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To Study the Effects of Proprioception and Resistance Training to Improve Performance Level in Taekwondo Athletes

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Abstract

Introduction: Taekwondo is a dynamic form of unarmed self defense and generally focused on kicking techniques, which derived from other martial arts. A sudden kick and turn kicking (dollyeo chagi, bandae dollyeo chagietc.) are part of Taekwondo; Player can turn to speed and power to escape from the competitor kicking. Speed and accuracy are two main factors of movement of Taekwondo[2].

The term of Proprioception was first described by Sherrington (1906) as a result of his study and practical's on sensory information achieved by the central neural system through mechanoreceptors located in the ligaments, joint capsule, tendons, muscles, and skin[4].

Aim of Study: To study the effect of proprioceptive training and resistance training in Taekwondo athletes in the level of their performances & to compare their affects on players trained under both the programs and getting a plan leading to efficacy.

Methodology: A total of 30 taekwondo athletes volunteered to participate in this study after having all risk explained to them before the investigation. They were divided randomly into two groups. Proprioceptive training group (group A) and Resistance training group (group B).

Result: This chapter deals with the result of data analysis of the pre and post training scores of three outcome measures that is Agility T- test, Quickness test and Acceleration test, within group A and group B and between group A and group B. The scores were analyzed and interpreted to determine effectiveness of Proprioception and Resistance training to improve performance level of taekwondo athletes. Paired t-test was used to analyze and compare pre & post training score within the group A & group B. The Significant level is kept at probability ($p<0.05$). Unpaired t-test was used to analyze and compare post training score between group A & group B.

Conclusion: Our studyconcluded that both Proprioceptive and Resistance trainings are helpful to prevent and minimize injuries and increases the performance level in athletes.

Keywords: Taekwondo athletes; Agility T–Test; Quickness and Acceleration Tests; Proprioceptive and Resistance trainings.

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Introduction

The technique of self defense that involves the skilful application of techniques that include punching; jumping kicks, blocks, actions with hands and feet is known as Taekwondo. The word "Taekwondo" is derived from the Korean word "Tae" means "to kick"; "Kwon" implies "punching" and "Do" means "method." It has evolved by

combining many different styles of martial arts that existed in Korea[1].

Taekwondo is a dynamic form of unarmed self defense and generally focused on kicking techniques, which derived from other martial arts. A sudden kick and turn kicking (dollyeochagi, bandaedollyeochagietc.) are part of Taekwondo; Player can turn to speed and power to escape from the competitor kicking. Speed and accuracy are two main factors of movement of Taekwondo. The features such as high speed, returns and kicks adore Taekwondo with uniqueness[2].

Taekwondo is practiced in over 206 countries and is a national sport of South Korea.Taekwondo is played at various levels of martial art competitions held all over the world. Taekwondo competitions have weight and age criteria regarding the selection of competitors to face one another in a match with high sports spirit[3].

The term of Proprioception was first described by Sherrington (1906) as a result of his study and practical's on sensory information achieved by the central neural system through mechanoreceptors located in the ligaments, joint capsule, tendons, muscles, and skin[4].

Fig. 1.1: Movements and Core Stability.

Taekwondo combines movement and the balance. Important balance for athletes is the dynamic balance which is required for giving a kick. Body is exposed to an exterior load; the centre of gravity always changes and generally increases in dynamic balance. The feet are used as the most important factor in keeping balance[5].

Core stability is required for successful execution of sports skills; a functionally based program should include resistance exercises that involve a destabilizing component. In recent years, fitness professionals have increasingly emphasized core stability exercises in sports conditioning programs[6]. (Fig.1.1)

Resistance training program has gained great popularity in recent years. It acts as an integral part of a total strength and conditioning program for the enhancement of athletic performance and also prescribed by many major health organizations, recreational and clinical communities for improving health, fitness and also in rehabilitation[7].

Injury Incidence

Practicing taekwondo may cause various types of injuries because it involves intense full-contact sparring. Active participation in sport is generally recognized as positive, but participation inany type of sports always has the possibility of injury[8 & 9].

Etiology

Damage to this Proprioception system is considered to be the main reason for the condition of functional instability. Proprioception isthe sensory feedback that contributes to postural equilibrium, muscle sense &joint stability. Proprioceptors are located in the skin, muscles, tendons, ligaments, and joint capsules. The lack of proprioceptive feedback caused by injuries may lead to excessive or unsuitable loading of a joint. It is one of the factors that lead to progressive degeneration of the joint and continued deficits in joint dynamics, balance, and coordination. The rate of injuries due to kicks including high level jumps is actually exhibiting an increasing trend. In general, training methods, issue related to physique, lack

of flexibility improper surface, and imbalance of muscle strength. Proprioceptive senses play an important role in maintaining joint stability[10].

Aim of Study

To study the effect of proprioceptive training and resistance training in Taekwondo athletes in the level of their performances & to compare their affects on players trained under both the programs and getting a plan leading to efficacy.

Need of Study

Sports are a vital enzyme for sustainability of human immunology. Injuries and lack of proper guidance hinders Indian sports to flourish to its fullest. Athlete can also understand their muscular movements better which involve use of ligaments and tendons which also may lead to injuries; this study will help Sports Physiotherapist and Taekwondo athlete to Prevent, understand and overcome from injury.

Research Hypothesis

Experimental Hypothesis

Proprioception and resistance training will be effective in taekwondo athletes.

Null Hypothesis

Proprioception and resistance training may or may not be effective in taekwondo athletes

Review of Literature

Shirley S.M. Fong, (2012) et.al. in this study aimed to evaluate the effects of three months of taekwondo (TKD) training on the sensory organization and standing balance of children with DCD. There was significant difference after three months of TKD training. And the result after three months of daily TKD training can improve sensory organization and standing balance for children with DCD. Clinicians can suggest TKD as a therapeutic leisure activity for this population[11].

Shirley S.M. Fong and Gabriel Y.F. Ng (2012) et. al. this study has group (a) compare the balance performance between adolescent TKD practitioners at different levels of expertise with nonpractitioners and (b) determine the sensory system(s) that contributed to the balance function in adolescents with and with-out TKD training. There was no significant difference in the somatosensory ratio among the 3 groups. They conclude that adolescents undertaking TKD raining may have better balance performance than untrained subjects[12].

G. Pons van Dijk(2013) et.al. in this study they concluded that balance deteriorates with age, and may eventually lead to falling accidents which may threaten independent living. As Taekwondo contains various highly dynamic movement patterns, Taekwondo practice may sustain or improve balance. In conclusion, data suggest that age-adapted Taekwondo training improves various aspects of balance control in healthy people over the age of 40[13].

SihyunYoo, Sang-Kyoon Park, Sukhoon Yoon (2018) et.al. in this study it was found that both Proprioception training and lower-extremity muscle Strength training improved athletic performance and raised the skill level of athletes with regard to maintaining the Taekwondo crane stance. Therefore, applying these training methods into Taekwondo training programs may have a positive effect on improving the competitive performance of Taekwondo athletes. In particular, the findings confirmed that conscious effort to perform the stance with load being applied to the forefoot area was related to maintenance of balance when performing the crane stance on one leg[14].

Top Elif, Akıl Mustafa (2018) et. al. the present study investigated that effects of the taekwondo training given to the children on their strength-agility and body coordination levels. The experimental groups of both boys and girls took a standardized group exercise program led by the taekwondo coaches, which lasted for three times a week in 12 weeks, while control groups of both boys and girls did not take any training. It was concluded that a 12-week taekwondo training given to the children in the 7-10 age group has increased the body coordination and strength-agility levels of the girls and boys[15].

Mahmut Alpha, (2018)et.al. the purpose of this study is to examine and compare the acute effects of static stretching (SS) and dynamic stretching (DS) on the knee and ankle flexor and extensor concentric (CON) Isokinetic strength in well-trained male taekwondo athletes. These findings suggest that in well-trained taekwondo athletes who are accustomed to static or dynamic movement actions may be less susceptible to stretching-induced strength deficit. Whether this conclusion may be extended to other sporting events requires further research[16].

Manolya Akin, InciKesilmi, (2020)et. al.reached to conclusion that, Important and necessary strength in body balance required in taekwondo is practiced with different techniques in the literature. The first two weeks of strength gain is affected by

neuromuscular muscle harmony. Therefore, the balance development that occurs in the strength training is important. Traditional strength exercise involves training with 80% of a repetitive maximal force[17].

MinSooJeon, (2020) et.al.the purpose of this study was to analyze the difference in body composition among athletes during different stages of their career Forty taekwondo athletes and 10 non-athletes. The bone mineral density of upper and lower limbs was higher among university athletes of both sexes than in high school athletes. The lean body mass of male athletes in the university was higher than in high school male athletes. By contrast, in case of females, the opposite results were obtained for the upper and lower limbs. Elucidation of the body composition according to career and sex of taekwondo athlete is worthwhile[18].

Avinash Kumar Boyat, (2020) et.al. did study on effects of a combined training program on explosive strength development in adolescents, Taekwondo players. The experimental group underwent resistance training program, followed by plyometrics training program 3 days in a week for 6 weeks. The participants were assessed before and after 6 weeks of training program for upper and lower extremities explosive strength.The results of the present study support the use of combined resistance and plyometric training program to improve the upper and lower body explosive strength level in Indian Taekwondo players. The study shows the use of combined resistance and plyometrics training program can improve the upper and lower body explosive strength level in Indian Taekwondo players[19].

FallahiFarrash F, (2020) et. al.this study aimed to investigate the effect of eight-week functional training on soft surfaces on the balance and electromyography activity of the muscles of female taekwondo fighters. This study showed that functional taekwondo training on soft surfaces was able to increase the balance of athletes and augment the feed-forward electrical activity of medial Gastrocnemius muscle. Therefore, it seems that these exercises can be used to prevent ankle injuries in these athletes[20].

Methodology

Study Design

The 30 subject selected by Simple random sampling. 30 athletes of taekwondo player who were willing to take participate after a written consent. It was a pre and post- test experimental study and the consent to carry out study was granted by Institutional ethical clearance committee. 30 taekwondo athletes with age group 17-25 were taken as subject. 15 subjects were included in group A and 15 subjects were included in group B according to inclusion and exclusion criteria. The study was done at Ultimate fitness center of Taekwondo and sports Roorkee, UK.

The subject was selected according to Inclusion Criteria and exclusion criteria. The inclusion criteria are An Age average group of 17 to 25, Taekwondo athletes willing to participate in study, Gender - Male and Female and Competitive level - District, State, National.The Exclusion criteria-Athletes withpervious history of any injuries. Participants were excluded if they had a lower extremity injury, vestibular problems and visual problems. Exclusions were assessed by questioning the participants. Subjects were instructed to refrain from any exercise before test.Outcome Measures: Agility T–Test and Quickness And Acceleration Tests. Material Used:Medicine ball, Balance Board, Weights, Resistance band, Bolster, Tennis ball and Bosu ball.

Procedure

A total of 30 taekwondo athletes volunteered to participate in this study after having all risk explained to them before the investigation. They were divided randomly into two groups. Proprioceptive training group (group A) and Resistance training group (group B).

After receiving a detailed explanation of study's benefit and risk, all subjects signed an informed consent documents that was approved by local ethics committee.

To evaluate the effect of Proprioception training and Resistance training over the agility, quickness, and acceleration, we applied a testing procedure that included measurements of the agility, quickness, and acceleration. Subject's height, weight and age were recorded of both group A & B. T test was used to evaluate agility of the subjects, 5 meters test was used to evaluate quickness of the subject, and 15 meters test was used to evaluate the acceleration. Each subject was familiarized with the testing procedures prior to data collection. Testing was conducted before and after 8weeks.

The 60-minute training sessions were completed 4 times per week over a period of 8 weeks. Warm-up exercises were performed as stretching during a 10-minute period. Warm-up exercises consisted of

neck tilts, neck rotations, neck stretch, triceps stretch, shoulder stretch, torsorotations, chest expansions, side arm raises, arm rotations, hip rotations, knee circles, toe touches, hops on the spot, and side to side hops. Each exercise was performed 10 times. These exercises focused primarily on some large muscle groups and the joints of neck, shoulders, hips, knees and lower back.

Group-A: Proprioceptive Training Group no. of Athletes - 15 (Randomly Selected) Session Duration - 60 Minutes, 4 Times A Week For 8 Weeks

Table 4.1: 8 Week Proprioceptive Training Program.

No.	Exercise
1 Week	1, 2, 3, 4
2 Week	2, 5, 6, 7, 8, 9
3 Week	3, 10, 11, 12, 13
4 Week	1, 14, 15, 16, 17, 18
5 Week	2, 1, 2, 5,6
6 Week	3, 3, 4, 7, 8, 9
7 Week	1, 10, 11, 14, 15
8 Week	2, 12, 13, 16, 17, 18

Table 4.2: Exercise Used During Proprioceptive Training

On the Floor	A Pair on the Floor	On Balance Board	A Pair on Balance Board
Exercise 1 One legged stance with theknee flexed. Step out on the other leg with the knee flexed and keep balance for 60 seconds. Repeat 3 sets.	Exercise 5 One legged stance with the knee flexed. Throw and catch under a ball to each other while maintaining Balance for 60 seconds. Repeat 3 sets	Exercise 10 One legged stance with the Knee flexed. Step out on the other leg with the knee flexed and keep balance for 60 seconds. Repeat 3 sets.	Exercise 14 One legged stance with the knee flexed. Throw and catch under a ball to each other while maintaining balance for 60 seconds. Repeat 3 sets.
Exercise 2 One legged stance with thehip and the knee flexed. Step out on the other legwith the hip and th0e kneeflexed, and keep balancefor 60 seconds. Repeat 3sets.	Exercise 6 One legged stance with the knee flexed Throw and catch over a ball to each other while maintainingbalance for 60 seconds. Repeat 3 sets.	Exercise 11 One legged stance with thehip and the knee flexed. Step out on the other leg with the hip and the kneeflexed, and keep balancefor 60 seconds. Repeat 3sets.	Exercise 15 One legged stance with the knee flexed. Throw and catch over a ballto each other while maintaining balance for 60 seconds. Repeat 3 sets.
Exercise 3 One legged stance with theknee flexed. Throw andcatch a ball over head alonewhile maintaining balancefor 60 seconds. Repeat 3sets.	Exercise 7 One legged stance with the knee flexed. Throw and catch one hand under a ball to each other while maintaining balance for 60seconds. Repeat 3 sets.	Exercise 12 One legged stance with theknee flexed. Throw andcatch a ball over head alonewhile maintaining balancefor 60 seconds. Repeat 3sets.	Exercise 16 One legged stance with the knee flexed. Throw and catch one hand under a ball to each other whilemaintaining balance for 60 seconds. Repeat 3 sets.
Exercise 4 One legged stance with theknee flexed. Throw andcatch a ball over the wallalone while maintainingbalance for 60 seconds. Repeat 3 sets.	Exercise 8 One legged stance with the knee flexed. Throw and catch one hand over a ball to each other while maintaining balance for 60seconds. Repeat 3 sets.	Exercise 13 One legged stance with theknee flexed. Throw andcatch a ball over the wallalone while maintainingbalance for 60 seconds. Repeat 3 sets	Exercise 17 One legged stance with the knee flexed. Throw and catch one hand over a ball to each other whilemaintaining balance for 60 seconds. Repeat 3 sets.
	Exercise 9 One legged stance with the knee flexed. Throw and catch at the same time a ball to each other while maintaining balance for 60sec. Repeat 3 sets.		Exercise 18 One legged stance with the knee flexed. Throw and catch at the same time a ball to each other whilemaintaining balance for 60 seconds. Repeat 3 sets.

Group-B: Resistance Training Group

Table 4.3: Exercises and Sets/ Rm/ Intensity.

EXERCISES	SETS/REPETITIONS/INTESITY
Half squat	3/10/50% of 1 RM
Bench press	3 / 10/ 50% of 1 RM
Knee extension	3 / 10/ 50% of 1 RM
Leg curl	3 / 10/ 50% of 1 RM
Lateral pull	3 / 10/ 50% of 1 RM
Hip adduction (exercise band)	3 / 10/Elastic Band
Hip abduction (exercise band)	3 / 10/Elastic Band

Selection of Exercise Band

Table 4.4: Selection of Elastic Band

Resistance	Colour	Pull Force (kgf) @300% extension
Medium	Green	5.5-5.9
Heavy	Pink	6.5-7.0
Strong	Purple	8.3-8.9
Extra strong	Silver	8.6-8.9

Fig. 4.4: Group A Athletes Performing Exercises.

Data Analysis

This chapter deals with the statistical analysis of three outcome measure that is Agility T-test, Quickness &Acceleration Test between group A & group B and within group A & group B.

The data was analyzed by Graph Pad Prism software version 8.3.4.

Paired t-test was used to compare pre & post training scores of Agility T-test, Quickness &AccelerationTest within group A & group B.

Unpaired t-test was used to compare post training scores of T-test, Quickness &Acceleration Test between group A & group B.

Result

This chapter deals with the result of data analysis of the pre and post training scores of three outcome measures that is Agility T- test, Quickness test and Acceleration test, within group A and group B and between group A and group B. The scores were analyzed and interpreted to determine effectiveness of Proprioception and Resistance training to improve performance level of taekwondo athletes.

Paired t-test was used to analyze and compare pre & post training score within the group A & group B.

Fig. 4.5: Group B Athletes Performing Exercises

The Significant level is kept at probability ($p<0.05$).

Unpaired t-test was used to analyze and compare post training score between group A & group B.

Analyzing Agility T-test revealed significant difference in group A post treatment, Mean & Standard error of Mean (7.773±0.0973) when compared to group A pre training, Mean and standard error of mean (8.428±0.1494). (Table 6.1& Graph 6.1& 6.2)

Analyzing Quickness revealed significant difference in group A post training Mean, standard error of Mean (1.395±0.0864) when compared to group A pre training Mean and Standard error of Mean (1.753±0.0743). (Table 6.1& Graph 6.3& 6.4)

Analyzing Acceleration revealed significant difference in group A post training Mean, standard error of Mean (5.817±0.2231) when compared to group A pre training, Mean and Standard error of Mean (7.032±0.2922). (Table 6.1& Graph 6.5& 6.6)

Outcome Measure	Pre Training		Post Training		P Value
	(Mean±Sem)	(Mean±Sd)	(Mean±Sem)	(Mean±Sd)	
Agility T-test	8.428±0.1494	8.428±0.5785	7.773±0.0973	7.773±0.3770	<0.0001
Quickness test	1.753±0.0743	1.753±0.2879	1.395±0.0864	1.395±0.3349	<0.0001
Acceleration test	7.032±0.2922	7.032±1.132	5.817±0.2231	5.817±0.8641	<0.0001

Table 6.1: Within Group Comparison of Pre And Post Training Scores of Outcome Measures in Group A

Analyzing Agility T-test revealed slight significant difference in group B post treatment, Mean & Standard error of Mean (7.875±0.0998) when compared to group B pre training, Mean and standard error of mean (8.455±0.1220). (Table 6.2 & Graph 6.7& 6.8)

Analyzing Quickness revealed slight significant difference in group B post training Mean, standard error of Mean (1.457±0.0887) when compared to group B pre training Mean and Standard error of Mean (1.795±0.0735). (Table 6.2 & Graph 6.9& 6.10)

Analyzing Acceleration revealed slight significant difference in group B post training, Mean standard error of Mean (6.219±0.2511) when compared to group B pre training, Mean and Standard error of Mean (7.406±0.3135). (Table 6.2 & Graph 6.11& 6.12)

Outcome Measure	Pre Training		Post Training		P Value
	(Mean±Sem)	(Mean±Sd)	(Mean±Sem)	(Mean±Sd)	
Agility T-test	8.455±0.1220	8.455±0.4727	7.875±0.0998	7.875±0.3869	<0.0001
Quickness test	1.795±0.0735	1.795±0.2849	1.457±0.0887	1.457±0.3437	<0.0001
Acceleration test	7.406±0.3135	7.406±1.214	6.219±0.2511	6.219±0.9725	<0.0001

Table 6.2: Within Group Comparison of Pre and Post Training Scores of Outcome Measures in Group B

Analyzing Agility T-test revealed no significant difference in group A post training, Mean and standard error of mean (7.773±0.0973) when compared to group B post training, Mean and standard error of mean (7.8735±0.09938). (Table 6.3& Graph 6.13 & 6.14)

Analyzing Quickness revealed no significant difference in group A post training, Mean and standard error of mean (1.395±0.0864) when compared to group B post training, Mean and standard error of mean (1.475±0.0887).(Table 6.3& Graph 6.15& 6.16)

Analyzing Acceleration revealed no significant between group A post training, Mean and standard error of mean (5.817±0.2231) when compared to group B post training, Mean and standard error of mean (6.291±0.2511).(Table 6.3& Graph 6.17& 6.18)

Outcome Measure	Pre Training		Post Training		P Value
	(Mean±Sem)	(Mean±Sd)	(Mean±Sem)	(Mean±Sd)	
Agility T-test	7.773±0.973	7.773±0.3770	7.875±0.0998	7.875±0.3869	0.4706
Quickness test	1.395±0.0864	1.395±0.3349	1.457±0.0887	1.457±0.3437	0.6207
Acceleration test	5.817±0.2231	5.817±0.8641	6.219±0.2511	6.219±0.9725	0.2407

Table 6.3: Comparison Between Group A and B Post Training Scores of Outcome Measures.

Analyzing and comparing both group's pre and post training scores, although both groups shows significant difference within pre and post training scores and there is no significant difference between the trainings of both groups but group A i.e. Proprioception training group shows more significant improvement in performance level of Taekwondo athletes.

Therefore results suggest that after 8 weeks of Proprioceptive training and Resistance training, both groups shows significant improvement in performance level but Proprioceptive training shows slightly more significant improvement in Taekwondo athletes.

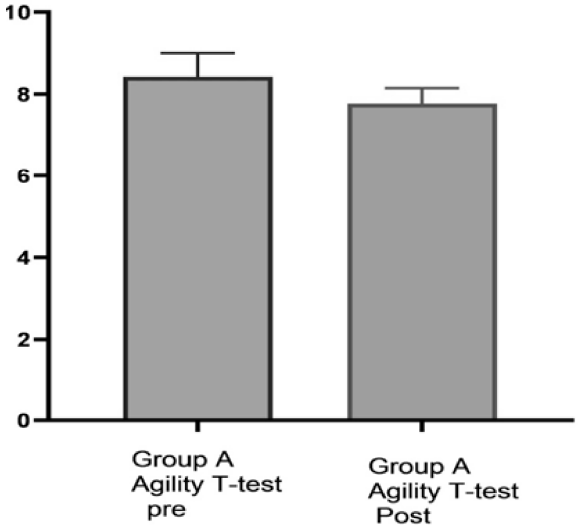

Fig. 6.1: Comparison of Agility T-Test Pre & Post Training Scores of Group A (Mean & Sd).

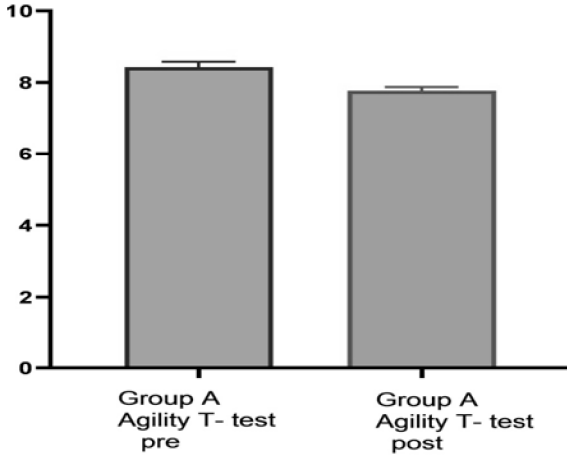

Fig. 6.2: Comparison of Agility T-Test Pre & Post Training Scores of Group A (Mean & Sem).

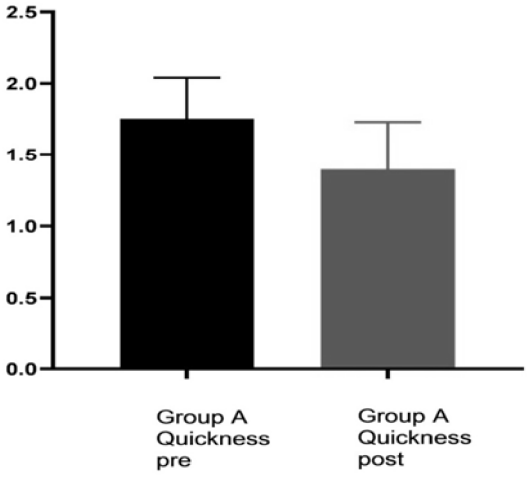

Fig. 6.3: Comparison of Quickness Pre & Post Training Scores of Group A (Mean & Sd).

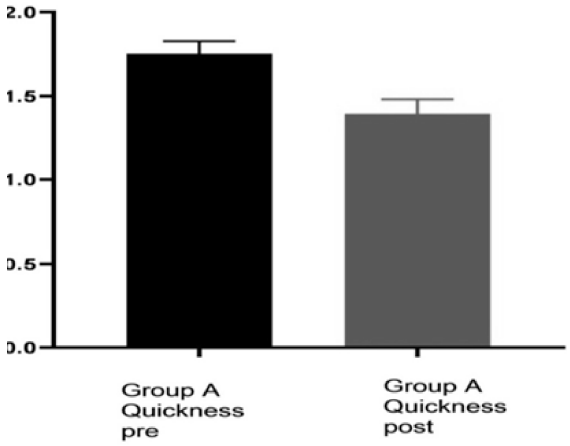

Fig. 6.4: Comparison of Quickness Pre & Post Training Scores of Group A (Mean & Sem).

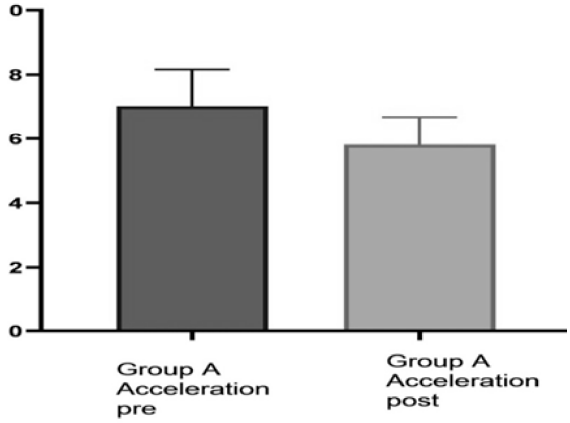

Fig. 6.5: Comparison of Acceleration Pre & Post Training Scores of Group A (Mean & Sd).

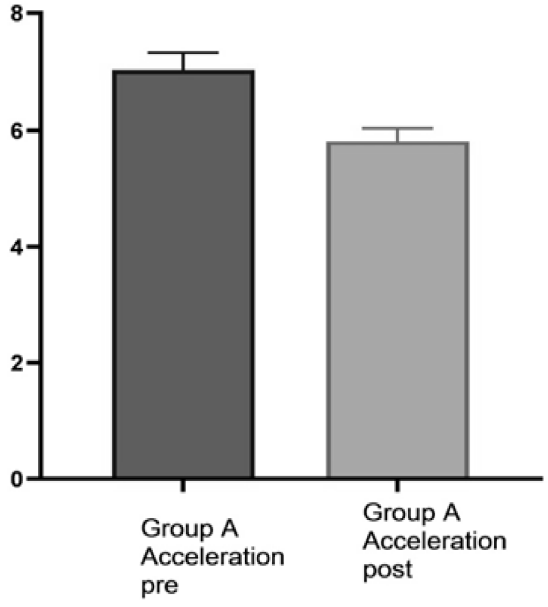

Fig. 6.6: Comparison of Acceleration Pre & Post Training Scores of Group A & B (Mean And Sem).

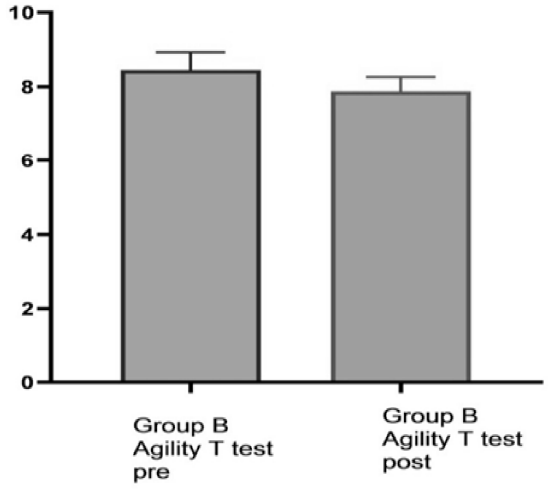

Fig. 6.7: Comparison of Agility T-Test Pre & Post Training Scores of Group B (Mean & Sd).

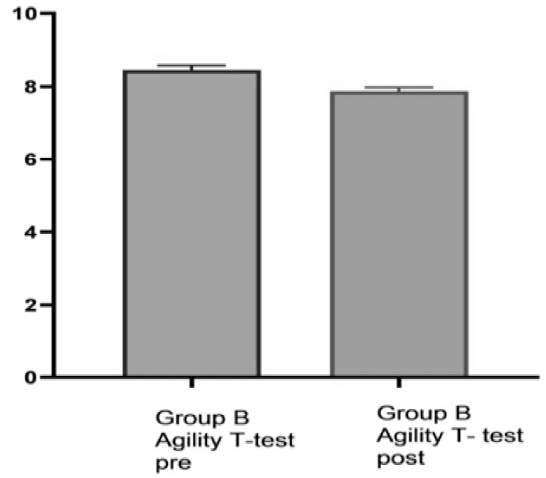

Fig. 6.8: Comparison of Agility T-Test Pre & Post Training Scores of Group B (Mean & Sem).

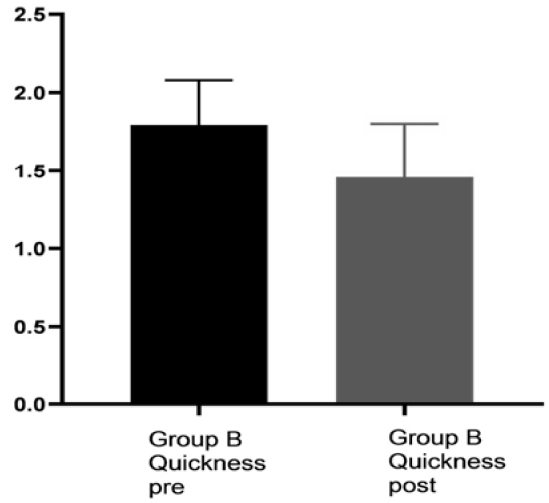

Fig. 6.9: Comparison of Quickness Pre & Post Training Scores of Group B (Mean & Sd).

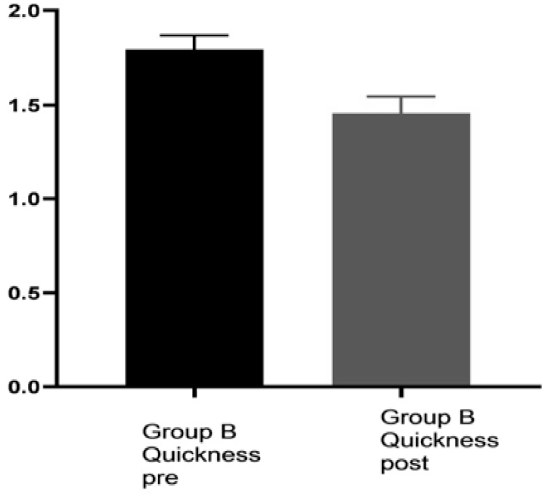

Fig. 6.10: Comparison of Quickness Pre & Post Training Scores of Group B (Mean & Sem).

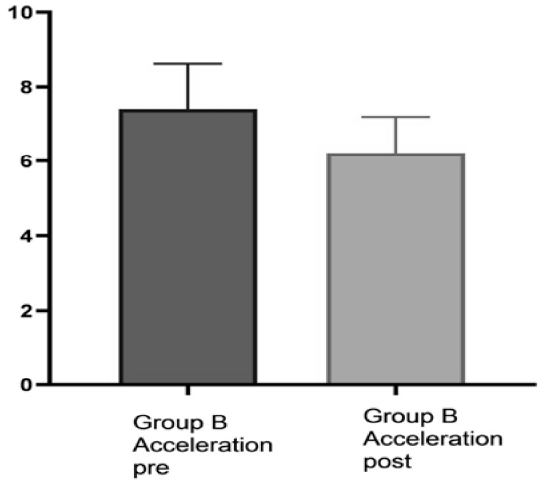

Fig. 6.11: Comparison of Acceleration Pre & Post Training Scores of Group B (Mean & Sd).

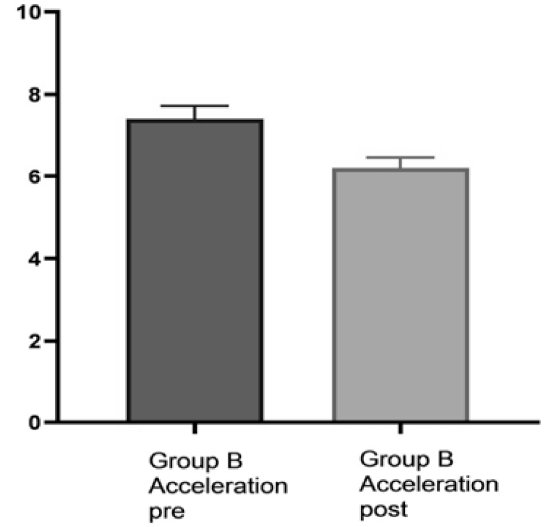

Fig. 6.12: Comparison of Acceleration Pre & Post Training Scores of Group B (Mean & Sem).

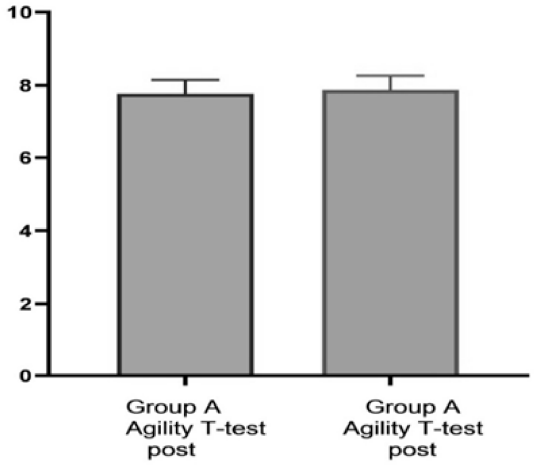

Fig. 6.13: Comparison of Agility T-Test Post Training Scores of Group A (Mean & Sd).

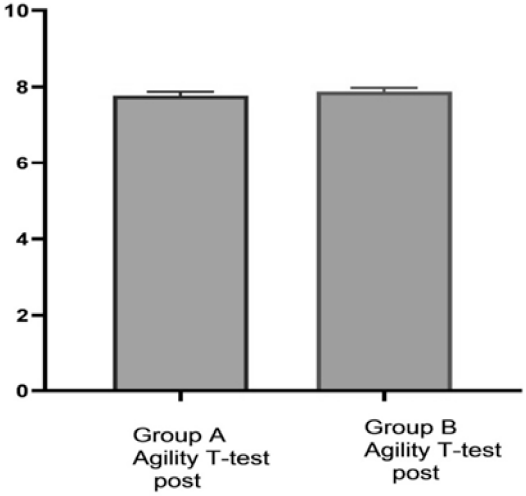

Fig. 6.14: Comparison of Agility T-Test Post Training Scores of Group A & B (Mean & Sem).

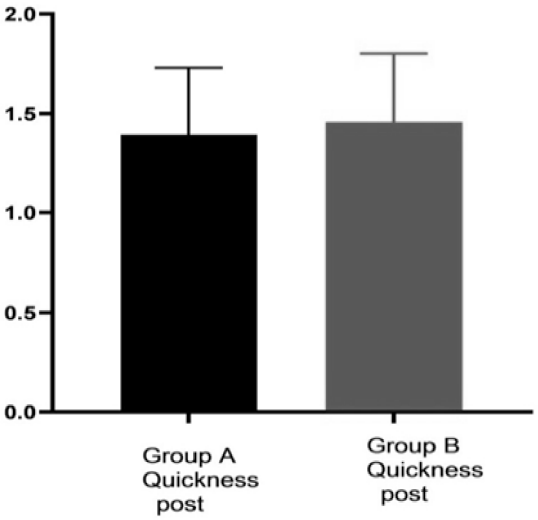

Fig. 6.15: Comparison of Quickness Post Training Scores of Group A & B (Mean & Sd).

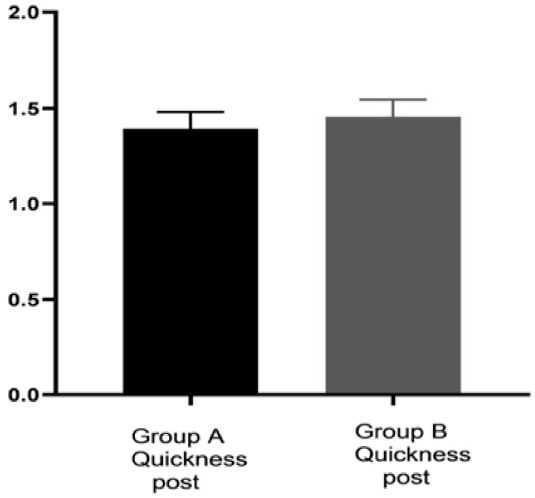

Fig. 6.16: Comparison of Quickness Post Training Scores of Group A & B (Mean & Sem).

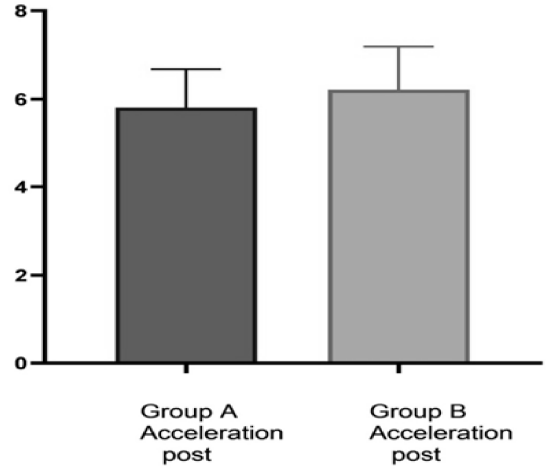

Fig. 6.17: Comparison of Acceleration Post Training Scores of Group A & B (Mean & Sd).

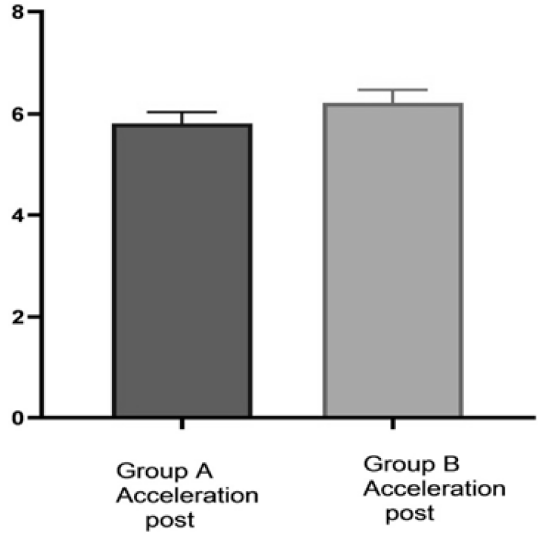

Fig. 6.18: Comparison of Acceleration Post Training Scores of Group A & B (Mean & Sem).

Discussion

This study aim to provide guidance with improvement of performance level and injuries prevention with providing Muscular strength in Taekwondo athletes and is conducted in order to investigate the effect of 8 week Proprioceptive training (Neuromuscular training) and Resistance training (strength training) to improve the performance level in Taekwondo athletes with maximal injury prevention . Quickness, Acceleration, Agility, Balance, and Stamina with powerful muscular strength is required in all sports so, it is very important to focus on these aspects.

The term Taekwondo is described as a Martial Art that uses Kicks and Punches in synchronized way concurrently and by performing specific techniques of kicks and punches with high speed, most of the skills used in Taekwondo are dependent on kicking techniques because kicks are more effective then punches to score points in competitive level

Proprioception is sense or ability to understand the position and velocity of body movements, weights and resistance. The objective of Proprioceptive training is to improve neuromuscular system for complex activities with assist of resistance training which more effective in providing strength to muscles. When performing static & dynamic activities, neural system makes body possible to maintain its balanced position and reach information from Peripheral receptors through Afferent-Efferent ways. Proprioceptive capabilities have great effects on sportive performance.

Thus, this study provides additional support for the use of Proprioceptive training and Resistance training to improve the performance level in Taekwondo athletes.

Limitation of Study

Sample size was small that is 30 athletes and 15 in each groups

The duration of study was only 8 weeks, so further performance and long term effects could not be recorded.

Proper follow up was not done due to COVID-19 pandemic.

The study was only limited to performance level of athletes.

Future Research

Future studies are recommended to minimize these limitations in such way that larger sample sizes of both sexes that include various age groups of athletes are studied.

The duration of study can be increased.

The study can be done to see the effect in balance, strength and muscle compositions by using various outcome measures in Taekwondo athletes.

Conclusion

Our study concluded that both Proprioceptive and Resistance trainings are helpful to prevent and minimize injuries and increases the performance level in athletes. And both training methods are effective in performance level of Taekwondo athletes in terms of agility, quickness, and acceleration.

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