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Yogic Intervention and its effect on Health-Related Physical Fitness

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Abstract: The objective of the study was to investigate the effects of yogic training on selected physiological and health-related fitness variables of taekwondo players. Specifically, the study was aimed to assess the impact of yogic training on resting pulse rate, systolic blood pressure and diastolic blood pressure in taekwondo players and to evaluate the influence of yogic training on flexibility and cardiorespiratory endurance in taekwondo players, utilizing standardized test (sit-and-reach flexibility measurements, Cooper 12 min run walk test for endurance).
Methodology: For the purpose of this study 40 (20 Experimental and 20 Control Group) taekwondo female players age ranging from 14 to 17 years were selected from Taekwondo Academy, Nalbari, Assam, India.The experimental group underwent yogic training intervention for 6 (Six Weeks) 5 (five)days in a week and the control group did not underwent any specific training. Physiological variables such as resting heart rate, systolic and diastolic blood pressure were dependent variable. And the health-related fitness variables such as flexibility, endurance was tested and measured by sit and reach test (in centimetre) and 12 minutes run/walk (in meter) respectively.
Result: the findings showed that there was a significant difference in experimental and a control group on endurance, resting heart ratesystolic blood pressure, diastolic blood pressureand whereas there was insignificant difference on flexibility between the groups respectively.
Conclusion: The findings of the study highlighted the potential benefits of yogic training for taekwondo players in improving selected physiological and health-related fitness variables. It is concluded that yogic intervention of six weeks training elicited significant improvement on $V0_2$ max, Resting heart rate, blood pressure among the female taekwondo players.

Keywords: Yogic Asanas, yoga, physiological variables, health related physical fitness variables and sports performance.

INTRODUCTION:

Physical fitness is the foundation of taekwondo movement, and physical deficiencies in Taekwondo will severely restrict technical and tactical level of play. With the improvement of taekwondo competition level, the change of the rules, as well as more attention and investment from the countries, competitions in taekwondo which put forward higher requirements on the Taekwondo athlete's fitness level, are facing increasingly fierce antagonism. Taekwondo is a traditional Korean martial art characterized by explosive, dynamic movements, and a rigorous physical demand on its practitioners. To excel in this sport, taekwondo athletes require a well-rounded approach to training, encompassing both physical conditioning and mental focus. Taekwondo belongs to the item of competition project in the same field, which is a competition with strength, speed, stamina, skill, and intelligence.
Therefore, the level of athlete's physical ability has increasingly become the key to ensure the large load exercise intensity for the competitive games in multi period. In order to make the athletes achieve good sports performance, in addition to techniques and tactical training, the fatigue recovery problem of taekwondo athletes has received more and more attention. Although the research in Taekwondo physical monitoring and training methods is still in weak phase, in training practice, the general coach attaches great importance to taekwondo player's physical ability training. Yoga, an ancient practice originating from India, offers a holistic approach to physical, mental, and spiritual well-being. It encompasses various techniques, including physical postures (asanas), breathing exercises (pranayama), meditation, and relaxation.
The integration of yogic training into the conditioning regimen of athletes has shown promising results in enhancing performance, preventing injuries, and improving overall health and well-being(Cadieux et al., 2021) (Teodora, 2011) (Akhtar et al., 2013). Previous studies have reported beneficial effects of yoga on various physiological and fitness parameters in different populations. However, limited research has specifically explored the impact of yogic training on taekwondo players. By examining the effects of yogic training on taekwondo athletes, this study aims to bridge this research gap and provide valuable insights into the potential benefits of incorporating yoga into the training regimen of

these athletes. Understanding the effects of yogic training on selected physiological and health-related fitness variables in taekwondo players can have significant implications for optimizing their performance and overall well-being.
It may uncover new avenues for enhancing training methodologies, improving physical attributes, and reducing the risk of injuries. Additionally, it may contribute to a comprehensive understanding of the potential synergistic effects between yoga and martial arts, expanding the scientific knowledge base in the field of sports science.The subsequent sections of this research article will delve into the methodology, results, and discussion, providing a comprehensive analysis of the effects of yogic training on selected physiological and health-related fitness variables of taekwondo players.

METHODOLOGY:

Methodology: For the purpose of this study 40(20 Experimental and 20 Control Group) taekwondo female players age ranging from 14 to 17 years were selected from Taekwondo Academy, Nalbari, Assam, India.The experimental group underwent yogic training intervention for 6 (Six Weeks) 5 (five)days in a week and the control group did not underwent any specific training. Physiological variables such as resting heart rate, systolic and diastolic blood pressure were dependent variable. And the health-related fitness variables such as flexibility, endurance was tested and measured by sit and reach test (in centimetre) and 12 minutes run/walk (in meter) respectively. The pre and post –test random group design was used. The descriptive statistics such as mean, standard deviation was calculated and the Analysis of covariance (ANOCVA) was used to find out the pre-test and post-test treatment effect between the experimental and control group at 0.05 level of significance by using SPSS 21 software.

RESULTS

Table No 1: Descriptive statistics of experimental and control group of Taekwondo players

Variable	Group	Mean	Std. Deviation	N
Endurance (V02 Max)	Control Group	32.00	8.50	20
	Experimental Group	33.13	8.94	20
	Total	**32.56**	**8.63**	**40**
RHR	Control Group	70.05	5.82	20
	Experimental Group	76.2	6.74	20
	Total	**73.12**	**6.95**	**40**
Systolic Blood Pressure	Experimental Group	115.25	6.20	20
	Control Group	119.85	5.76	20
	Total	**117.55**	**6.35**	**40**
Diastolic Blood Pressure	Experimental Group	72.85	5.28	20
	Control	75.20	4.99	20
	Total	**74.02**	**5.21**	**40**
Flexibility	Experimental group	32.60	5.50	20
	Control Group	34.20	5.80	20
	Total	**33.4**	**5.64**	**40**

The table no.1 showed that the mean and standard deviation score of experimental and a control group on endurance (33.13±8.50 and 32.00±8.94), resting heart rate(70.05$\pm$5.82 and 76.20$\pm$6.74) systolic blood pressure (115.25$\pm$6.20 and 119.85$\pm$5.76), diastolic blood pressure (72.85±5.28 and 75.2±4.99)and flexibility (32.60+5.50 and 34.20+5.80) respectively.

Table. No: - 2: Analysis of covariance of control and experimental group of Taekwondo player

Variables		Sum of Squares	Df	Mean Square	F	Sig.
Endurance (V02 Max)	Contrast	67.34	1	67.34	9.93	0.003
	Error	250.79	37	6.78		
Resting Heart Rate	Contrast	271.21	1	271.21	42.74	0.000
	Error	234.80	37	6.35		
Systolic Blood Pressure	Contrast	86.45	1	86.45	20.18	0.000
	Error	158.51	37	4.28		
Diastolic Blood Pressure	Contrast	58.27	1	58.27	4.47	0.041
	Error	482.88	37	13.05		
Flexibility	Contrast	9.75	1	9.75	3.69	0.062

	Error	97.74	37	2.64		

Significance f_0 (1,37) = 4.08. The mean difference is significant at the .05 level, b. Adjustment for multiple comparisons: Bonferroni.

The F tests the effect of group. This test is based on the linearly independent pair wise comparisons among the estimated marginal means.
Based on estimated marginal means Table no 2 revealed that, the F value was significant,and pair wise comparison of mean has been made with the Bonferroni correction. It may be noted that the p value associate with the mean difference between experimental group and control group.Table no 2 revealed that, there was significant difference between experimental and control group on endurance (obtained f-ratio = 9.93), resting heart rate (obtained f-ratio = 42.737), systolic blood pressure (obtain f-ratio = 20.178), diastolic blood pressure (obtained f-ratio = 4.465) which is higher than the tabulated value 4.08, required for f –ratio to be significant at 0.05 level.Table no 2 further revealed that, there was insignificant difference between experimental and control group on flexibility as obtain f-ratio is 3.69 which is less than the tabulated value is 4.08, required for f –ratio to be significant at 0.05 level.

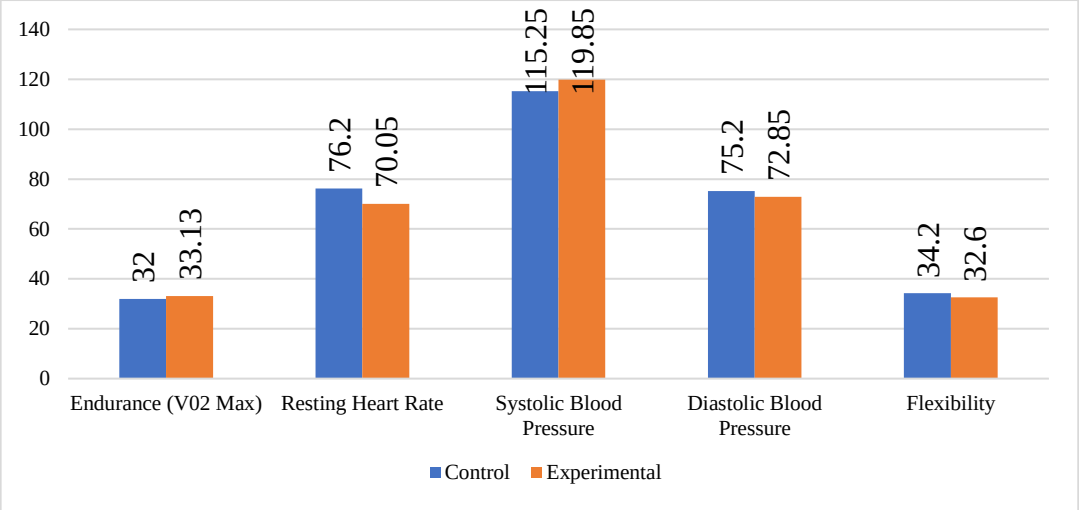
Table No: -3: Pair wise Comparisons of control and experimental group of Taekwondo players

Variable	Group		Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
						Lower Bound	Upper Bound
Endurance (V02 Max)	Control Group	Experimental Group	-2.665*	0.845	0.003	-4.377	-0.951
	Experimental Group	Control Group	2.665*	0.845	0.003	0.951	4.377
Resting Heart Rate	Experimental Group	Control Group	-5.225*	0.799	0	-6.845	-3.606
	Control Group	Experimental Group	5.225*	0.799	0	3.606	6.845
Systolic Blood Pressure	Experimental Group	Control Group	-2.972*	0.662	0	-4.313	-1.632
	Control Group	Experimental Group	2.972*	0.662	0	1.632	4.313
Diastolic Blood Pressure	Experimental Group	Control Group	-2.414*	1.142	0.041	-4.729	-0.099
	Control Group	Experimental Group	2.414*	1.142	0.041	0.099	4.729

Based on estimated marginal means
*The mean difference is significant at the .05 level.
b. Adjustment for multiple comparisons: Bonferroni.

Table no 3 revealedthat the Pair-wise comparison between the experimental and control group on endurance (calculated p value = 0.003), resting heart rate (calculated p value = 0.000), systolic blood pressure (calculated p value = 0.000), diastolic blood pressure (calculated p value = 0.041) which is less than 0.05 level of significance (P<0.05) respectively.

Figure 1: Mean score of Experimental and Control Group of Female Taekwondo Players



Discussion: Yoga is an Indian method of exercise which has been practiced over thousands of years for keeping the human body physically and mentally fit. Many research studies of the past and present reports that yogic training improves the physical fitness level as well as performance of sportsperson in various sports. Yogic practice plays an influential role in physical, physiological, psychological variables and performance in sports.Athletes in all sports find that yoga conditioning does not only protract toned muscles, abridgement, and fatigue, but also brings calm and clarity to the mind. Yoga does more for the body than just "stretch" it; it additionally develops each muscle group, including the core stabilizers; enhances proprioception (body awareness); diminishes stress; and regulates the countless movements that an athlete perform in their sport. A holistic approach to sports conditioning may eventually develop once athletes include yoga in their daily regimen (Teodora, 2011b, Polsgrove et al., 2016, Ms, 2020). The present study was aimed to investigate the effects of yogic training on selected physiological and health-related fitness variables of female taekwondo players.
Cardiorespiratory Endurance ($V0_2$ Max): In taekwondo, cardiovascular endurance plays a crucial factor in taekwondo performance, as it determines the athlete's ability to sustain high-intensity activities (Marković, 2005). A Yoga intervention training produces a significant increase in respiratory pressures and respiratory endurance. The asanasrequire deep inspiratory and expiratory efforts, as it stimulates both the inspiratory and expiratory muscles, which results in development of respiratory musculature (Sovová et al., 2015, Centre for Reviews and Dissemination (UK), 2014). It was evident from the study that the cricketers who underwent the yoga intervention training had a significant improvement in the cardiorespiratory endurance (Vaidya et al., 2021).The results by and large were in conformity with findings of Ankad et al. (2011) as it was evident that regular pranayama and yoga asana practice had a significant impact on the cardiovascular functions. The findings of our study also revealed that there was a significant improvement in the cardiovascular endurance after 6 weeks yoga training i.e., asana, pranayama, and meditation. Health fitness was improved i.e., heart, lungs, and cardiac muscles due to cardiovascular endurance activity. It also indicates that yogic training positively influenced cardiovascular endurance in the women taekwondo players. The improvements in maximal oxygen uptake (VO2 max), decreased heart rate, and blood pressure suggest enhanced cardiovascular efficiency and endurance capacity(Ray et al., 2001). These changes may be attributed to the combination of physical postures (asanas) and controlled breathing exercises (pranayama) practiced in yoga, which enhance respiratory function, oxygen uptake, and overall cardiovascular health (Divya et al., 2017, Kothari et al., 2023).

Resting Heart Rate (RHR): Singh, Bhandari, and Rana (2011) revealed that there was a significant decrease in the resting pulse rate after employing the yogic exercises. There was reduction in pulse rate and blood pressure after the yoga training in both categories. Krishan et.al (2009) also revealed that the Yogic Practices and Callisthenic Exercises had a significant reduction in restingpulse rate in secondary students. The findings of our study also revealed that there was a significant improvement in the resting pulse rate after the six weeks of yogic training (Sukumar, 2017, Vishnu, 2017, Adhikari and Sahu, 2016). It has been demonstrated that yogic exercise (pranayama), which is the modulation of breath movement, helps to produce a physiological response marked by a decrease in oxygen consumption, heart rate, and blood pressure (Jerath et al., 2006). The athlete who underwent Yoga training had a significant reduction in resting heart rate (RHR) which suggest that yoga training may have a significant impact on the resting heart rate and may further enhance the efficiency of the athlete (Goel et al., 2016, Kukreja et al., 2016, Hemalatha and Mariayya, 2015, Mishra et al., 2015, Sharma et al., 2013, Bhavanani et al., 2012, Malik et al., 2011 Begum and Chand 2013, Dhivyalaxmi and Murugavel, 2013).

Systolic Blood Pressure (SBP) & Diastolic Blood Pressure (DBP): Pramanik et al. (2009) revealed in their study that yoga training enhances the amount and length of inhibitory nerve impulses by stimulating pulmonary stretch receptors during above-tidal volume inhalation, as in the Hering Bruer reflex, triggering an inhibition of the sympathetic tone within

the muscle's circulatory system, resulting in widespread vasodilation and a decline in peripheral resistance, resulting in a decline in diastolic blood pressure.Peripheral resistance affects diastolic blood pressure, and systemic vascular resistance has been shown to be reduced by lung inflation. The cardiovascular stretch receptors that trigger this reaction cause the sympathetic tone in the pulmonary blood vessels of the skeletal muscles to recede, creating broad vasodilatation that lowers the diastolic blood pressure and decreases peripheral resistance (Jerath et al., 2006, Chauhan et al., 2017, Manna, 2017, Pandey, Arya, Kumar, and Yadav 2017). Rejinadevi and Ramesh (2017), further revealed that there was a significant change after the intervention of the yogic training.The finding of our study also revealed that there was a significant improvement of the systolic heart rate after the six weeks yogic training. Experimental group were more significant as compared to the control group in decreasing the systolic blood pressure. Therefore, these changes may have been attributed due to the yogic training intervention given to the athletes (Rajapandian and Anbalagan, 2017, Rejinadevi and Ramesh 2017, Adhikari and Sahu, 2016, Goel et al., 2016, Kukreja et al., 2016, Gadham et al., 2015, Begum and Chand, 2013, Bhavanani et al., 2012, Malik et al., 2011, Singh et al., 2011, Pramanik et al., 2009).Yoga training, induced asignificant change in the decrease in Diastolic Blood Pressure (Divya et al., 2017).Adhikari and Sahu (2016), Himashree et al. (2016) reported that yogic exercise, given on an interval with optimum stimulus may have a significant change in the diastolic blood pressure of an individual. Our findings further revealed that these changes were observed in the experimental groups that underwent yogic training. Therefore, these findings reveals that yogic training may have a significant impact on the diastolic blood pressure (Sharma et al., 2013, Singh et al., 2011, Pramanik et al., 2009, Upadhyay et al., 2008, Singh et al., 2004).

Flexibity: Flexibility makes a significant contribution to joint mobility, which significantly affects how well an athlete can perform in different levels of competition or tournament (Luttrell, 2019, Bukva et al., 2019). Polsgrove et al. (2016) elicited a significant change in the flexibility after 10 weeks of yogic training in a college athlete. Significant improvements in flexibility and balance (SS, $P > 0.05$) were observed in theknee extension ($p<0.05$), hip extension ($P<0.05$), shoulder flexion ($P<0.05$) and knee flexion ($P<0.05$) among yoga intervention groups. The results by and large were in conformity with the findings the various studies(Gonçalves et al., 2011, Kongkaew et al., 2018, Ramezani et al., 2022, Mastrangelo et al., 2007) and thus justifies that physical and perceptual benefits of yoga asana practice may illicit significant improvements. Our present study was limited to 6 weeks of yogic intervention and therefore elicited negligible improvementin the flexibility.

Conclusion & Recommendation

The findings of this study highlight the potential benefits of yogic training for taekwondo players in improving selected physiological and health-related fitness variables. The integration of yoga into the training regimen of taekwondo athletes may lead to enhanced cardiovascular endurance, flexibility, muscular strength, body composition, muscular endurance, agility, balance, and coordination. These improvements can contribute to better performance, injury prevention, and overall well-being of taekwondo athletes.

It is important to note that individual variations may exist in response to yogic training, and factors such as training intensity, duration, and frequency should be considered when designing yoga interventions for taekwondo athletes. Future research should explore the optimal duration, frequency, and specific yoga practices that yield the most significant benefits for taekwondo players. Moreover, investigations into the long-term effects of yogic training on taekwondo or similar area of combative, team sports and individual events.

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