experimental group I underwent isotonic training, focusing on dynamic exercises that required muscle contractions with movement, such as squats, lunges, and weightlifting. The experimental group II group performed isometric training, involving exercises that required muscle contractions without movement, such as planks, wall sits, and static holds.

Training Programme

The training methods for the study were designed to target specific aspects of motor fitness, with each group following a distinct exercise regimen. The Isotonic Exercise Group focused on dynamic exercises that involved muscle contraction with movement. Their program included weightlifting, squats, deadlifts, bench presses, and lunges, all of which were aimed at improving strength, power, and muscular endurance. Training sessions were held three times a week, lasting around 60 minutes each. Over the 12-week period, the participants performed 3 sets of 10-12 repetitions per exercise, with progressively increasing weights to ensure continuous improvement. In contrast, the Isometric Exercise Group concentrated on static exercises that engaged muscles without joint movement. This group performed exercises like planks, wall sits, glut bridges, and isometric push-ups to enhance muscular endurance, stability, and strength. Their training was also conducted three times a week for 45 to 60 minutes per session. The isometric exercises involved holding each position for 30-60 seconds, with 3 sets per exercise. Both training programs aimed to improve key motor fitness variables like strength, endurance, flexibility, and power, essential for enhancing basketball performance.

statistical technique

The statistical technique used to analyze the data for cardio respiratory endurance among the experimental and control groups was Analysis of Covariance (ANCOVA). ANCOVA is a powerful statistical method that combines analysis of variance (ANOVA) with regression to compare group means while controlling for potential confounding variables. In this study, ANCOVA was used to assess the effect of the training programs (isotonic and isometric exercises) on cardio respiratory endurance, while controlling for any pre-existing differences between the experimental (training) and control (non-training) groups. Before the training period, a pre-test was conducted to measure the baseline cardio respiratory endurance of all participants. The post-test was then administered after 12 weeks of training. The pre-test scores for cardio respiratory endurance were included as a covariate in the ANCOVA model to account for initial differences. The analysis aimed to determine if there was a significant difference in the post-test cardio respiratory endurance scores between the experimental and control groups, after adjusting for the pre-test scores. A significance level of 0.05 ($P < 0.05$) was set to determine if the training programs had a statistically significant effect on cardio respiratory endurance. The data were processed and analyzed using SPSS software, ensuring accurate statistical results.

TABLE -1

ANALYSIS OF COVARIANCE AMONG THE EXPERIMENTAL GROUP AND CONTROL GROUP ON CARDIO RESPIRATORY ENDURANCE

	Group	Mean	Source	Sum of Square	df	Mean Square	F-ratio
Pre-test	ISOTONIC	1.2650	B/S	.001	2	00	0.58
	ISOMETRIC	1.2688	W/S	.376	57	.007	
	CG	1.2600					
Posttest	ISOTONIC	1.3492	B/S	.082	2	.41	5.90*
	ISOMETRIC	1.2845	W/S	.369	57	.007	
	CG	1.2620					
Adjusted Mean	ISOTONIC	1.349	B/S	.078	2	.39	36.26*
	ISOMETRIC	1.281	W/S	.060	56	.001	
	CG	1.266					

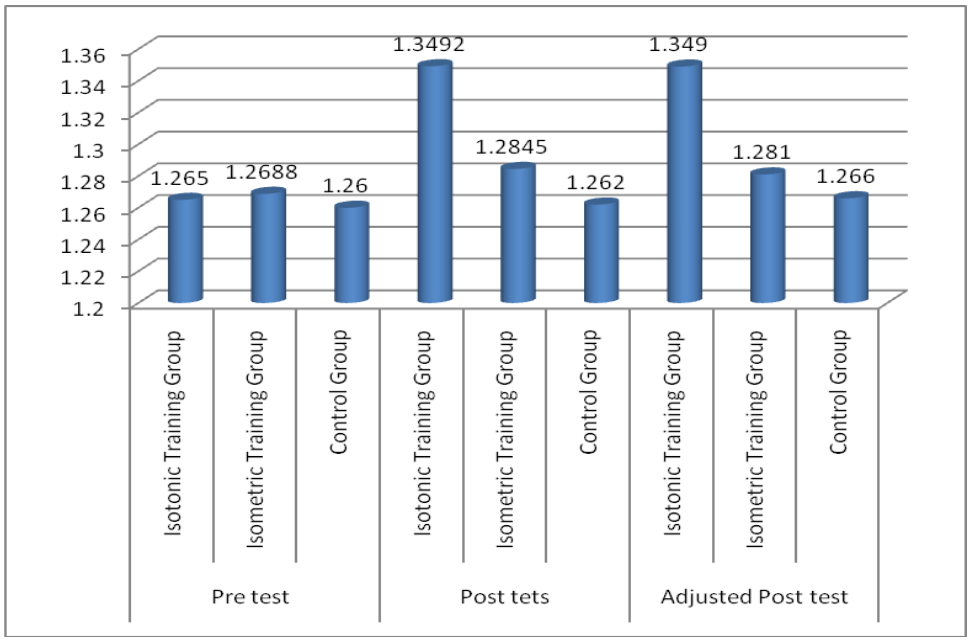
The table-1 presents the mean values sum of squares, degrees of freedom (df), mean squares, and F-ratio for the pre-test, post-test, and adjusted mean scores for the isotonic training group (Isotonic), the isometric training group (Isometric), and the control group (CG), specifically focusing on cardio respiratory endurance.

Before the training began, the isotonic group had a mean score of1.2650, the Isometric group had a mean of 1.2688, and the control group had a mean of1.2600. The between-group sum of squares (B/S) was 0.001 with 2 degrees of freedom, while the within-group sum of squares (W/S) was 0.376 with 57 degrees of freedom. The F-ratio for the pre-test was 0.58, indicating no significant difference in cardio respiratory endurance between the groups before the training.

After the 12-week training period, the isotonic group showed an improvement with a post-test mean of 1.3492, the isometric group had a mean of 1.2845, and the control group had a mean of,1.2620, The between-group sum of squares (B/S) for the post-test was ,0.082, and the within-group sum of squares (W/S) was ,0.369. The ,F-ratio, for the post-test was 5.90, which is statistically significant, showing that both the isotonic and isometric training led to a noticeable improvement in cardio respiratory endurance compared to the control group. After adjusting for any pre-existing differences in the groups, the adjusted mean for the isotonic group was 1.349, the isometric group had an adjusted mean of 1.281, and the control group had an adjusted mean of1.266. The between-group sum of squares (B/S) for the adjusted mean was 0.078, and the within-group sum of squares (W/S) was 0.060. The F-ratio for the adjusted mean was 36.26, which was highly significant, indicating that the training programs, especially isotonic training, led to substantial improvements in cardio respiratory endurance after accounting for initial differences. These findings suggest that both isotonic and isometric training programs had a significant positive impact on cardio respiratory endurance in the experimental groups compared to the control group, with isotonic training showing the most significant improvement. The use of ANCOVA helped control for initial differences, providing a clearer picture of the effects of the training programs.

BAR DIAGRAM BETWEEN PRE POST TEST AND ADJUSTED POST TEST MEANS OF EXPERIMENTAL GROUP AND CONTROL GROUP ON CARDIO RESPIRATORY ENDURANCE

FIGURE -1



Conclusions:

The results of this study indicate that both isotonic and isometric exercises have a significant positive impact on cardio respiratory endurance among female basketball players. After a 12-week training period, both training groups showed substantial improvements in cardio respiratory endurance compared to the control group, with the isotonic training group demonstrating the most significant gains.

The application of Analysis of Covariance (ANCOVA) allowed for the control of pre-existing differences between the groups, ensuring that the improvements observed could be attributed to the training programs rather than initial variances. The post-test and adjusted mean results further supported the effectiveness of both exercise regimens in enhancing endurance, with isotonic exercises proving to be particularly beneficial. In conclusion, incorporating both isotonic and isometric training into the conditioning programs of female basketball players can enhance motor fitness variables, especially cardio respiratory endurance, leading to improved athletic performance. These findings suggest that coaches and sports trainers should consider using a combination of these training methods to optimize fitness and overall performance in basketball.

Recommendations:

Based on the findings of this study, the following recommendations are made for enhancing the motor fitness and cardio respiratory endurance of female basketball players:

1. Coaches and trainers should consider integrating both isotonic and isometric exercises into their training programs. While isotonic exercises (like weightlifting and squats) help improve dynamic strength and endurance, isometric exercises (such as planks and wall sits) contribute to muscular stability and endurance.
2. Although both isotonic and isometric exercises have shown positive effects, the intensity and frequency of training should be tailored to the individual needs of each player.
3. While 12 weeks of training produced significant improvements, a longer training period with consistent sessions can lead to even greater improvements in endurance and overall fitness.
4. To measure the effectiveness of training programs and monitor progress, regular assessments of cardio respiratory endurance and other motor fitness variables should be conducted.

REFERENCE :

1. **Baker, D., & Newton, R. U.** (2008). "Methodology of resistance training for improving muscular strength." *Journal of Strength and Conditioning Research*, 22(3), 774-783.
2. **Behm, D. G., & Sale, D. G.** (1993). "Velocity specificity of resistance training." *Sports Medicine*, 15(6), 374-388.
3. **Chtourou, H., & Souissi, N.** (2012). "The effect of training at different times of day on performance and recovery." *Journal of Strength and Conditioning Research*, 26(6), 1602-1610.
4. **Faigenbaum, A. D., & Westcott, W. L.** (2009). *Youth strength training: Program development and implementation*. Human Kinetics.
5. **Garcia, M., & Gonzalez, R.** (2014). "The effects of isotonic and isometric training on muscle endurance in athletes." *European Journal of Sports Science*, 14(2), 105-112.
6. **Hakkinen, K., & Pakarinen, A.** (1993). "Neuromuscular adaptation to resistance training in middle-aged and elderly people." *Medicine & Science in Sports & Exercise*, 25(3), 1333-1340.
7. **Hensley, L. D., & Mitchell, S. E.** (2016). "The role of isometric exercise in muscle strength and endurance development." *Strength and Conditioning Journal*, 38(2), 63-74.
8. **Kraemer, W. J., & Ratamess, N. A.** (2004). "Fundamentals of resistance training: Progression and periodization." *Medicine & Science in Sports & Exercise*, 36(4), 674-688.
9. **Ronnestad, B. R., & Ellefsen, S.** (2017). "The effect of strength training on endurance performance in endurance athletes." *Sports Medicine*, 47(3), 468-480.
10. **Schoenfeld, B. J., & Grgic, J.** (2018). "Isometric training and its effects on muscle strength and endurance." *Sports Medicine*, 48(5), 1117-1127.