Assessment of Yogic Exercise Intervention on Aerobic Capacity (Vo2max) of Women Soccer Players

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Abstract

The study's main objective was to investigate the significant changes in aerobic capacity (VO2max) of Women Soccer following the progressive yogic exercise intervention. A total of fifty (N=50) women soccer players between 18 to 30 years of age from the KRYPHSA and YWC), Imphal, were selected randomly and divided into experimental (N1=25) and control (N2=25) groups. The experimental group only had been assigned the yogic exercise intervention 6 times in a week for duration of 12 weeks in the morning before attending the regular football training and the control group was not treated with any specific intervention exercise except regular football training. The yogic exercise intervention composed of Asanas, Pranayamas, Om-chanting and Meditation. Cooper's 12 minutes Run-Walk test was administered to assess the VO2max in pre-intervention, 4th, 8th, and 12th weeks. The Repeated Measures Two-way Analysis of Variance (ANOVA) was adopted to determine the overall significant changes in aerobic capacity (VO2mx) and the level of significance was set at 0.05 to interpret the substantial differences. The result of the study showed a progressive improvement of 4, 8, and 12 weeks of yogic exercise intervention on the VO2max within the experimental group. There were significant improvements in the control group from pre-intervention to 12th week, 4th to 12th week, and 8th to 12th week in VO2max. But, no gradual improvement was evidenced at all within the control group. Further, the result showed non-significant difference in the aerobic capacity (VO2max) between the experimental and control groups after the course of 12 weeks. The result might be because of the control group players evolved the same periodized regular soccer training except for yogic exercise intervention. They might acquire the chance to improve aerobic capacity (VO2max). The present study concluded that there was found the gradual increase of aerobic capacity (VO2max) of women soccer players during the course of 12 weeks yogic exercise intervention.

Key words: *Yoga, exercise intervention, VO2max, Soccer.*

DOI Number: 10.14704/nq.2022.20.9.NQ44790 **Neuro Quantology 2022; 20(9):6752-6762**

1. INTRODUCTION

The game 'Soccer' is the most popular and truly a dominant game in the world. It is taken as a part of life in the developed countries. Soccer is considered the most coordinated game consisting of highly dramatic magical skills with dominant physical and physiological fitness to sustain the intensive workload of 90 minutes or more. Soccer is a unique that crosses all geographic, ethnic, religious, and casteism boundaries across the world and attracts the global's all-eye views.

High-level soccer performance is the result of multiple factors such as physical, motor abilities, constitutional mental abilities, high physiological work output, technical and tactical skill efficiency, etc. The performance of world-class soccer players is the result of interactions of a number of these factors, which include high psychological and physiological demands. Therefore, soccer is a game of psycho-physio-physical activity. Modern soccer training gives greater emphasis in preparing the players physically and the effects on the physiological

parameters. In a soccer match, aerobic capacity is the main domain physiological component. Soccer is an endurance sport with a period of intense activities. During a 90 minute and more game elite soccer players cover 9–14 km (Bradley, et al. 2010).

The aerobic capacity is a measurement of maximum oxygen consumption during physical activity, which is referred to as VO2max. It is a reflection of aerobic power and the body's ability to maintain performance under strenuous activity for a longer time. The maximal oxygen uptake (VO2max) is usually expressed in relative (O2 uptake relative to body weight) terms as milliliters of oxygen consumed per kilogram of body weight per minute (O2 ml /kg/min or ml/kg/min).

Soccer is a demanding sport the performance of which is determined by physical, techno-tactical, psychological, and social parameters. A player needs a relatively high maximum oxygen uptake during a soccer match can be as high as 70% of VO_2max. An increase in VO_2max and the ability to sustain exercise for a prolonged period can be obtained by aerobic training (Reilly, 2003). Aerobic efficiency is the highest amount of oxygen consumed during maximal exercise in activities that use the large muscle groups in the legs or arms and legs combined (https://community.plu.edu/~chasega/terms.html). The maximum oxygen uptake (VO_2max) is perhaps the physiological parameter most evaluated in elite soccer players. The average level of VO2max is about 60ml.kg^{-1}.min^{-1}, but, individual figures as high as 76ml.kg^{-1}.min^{-1} has been reported. Maximum oxygen uptake has been observed to be higher for midfielders than for players in other positions and this has been associated with a longer distance covered in the game (Rico-Sanze). Slimani, et al. (2019) reported VO2max values were in the range of 48–62 ml/kg/min for male soccer players regardless of their competitive level. Due to the duration of a football game, aerobic capacity is extremely important for footballers (Stolen T. et al., 2005). One of the most fundamental component determining success in an aerobic endurance sport is maximal oxygen uptake (VO2max) (Helgerud J. et al., 2007).

As for athletes or sports persons, yoga can be a powerful enhancement in regular training exercises. Adding yoga in a routine training programme helps develop strength, flexibility, range of motion, concentration, and cardiovascular health and reduces stress, tension and tightness. The most significant benefit of adding yoga to a training programme is its effect on performance. It allows an athlete to train harder and a higher level because of motion is greater and the fear of injury lesseness (Kadu). Ultimately, it is recognized that practicing prolonged yoga exercises changes various physiological systems like the cardiovascular system, ventilatory system, metabolic process, biochemical changes, etc. It affects aerobic capacity, anaerobic capacity, vital capacity, cardiac output, recovery, and others fitness parameters of the soccer players. Regular yoga exercise intervention during routine practices affects various physical fitness, motor abilities, physiological efficiencies, and psychological maintenance that enhance the performance qualities with the development of skill abilities. There is evidence that yoga practices like asanas, pranayamas, and others enhance the performance of soccer players. There are many styles of yoga that range from very dynamic, active, movements that go from one posture to another (and result in a thorough aerobic workout) to more slow-paced practices that hold postures for several minutes and form an intense strength training and balance workout (Quinn, 2020).

Women's soccer is one of the most prominent team game played by women around the globe. It is played at the professional level in numerous countries throughout the world in different level equally to men's soccer. Women soccer players need adequate different fitness level to depict the best performance for duration of 90 minutes or more. The VO2max values of women football players were obtained to be 42-57 ml.kg^{-1}.min^{-1} (İbrahim CAN, et al., 2019).

High level soccer performance is the result of a multiple factors such as physical, motor abilities, constitutional mental abilities, high physiological work output, technical and tactical efficiency etc. (wikipedia.org). Indeed soccer players are reliant on high intensive physiological work efficiencies to achieve the

competitive performance level. Therefore, an issue is decided to investigate the effect of scheduled yogic exercise intervention programs on aerobic capacity (VO2max) of women soccer players.

2. OBJECTIVE

The study's main objective was to investigate the significant changes in aerobic capacity (VO2max) of women soccer players following the progressive yogic exercise intervention.

3. METHODS

Based on the objective of the study, a total of fifty (N=50) women soccer players between 18 to 30 (M=24) years of age from the Kangchup Road Young Physical and Sports Association (KRYPHSA) and the Youth Welfare Club (YWC), Imphal, were selected randomly. The subjects were divided into Experimental (N1=25) and Control (N2=25) groups by adopting the randomized group design. The experimental group only had been assigned the yogic exercise intervention for 12 weeks. The yogic exercise intervention composed of Asanas, Pranayamas, Om-chanting and Meditation. The experimental group practiced the yogic exercises in the morning for six days per week before they attended the regular football training with adjusted load volume and intensity. The control group was not treated with any specific intervention exercise except regular football training. The data were collected by administering Cooper's 12 minutes Run-Walk test in repeated series viz pre-intervention test, 4th, 8th, and 12th weeks. The Repeated Measures Two-way Analysis of Variance (ANOVA) was adopted to determine the overall significant changes in aerobic capacity (VO2mx) between and within the experimental and control groups following the repeated measures of pre, 4th, 8th and 12th week. The level of significance was set at 0.05 to interpret the substantial differences in VO2max. The schedule of yogic exercise intervention programme is shown in table 1.

Table 1: Schedule of yogic exercise intervention programme For 12 weeks

Week	Yogic Exercise Category	Exercises	Practice Duration	Total Duration
I - IV	Asanas	Warm up & Loosening Exercises	8 min	**35 min**
		Suryanamaskar	4 min	
		Tadasana	4 min	
		Utkatasana		
		Vriksasana		
		Natarajasana		
		Savasana	1 min	
		Sarvangasana	5 min	
		Matsyasana		
		Makarasana		
		Bhujangasana		
		Pashchimotasana		
		Konasana		
	Pranayamas	Anulom-Vilom	4 min	
		Kapalbhati	1 min	
		Bhastrika	1 min	
		Ujjayi	2min	
		Shitali		
		Shitkari		
		Om Chanting & Meditation	5 min	

V - VIII	Asanas	Warm up & Loosening Exercises	8 min	**40 min**
		Suryanamaskar	5 min	
		Tadasana	4 min	
		Utkatasana		
		Vriksasana		
		Natarajasana		
		Savasana	1 min	
		Sarvangasana	8 min	
		Halasana		
		Matsyasana		
		Makarasana		
		Dhanurasana		
		Pashchimotasana		
		Konasana		
		Vakrasana		
		Shirasana		
	Pranayamas	Anulom-Vilom	5 min	
		Kapalbhati	1 min	
		Bhastrika	1 min	
		Ujjayi	2 min	
		Shitali		
		Shitkari		
		Om Chanting & Meditation	5 min	
IX - XII	Asanas	Warm up & Loosening Exercises	8 min	**45 min**
		Suryanamaskar	5 min	
		Tadasana	4 min	
		Utkatasana		
		Vriksasana		
		Natarajasana		
		Savasana	2 min	
		Sarvangasana	12 min	
		Halasana		
		Matsyasana		
		Makarasana		
		Dhanurasana		
		Pashchimotasana		
		Konasana		
		Vakrasana		
		Shirasana		
		Virabhadrasana		
		Ekapada rajakapotasana		
		Ardha Hanumanasana		
		Upavistha Konasana		
	Pranayamas	Anulom-Vilom	5 min	
		Kapalbhati	1 min	
		Bhastrika	1 min	
		Ujjayi	2min	

		Shitali		
		Shitkari		
		Om Chanting & Meditation	5 min	

4. FINDINGS

Firstly, the descriptive analysis of aerobic capacity (VO2max) for experimental and control groups on the progression of yogic exercise intervention on women soccer players has been shown in table 2.

Table 2: Description of VO2max for Experimental and Control Groups in Repeated Measures

Variable Measured	Treatment Groups	Time Scale of Testing	Range	Min.	Max.	Mean	SD	SE	Var
VO2max	Experimental	Pre-Test	11.87	35.37	47.24	42.56	3.24	0.65	10.48
		4th Week	12.95	38.03	50.98	44.63	3.42	0.68	11.68
		8th Week	11.16	40.42	51.58	46.17	3.16	0.63	10.01
		12th Week	10.12	41.94	52.06	47.37	2.72	0.54	7.38
	Control	Pre-Test	12.02	38.36	50.38	44.71	3.66	0.73	13.36
		4th Week	11.34	39.12	50.46	44.80	3.55	0.71	12.63
		8th Week	11.17	39.38	50.55	44.53	3.16	0.63	10.00
		12th Week	10.40	40.25	50.65	45.38	3.28	0.66	10.76

Table 2 precisely reveals that the means and standard deviations (SD) of the VO2max for the experimental group in repeated measures of pre-exercise, 4th, 8th and 12th week tests were 42.56±3.24, 44.63±3.42, 46.17±3.16, and 47.37±2.72, respectively. In addition, for the control group in repeated measures of pre-exercise, 4th, 8th and 12th week tests were 44.71±3.66, 44.80±3.55, 44.53±3.16, and 45.38±3.28, respectively.

The mean comparisons and the average means of the VO2max between the experimental and control groups have shown in table 3.

Table 3: Descriptive Means Comparison between the Experimental and Control Groups.

Variable Measured	Treatment	Group	Mean	SD	N
	Pre- Test	Experiment	42.56	3.24	25
		Control	44.71	3.66	25
		Mean Average	*43.63*	*3.59*	*50*
	4th Week Test	Experiment	44.63	3.42	25
		Control	44.80	3.55	25
		Mean Average	*44.72*	*3.45*	*50*
		Experiment	46.17	3.16	25

VO2max	8th Week Test	Control	44.53	3.16	25
		Mean Average	*45.35*	*3.24*	*50*
	12th Week Test	Experiment	47.37	2.72	25
		Control	45.38	3.28	25
		Mean Average	*46.38*	*3.14*	*50*

Table 3 reveals that the mean average of experimental and control groups in the pre-test, 4th, 8th and 12th week tests were 43.63±3.59, 44.72±3.45, 45.35±3.24 and 46.38±3.14, respectively. Further, the graphical mean comparisons of repeated measures of the pre-test, 4th, 8th and 12th week tests of both experimental and control groups have been shown in figure 1.

of Pre, 4th, 8th and 12th week Tests in VO2max of both Experimental and Control Groups.

The comparison of pair-wise means average of the sum of both experimental and control groups among the pre-test, 4th week, 8th week, and 12th week tests based on the course of yogic exercise intervention for 12 weeks are shown in table 4.

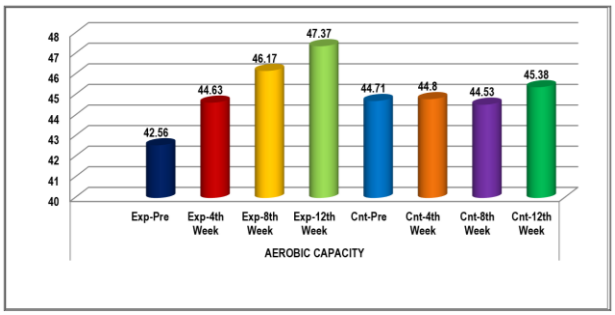

Figure 1: Graphical representation of Means

Table 4: Comparison of Pair-wise Means Average of the Sum of both Experimental and Control Groups in VO2max.

Repeated Measures of the Groups			MD	SE	Sig. P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
VO2max	Pre-Test	4th	-1.08*	0.16	0.00	-1.40	-0.76
		8th	-1.72*	0.23	0.00	-2.18	-1.25
		12th	-2.74*	0.24	0.00	-3.21	-2.27
	4th	8th	-0.64*	0.16	0.00	-0.95	-0.32
		12th	-1.66*	0.18	0.00	-2.01	-1.31
	8th	12th	-1.03*	0.13	0.00	-1.29	-0.77

**Significant at 0.05 level of confidence.*

Table 4 reveals that the mean average difference of the sum of both experimental and control groups between the pre-test and 4th week test was -1.08, the pre-test and 8th week test was -1.72, the pre-test and 12th week test was -2.74, the 4th and 8th week tests was -0.64, the 4th and

12th week tests was -1.66, and the 8th and 12th week tests was -1.03 (P-value=0.00). Therefore, a significant improvement of the yogic exercise intervention on the VO2mx had been found from pre-intervention to 4th, 8th and 12th weeks progressively.

The pair-wise mean comparisons among the repeated measures of the pre-test, 4th week, 8th week, and 12th week tests within the experimental and control groups based on the whole course of yogic exercise intervention for 12 weeks shown in table 5.

Table 5: Pair-wise Mean Comparisons among Repeated Measures within the Experimental and Control Groups.

Repeated Measures of the Groups				MD	SE	Sig. p-value	95% Confidence Interval for Difference	
							Lower Bound	Upper Bound
VO2max	Experimental	Pre-Test	4th	-2.07*	0.22	0.00	-2.52	-1.62
			8th	-3.61*	0.33	0.00	-4.27	-2.95
			12th	-4.81*	0.33	0.00	-5.48	-4.14
		4th	8th	-1.54*	0.22	0.00	-1.98	-1.10
			12th	-2.74*	0.25	0.00	-3.24	-2.24
		8th	12th	-1.20*	0.18	0.00	-1.57	-0.83
	Control	Pre-Test	4th	-0.09	0.22	0.68	-0.54	0.36
			8th	0.18	0.33	0.59	-0.48	0.84
			12th	-0.67*	0.33	0.05	-1.34	-0.01
		4th	8th	0.27	0.22	0.22	-0.17	0.71
			12th	-0.58*	0.25	0.02	-1.08	-0.08
		8th	12th	-0.85*	0.18	0.00	-1.22	-0.49

**Significant at 0.05 level of confidence.*

Table 5 reveals that the mean differences between the experimental group's pre-test and 4th, 8th & 12th week means were -2.07, -3.61 & -4.81, respectively (P=0.00). Further, the mean differences between the experimental group's 4th week and 8th & 12th week were -1.54 and -2.74 (P=0.00), respectively. Lastly, the mean difference of -1.20 (P= 0.00) between the 8th and 12th week of the experimental group was also found. Therefore, there was a progressive improvement of 4, 8, and 12 weeks of yogic exercise intervention on the aerobic capacity (VO2max) of women soccer players. In the case of the control group, table 5 reveals that the mean differences between the pre-test and 4th, 8th & 12th week means were -0.09, 0.18 & -0.67, respectively, and their respective P-values were 0.68, 0.59 & 0.05. It showed no significant differences between pre-test and 4th & 8th week tests except between the pre-test and 12 week test. Similarly, no significant improvement was found between the 4th and 8th week as the MD= 0.27 and P= 0.22 (>0.05). However, significant improvement was found between the 4th and 12th week as the MD= -0.58 and P= 0.02 (<0.05). There was also a significant improvement from the 8th to 12th week as the MD= -0.85 and P= 0.00 (<0.05).

The descriptive analysis and pair-wise mean comparisons of VO2max between the experimental and control groups for the whole course of 12 week yogic exercise intervention programme for the women soccer players are shown in table 6.

Table 6: Descriptive Measures of 12 Weeks Yogic Exercise Intervention for Women Soccer Players.

Measure	Treatment	Mean	SE	95% Confidence Interval	
				Lower Bound	Upper Bound
Aerobic	Experimental	45.18	0.64	43.90	46.46
	Control	44.86	0.64	43.57	46.14

Table 6 reveals the means of experimental and control groups in VO2max as 45.18 and 44.86, respectively, and the pair-wise mean comparison is shown in table 7.

Table 7: Pair-wise Mean Comparison between Experimental and Control Groups for the course of 12 Weeks Yogic Exercise Intervention Programme.

Measure			MD	SE	Sig. P-value	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
Aerobic	Experiment	Control	0.33	0.90	0.72	-1.48	2.14
	Control	Experiment	-0.33	0.90	0.72	-2.14	1.48

Table 7 reveals that the pair-wise mean differences between the experimental and control groups after the prolonged 12 weeks yogic exercise intervention for women soccer players was 0.33(-0.33) with the P-value of 0.72>0.05. Therefore, there was no significant difference between the experimental and control groups in improving aerobic capacity (VO2max) after the 12 weeks of a course of yogic exercise intervention for women soccer players.

The profile plots of the aerobic capacity (VO2max) based on the series of time scale testing of pre-test, 4th week, 8th week, and 12th week tests are shown in figure 2.

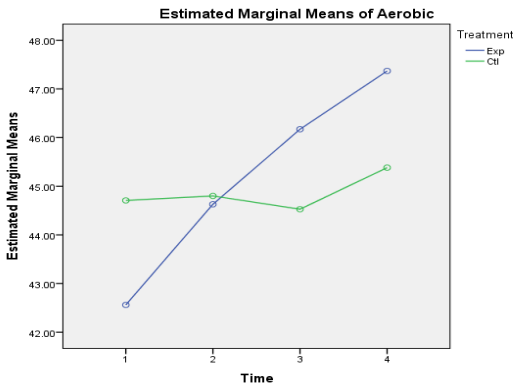

Figure 2: Profile Plotting of Pre, 4th, 8th and 12th Week Tests of VO2max.

The profile plotting of aerobic capacity, shown in figure 2, reveals the significant effect of yogic exercise intervention for 12 weeks on the women soccer players of the experimental group found under the repeated measures. Therefore, women soccer players could improve aerobic capacity (VO2max) through regular yogic exercise participation.

5. DISCUSSION OF FINDINGS

Research into soccer has achieved a long journey since numerous decades and produced a significant volume of studies for both male and female players. A more prominent aspect of research that emphasizes soccer development emphasizes the physical and physiological demands that reproduce players' fitness, technical and tactical performance. Among the physiological and physical correlations, aerobic capacity is focused as a performance-enhancing parameter, which could be affected by the yogic exercises over a planned training period. Hoff (2005) observed in his study that the professional soccer players devote a large amount of time on developing physical capacities (speed, strength, power, stamina and explosive strength). He stated the international soccer player's average oxygen uptake ranges from 55 to 68 ml/kg/min.

The primary purpose of the study was to investigate the significant effect of yogic exercise intervention on the aerobic capacity (VO2max) of women soccer players beside the regularly football practices.

In the result of the study, firstly, the means and standard deviations (SD) of the aerobic VO2max for the experimental group in repeated measures of pre-test, 4th, 8th and 12th week tests were 42.56±3.24, 44.63±3.42, 46.17±3.16, and 47.37±2.72, respectively, and for the control group were 44.71±3.66, 44.80±3.55, 44.53±3.16, and 45.38±3.28, respectively under the course of yogic exercise intervention. The experimental group found the gradual improvement of VO2max in the repeated measures of the pre-intervention, 4th, 8th, and 12th week. However, no gradual increment of VO2max was found in the control group. The gradual increment of VO2max was found among the mean average of the sum of experimental and control groups in the pre, 4th, 8th, and 12th week tests (43.63±3.59, 44.72±3.45, 45.35±3.24, and 46.38±3.14, respectively). The mean average differences between the pre and 4th week tests were -1.08, pre and 8th week tests was -1.72, pre and 12th week tests was -2.74, 4th and 8th week tests was -0.64, 4th and 12th week tests was -1.66, and between the 8th and 12th week tests was -1.03 (P-value=0.00). The mean differences between the pre and 4th, 8th & 12th week tests of the experimental group were -2.07, -3.61 & -4.81, respectively (P=0.00), between the 4th and 8th & 12th week tests were -1.54 and -2.74 (P=0.00), respectively, and the mean difference of -1.20 (P= 0.00) between the 8th and 12th week was also found. In the case of the control group, the mean differences between the pre and 4th, 8th & 12th week tests were -0.09, 0.18 & -0.67, respectively, and showed a significant difference between the pre and 12 weeks tests only. Similarly, no significant improvement was found between the 4th and 8th week tests. However, significant improvement was found between the 4th and 12th, and the 8th and 12th week tests (P<0.05). The profile plotting of VO2max showed a significant improvement of yogic exercise intervention for 12 weeks for the experimental group under repeated measures. Therefore, there was a progressive improvement of 4, 8, and 12 weeks of yogic exercise intervention on the aerobic capacity (VO2max) of women soccer players.

Some consonance research findings may be discussed. Pal and Saha (2013) investigated the effect of regular yogic practices and found the improvement of the work capacity by improving the aerobic capacity, anaerobic power, joint flexibility, and muscle strength. Singh and Singh (2015) studied the effect of yogic practices on physiological variables of University students and proved a significant improvement of vital capacity and haemoglobin level, whereas no significant changes in systolic and diastolic blood pressure. Doijad, Kamble, and Surdi (2013) also conducted a study to find the effect of short-term yoga practice on aerobic capacity (VO2 max) on 60 M.B.B.S. male and female students. They found the improvement of aerobic capacity (VO2 max) after 12 weeks of yoga practices. 0studied the effects of 45 days daily practice of Suryanamaskaran on blood pressure (BP), heart

rate (HR), respiratory rate (RR), forced vital capacity (FVC), and peak expiratory flow rate (PEFR) in school students of both sexes. The results showed that the systolic blood pressure, PEFR, and FVC increased significantly. Arumugam and Anuja (2016) studied the impact of yoga breathing exercises on total lung capacity among the 18 women soccer players and showed the evidence of significant improvement after six weeks training. Joniton and Gopinath (2016) designed an experimental study to assess the impact of yogic exercises on bio-motor variables among soccer players and concluded that yogic exercises have a significant effect on the bio-motor variables of male soccer players. Khan, Sathe and Yadav (2016) studied the effect of balancing yogic asanas on specific physical fitness components of school male football players and showed that the experimental group had greater improvement in fitness than control group. Thus, various researches had been conducted similar to the present study.

In the present study, the significant improvement found in the aerobic capacity (VO2max) for the experimental group might be reliant on the strict conduct of the planned yogic exercises, duration, players' sincere efforts and early adaptation to load volume and intensity of the yogic exercises. The yogic exercise intervention plan was composed of 13-21 Asanas, 7 Pranayamas and Om-chanting, lasted 12 weeks and conducted six sessions a week. Moreover, the players were participating periodized regular soccer training also. Therefore, it was confident that there would be a significant effect of a yogic exercise intervention on the aerobic capacity (VO2max) of women soccer players.

On the other result, the mean difference between the experimental and control groups in the aerobic capacity (VO2max) after a prolonged yogic exercise intervention of 12 weeks was 0.33. The result showed non-significant difference in the aerobic capacity (VO2max) between the experimental and control groups. The result might be because of the control group players also evolved the same periodized regular soccer training except for yogic exercise intervention. They might acquire the chance to improve aerobic capacity (VO2max). There were significant improvements in the control group from pre-intervention to 12th week, 4th to 12th week, and 8th to 12th week in aerobic capacity (VO2max). Therefore, there were similar conditions to improve the same physiological parameters of both the experimental and control groups. Hence, non-significant differences might be found in the aerobic capacity (VO2max) between the experimental and control groups.

6. CONCLUSION

There are many studies on the physiological and physical features of elite level soccer players. In Mnipur, men and women soccer is so popular comparatively to other states of India. Larger number of soccer players from Manipur representing Indian National team at all. Various training means and methods are used for the improvement of soccer performance. Indeed, yogic practices can improve the physiological work efficiencies, cognitive and motor abilities of soccer players. The present study had shown the gradual increase of aerobic capacity (VO2max) of women soccer players during the course of 12 weeks yogic exercise intervention. The result of this research has shown the importance of the yogic practices in addition to the regular training to gain more endurance capacity. Hence, yogic exercise intervention may be recommended to catalyze the athletic performance and competition quality.

7. ACKNOWLEDGEMENT

The authors would like to acknowledge all the women football players, coaches, yoga trainer, assistants and officials of different clubs for making the fulfillment of the piece of research conducted.

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