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EFFECT OF GYMNASTIC EXERCISE AND AEROBICS ON THE PERFORMANCE OF WING SHOOTING IN HANDBALL.

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ABSTRACT

The aim of the study was to examine the effect of gymnastic exercise and aerobics on the performance of wing shooting in handball. To achieve this purpose of investigation 90 handball players (girls) were randomly selected from different schools in Andhra Pradesh. The subjects were divided into three groups consisting of 30 handball players in each group. The subjects were in the age group of 15 to 18 years of school girls..For this study the researcher selected the performance of wing shooting in handball, as this ability is considered as one of the basic necessities in the game of handball. Randomly selected ninety school girls handball players who participated in the inter-school level tournaments were selected randomly from Andhra Pradesh. The selected subjects were randomly divided into three groups. Experimental group I was assigned as Gymnastic exercises training group, Group II was assigned as aerobic training and the third group served as control group which was kept under control. Based on the initial performance in wing shooting in handball, the subjects were divided into three equal groups consisting of 30 handball players in each group. Prior to experimental treatment all the subjects were measured of their wing shooting performance objectively. Gymnastic group was given selected gymnastic exercises consisting of 10 exercises for 12 weeks. The aerobic group was provided with aerobic training of 10 different exercises for 12 weeks. Immediately after the completion of experimental period all the three groups were measured of their performance of wing shooting in handball. The differences between the initial and final scores were considered as the effect of respective treatment on wing shooting performance. The ANCOVA results showed that the obtained F value 68.94 was significant. The post hoc analysis and the data paired mean comparisons proved that experimental treatments were significantly better than control group. Comparison between treatment groups, that is, gym exercises group and aerobic training group proved that gym exercises group was significantly better than aerobic training in improving wing shooting performance of handball players girls. Based on the findings of the study, it was concluded that gym exercises may be included in the training schedule of handball players, especially, school level girls.

Key Words: Gymnastic Exercises Training, Aerobic Training, Wing Shooting in Handball

INTRODUCTION

Handball is a fast-paced body-contact sport, played by two competing teams of seven players (one player is a goalkeeper) on an indoor court (40 × 20 m) over two 30-minute periods. It is generally recognised that due to relatively recent changes in game rules (e.g. starting the game quickly from the centre) and improvements in the tactical use of rolling substitutions, the intensity of the game is increased. Players are also able to perform more high-intensity actions. Despite its popularity, a paucity of data exits to describe the game's physical demands. What is clear is that anthropometric characteristics of the players vary depending on the position they play with backcourt and line players (pivot) being taller and heavier than wingers Inn (Krüger K, Pilat C, Ueckert K, Frech T, Mooren FC (2911) . Time-motion data from the elite men's game during the 2007 World Championships has indicated that playing time is different between positions with wingers (37.37 ± 2.37 minutes) and goalkeepers (37.11 ± 3.28 minutes) having more court time than either backcourt players (29.16 ± 1.70 minutes) and pivots (29.3 ± 2.70 minutes).

The total distance covered during the game also varies between positions with larger distances covered by wing players (3710 ± 210 m) when compared to backcourt (2839 ± 150 m) and line player (pivot) (2786 ± 238 m) positions. More recent research on elite male handball players has shown that players cover a mean distance of 4370 ± 702 m during a game, most of which is spent performing low intensity actions that is interspersed by short duration, very high-intensity anaerobic actions (Póvoas SC,, 2012) . Such actions define the most important aspects of the game, as they represent offensive or defensive situations needed to score a goal and/or avoid conceding one. To our knowledge, extremely limited information exists to date to describe the physical demands within the elite women's game, but it is likely that similar patterns exist and clear signs of fatigue can be observed towards the end of the game. The aim of this article is to consider how strength training can improve performance and reduce the risk of injuries, taking into consideration the demands of modern handball.

Research and notational analysis of international games clearly indicates that handball players perform a large number of high intensity actions during a game (Chelly MS, et.al. 2011) . Such actions are characterised by accelerations and decelerations in various directions (including cutting movements) and jumps and landing activities. All such movements require forceful muscle actions and can be repeated more than 100 times during the course of one game. For this reason, it is important to consider the strength requirements of these typical movement patterns in order to define the most appropriate approach to implement a successful strength training programme. Furthermore, due to the fact that physical contact is allowed within the rules of the game, strength requirements are quite high in order to sustain the physicality of the game and the high risk of injury as documented in the last survey conducted at the London 2012 Olympic Games (Engebretsen L, et.al. (2012) .

Jump shots, for example, are the most used shooting technique by handball players (more than 70% of the shots are performed while jumping (Wagner H, Müller E. (2008)) and are performed with a run-in, planting of the foot and take off, usually on the opposite leg to the throwing arm (albeit some players at times will perform jump shots taking off with both lower limbs and/or jumping on the leg on the same side of the shooting arm). Ground reaction forces measured in handball players performing one leg take off after a run-in have shown values larger than 3 ×the player's body mass with ground contact times shorter than 300 milliseconds (Laffaye G, Bardy BG, Durey A. (2005) . This means that muscles of the lower limbs are required to produce large contractile forces in a relatively short period of time in order to facilitate longer fly times. An increased jumping ability on one leg would be a big advantage for a player, as it would allow shooting from a bigger height with the possibility to avoid a block from a defender (mainly backcourt players) and would give more time in the air to wait for a goalkeeper's move or fake a shot (mainly for wings, line players and other game-specific situations). Strength training should therefore be targeted to improve vertical jumping ability in handball players, however other aspects related to injury prevention should be taken into account. Due to the kinetics and kinematic characteristics of jump shots, and the large number of repetitions of such actions in training, stronger lower limbs are particularly necessary as braking forces are large during the deceleration phase and stress on the ankle and knee joint is quite remarkable (Lindner M,. 2012) . This is particularly important after landing from such shots and when landing is affected by contact with a defender from the opposite team.

It is clear that there is a paucity of studies involving handball players and more effort is needed from the scientific community to understand more about the physical demands of the game and the potential to modify and individualise training in order to improve performance and reduce the risks of injury. In particular, little is known about the most appropriate approaches for a periodised strength training programme in teams involved in national and international competitions (where players can play a large number of games within a season).

In our experience, strength training can be performed weekly with one to three sessions per week according to the playing schedule in professional teams. This requires appropriate planning with the coaching team and needs to take into consideration the overall loading patterns experienced by the players in order to avoid overreaching or the occurrence of overtraining. Generally, two sessions per week can be useful to improve strength and power in well-trained individuals, with three sessions per week being more appropriate in pre-season or intensive preparation periods. Single sessions per week are unlikely to produce significant improvements in strength and power, but can be useful to maintain strength and power levels in well-trained players.

Vassilios Panoutsakopoulos (2022) examined the effect of the ankle joint range of motion (ROM) on the vertical jump (VJ) performance of adult handball players. Results reveal that PAS-ROM was larger ($p < 0.05$) in all knee joint flexion angles. ROM was smaller ($p < 0.05$) by approximately 10° at 0° compared to 90° knee flexion. No lateral effects on ROM due to the handedness of the players were observed. AS and CM resulted in increased jump height ($p < 0.05$). Finally, ACT-ROM when the knee joint was flexed at 40° was highly correlated ($r \geq 0.66$, $p < 0.05$) with VJ performance except for CMJ-AS. In conclusion, the differences in the bi-articular gastrocnemius muscle flexibility due to the alteration of the angular position of the examined joints affected the ability to generate impulse during the VJ tests.

Souhail Hermassi et.al. (2019) examined the anthropometric characteristics, as well as the physical performance of professional handball players classified by playing position and competition level. It was found the anthropometric differences between playing levels and playing positions may indicate the advantageous characteristics that the respective position demands, whereas the playing position differences in physical fitness characteristics may indicate training specificity issues that must be addressed cautiously.

Zsófia Tróznai et.al. (2021) documented that Handball-specific generic skills, position-specific technical drills and in-game performance were the selection criteria evaluated by experts and coaches. And found at national level, (relative age effects) RAEs were still present, but with no further increase in the effect size. The performance metrics in technical skills, but also coaching assessments are likely involved.

Souhail Hermassi (2019) assessed the impact of 8 weeks biweekly in-season weightlifting training on the strength, throwing ability, and body composition of healthy male handball players. It was found that 8 weeks of biweekly in-season weightlifting training yielded substantial increases of muscle volume, maximal strength of the upper limbs, and ball throwing velocity in healthy handball players relative to their standard training program.

The previous researches showed that there were further scope for research to find out the effect of gymnastic exercise and aerobic training on the performance of wing shooting handball. Hence, this research was attempted.

METHODOLOGY

SUBJECTS

To achieve this purpose of investigation 90 handball players (girls) were randomly selected from different schools in Andhra Pradesh. The subjects were divided into three groups consisting of 30 handball players in each group. The subjects were in the age group of 15 to 18 years of school girls..

VARIABLES SELECTED

For this study the researcher selected the performance of wing shooting in handball, as this ability is considered as one of the basic necessities in the game of handball.

EXPERIMENTAL DESIGN

Randomly selected ninety school girls handball players who participated in the inter-school level tournaments were selected randomly from Andhra Pradesh. The selected subjects were randomly divided into three groups. Experimental group I was assigned as Gymnastic exercises training group, Group II was assigned as aerobic training and the third group served as control group which was kept under control. Based on the initial performance in wing shooting in handball, the subjects were divided into three equal groups consisting of 30 handball players in each group. Prior to experimental treatment all the subjects were measured of their wing shooting performance objectively. Gymnastic group was given selected gymnastic exercises consisting of 10 exercises for 12 weeks. The aerobic group was provided with aerobic training of 10 different exercises for 12 weeks. Immediately after the completion of experimental period all the three groups were measured of their performance of wing shooting in handball. The difference between the initial and final scores were considered as the effect of respective treatment on wing shooting performance. To test statistical significance, statistical application was made and results presented.

RESULTS

Tab I: COMPUTATION OF ANALYSIS OF COVARIANCE OF WING SHOOTING PERFORMANCE AMONG GIRL HANDBALL PLAYERS

(Scores in Points)

`	Gym Exercise Training Group	Aerobic Training Group	Control Group	Source of Variance	Sum of Squares	Df	Mean Squares	Obtained F
Pre Test Mean	18.64	17.96	18.00	Between	1.40	2	0.70	
				Within	-626.00	87	7.20	0.10
Post Test Mean	21.64	20.00	18.48	Between	117.96	2	58.98	
				Within	-726.23	87	8.35	7.07*
Adjusted Post Test Mean	21.11	20.18	18.54	Between	102.11	2	51.06	
				Within	63.69	86	0.74	68.94*
Mean Diff	3.00	2.04	0.48					

Table F-ratio at 0.05 level of confidence for 2 and 87 (df) =3.06, 2 and 86(df) =3.86 .
*Significant

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table II

Tab II: Scheffe's Confidence Interval Test Scores on Wing Shooting

Gym Exercise Training Group	Aerobic Training Group	Control Group	MEAN DIFF	C.I
21.11	20.18		0.93*	0.55
21.11		18.54	2.58*	0.55
	20.18	18.54	1.65*	0.55

***** Significant at 0.05 level.

DISCUSSIONS

As shown in Table I, the obtained pre test mean was 18.64 for gym exercise group, 17.06 for aerobic group, 18.00 for control group. The post test means were 21.64, 20.00, and 18.48 respectively. The obtained F values on the scores of pre test means was less than the required table value. And the post test F value was significant. Taking into consideration of the pre test means and post test means, adjusted post test means were determined and analysis of covariance was done and the obtained F value 68.94 was greater than the required value of 3.06 and hence it was accepted that the gym exercises and aerobic training improved wing shooting performance of handball players.. Since significant results were obtained, the data were subjected to post hoc analysis and the data paired mean comparisons were presented in Table II. It was proved from that experimental treatments were significantly better than control group. Comparison between treatment groups, that is, gym exercises group and aerobic training group proved that gym exercises group was significantly better than aerobic training in improving wing shooting performance of handball players girls.

CONCLUSIONS

Based on the findings of the study, it was concluded that gym exercises may be included in the training schedule of handball players, especially, school level girls.

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