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EFFECT OF AGILITY TRAINING ON THE STRENGTH PERFORMANCE OF TAEKWONDO PLAYERS

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Abstract:
Purpose: This study aimed to investigate the effects of an agility training program on the strength performance of Taekwondo players.
Method: For the study, twenty male Taekwondo players (between age of 18 and 23) who had competed at the national level were chosen from Khangabok Taekwondo Academy in Manipur, India. The subject were divided into two equal groups at randomly: a control group (n = 10) and an experimental group (n = 10). The leg lift dynamometer and vertical jump tests were used to evaluate both groups' maximum and explosive strength performance before to the intervention in order to establish the baseline relevance of the chosen variables. Following the collection of pre-test data, the experimental group received agility training for six weeks, five days a week (Monday through Friday). The control group, did not receive any special training and carried on with their usual routine.
Result: It revealed that the experimental group showed significant improvements in both maximum and explosive strength compared to the control group. The mean and standard deviation of explosive strength for the experimental group were 19.84 ± 1.39 in the pre-test and 20.55 ± 1.08 in the post-test. For maximum strength, the values were 130.47± 19.67 in the pre-test and 133.73 ± 18.84 in the post-test. The significant improvements in explosive strength and maximum strength performance in the experimental group are likely attributed to the six-week agility training program, which facilitated quick physical adaptation among the Taekwondo players.

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Conclusion: This study concludes that six weeks of agility training can enhance the strength performance of Taekwondo players. Additionally, this training method has proven to significantly enhance the overall athleticism and performance of Taekwondo players, leading to better results on the field.

Keywords: Taekwondo, Agility training, Strength performance, Maximum strength, and Explosive strength.

Introduction:

Taekwondo demands a unique combination of physical qualities from its players since it blends complex footwork with high-intensity striking. In order to execute high-impact kicks, make explosive movements, and stay stable during dynamic exchanges with opponents, strength, particularly lower body strength, is essential. Another crucial Taekwondo talent that is necessary for both offensive and defensive maneuvers is agility, which is the capacity to change direction or speed while retaining control quickly.

Taekwondo is a fast-paced fighting sport that requires a unique combination of technical and physical skills, such as strength, speed, agility, and accuracy (Bridge et al., 2014). During practice, agility is the capacity to change direction quickly and effectively, and it is essential for carrying out both offensive and defensive tactics (Sheppard & Young, 2006). Taekwondo athletes' training regimens have increasingly included agility training, which frequently combines plyometric, ladder drills, cone drills, and reactive exercises. This is because it can improve movement efficiency and performance in a particular activity (Chaabène et al., 2014).

On the other hand, strength performance is equally vital for Taekwondo players, as it underpins the execution of powerful kicks, rapid movements, and the ability to withstand physical challenges during matches (Marković et al., 2007). Strength in Taekwondo is multifaceted, encompassing maximal strength, explosive strength, and endurance strength, all of which contribute to overall athletic performance (Häkkinen et al., 1985). While traditional resistance training has been the primary method for improving strength, integrating agility training into strength development programs has sparked interest due to its potential to enhance neuromuscular coordination, reactive strength, and explosive power (Young et al., 2001).

The aim of this study was to examine whether a structured agility training program could enhance strength performance in Taekwondo athletes. Specifically, the study sought to assess improvements in explosive power and lower body strength following a six-week agility training regimen.

Objectives: The objective of the present study was to investigate the effect of agility training on the strength performance of Taekwondo players.

Methods and Materials

Selection of Subjects: For this study, the researcher randomly selected 20 male Taekwondo players, aged 18 to 23, from Khangabok Taekwondo Academy, Manipur, India, who had participated in National-level competitions.

Selection of Variables:

After evaluating the feasibility of the equipment and reviewing the literature, the researcher selected the following variables:

Independent Variable: Agility Training

Dependent Variables: Maximum and Explosive strength

Criterion Measures:

The following standardized tests were selected for the study:

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Maximum Strength: It was measured by Leg lift dynamometer instrument and read in the dynamometer

Explosive Strength: The explosive strength was measured by vertical jump and recorded in inches.

Design of the Study:

This study randomly assigned subjects into two equal groups: an experimental group (n=10) and a control group (n=10). Both groups were assessed before the intervention for strength performance using the leg lift dynamometer test and the vertical jump test to determine the baseline significance of the selected variables. Following the initial tests, the experimental group participated in a supervised agility training program, while the control group received no specific training. The agility training program was conducted over six weeks, with sessions held five days a week (Monday to Friday). Each session lasted 60 minutes, with rest days on Saturday and Sunday.

Administration of Training:

The six-week agility training program consisted of five days a week (Monday through Friday) sessions. Every practice lasted sixty minutes, with Saturday and Sunday being rest days. Table 1 describes the precise agility training regimen used for the experimental group.

Table-1: SIX WEEKS AGILITY TRAINING SCHEDULE

Week	Agility Training Components	Set	Repetition
1 - 2 week	20-yard shuttle run	2	5
	30-yard T-drill squirm		
	40-yard sprint		
	40-yard backpedal- Forward		
3 - 4 week	40-yard square-carioca	3	8
	15-yard turn drill		
	Figure eights		
	Z-pattern run zigzag		
5 - 6 week	40-yard square drill-sprint	4	10
	Single-leg hop, backpedal		

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	Star drill-sprint, backpedal		
	Shuffle 5 - cones snake drill		
	180-degree turn crossover		
	Shuffle		

Note: The agility training program was conducted over six weeks, with sessions held five days a week (Monday to Friday). Each session lasted 60 minutes, with rest days on Saturday and Sunday.

Statistical Analysis

The collected data were entered into an excel sheet and statistical analysis were conducted using the IBM SPSS software (version 22.0; SPSS Inc., Chicago, IL, USA). Normality of statistical distribution was tested by using descriptive statistics, paired t-test and ANCOVA was applied to examine differences among groups. The level of significance used in the statistical analysis was 0.05.

Results

The result of the study showed that there was significant improvement of agility training program on strength performance of taekwondo players of the experimental group and control group. The descriptive analysis of pre-test and post-test of experimental and control group for explosive strength performance of taekwondo players was presented at table 2.

Table-2 : Pre-test and Post-test mean for Experimental and Control groups of Explosive Strength performance of Taekwondo players.

Variable	Group	N	Test	M	SD	df	t-value	Sig.
Explosive Strength	Experimental	10	Pre-test	19.84	1.39	9	5.18*	0.001
			Post-test	20.55	1.08			
	Control	10	Pre-test	20.38	2.07		2.83*	0.01
			Post-test	20.62	2.00			

Significant at 0.05 level of confidence** **Tabulated $t_{.05}$ (9) = 2.26

Table 2 shows that the mean and standard deviation values of explosive strength for the experimental and control groups in both pre-test and post-test assessments. In the experimental group, the pre-test mean and standard deviation were 19.84±1.39, while the post-test values were 20.55±1.08. For the control group, the pre-test mean and standard deviation were 20.38±2.07, and the post-test values were 20.62±2.00. A significant difference was found in the experimental group, with a calculated t-value of 5.18, which is higher than the table t-value of 2.26 at 9 degrees

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of freedom and a 0.05 level of significance. In the control group also showed significant difference, as the calculated t-value of 2.83 was higher than the table t-value of 2.26 at 9 degrees of freedom and a 0.05 level of confidence. The graphical representation of pre-test and post-test mean comparisons for experimental and control groups of explosive strength performance of taekwondo players was shown at figure 1.

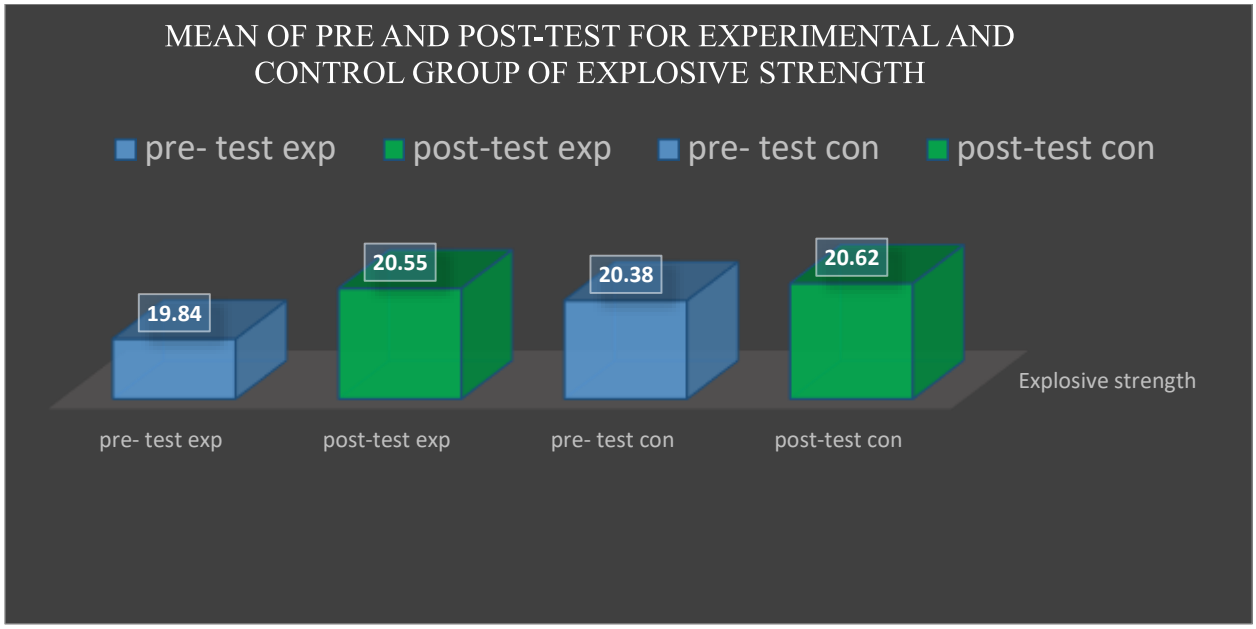

Figure1: The graphical presentation of pre and post-test for experimental and control groups on the explosive strength performance of Taekwondo players.

The result of the study showed that there was significant improvement of agility training program on maximum strength performance of taekwondo players of the experimental group and control group. The descriptive analysis of pre-test and post-test of experimental and control group for maximum strength performance of taekwondo players was presented at table 3.

Table-3: Pre-test and Post-test mean for Experimental and Control groups of Maximum Strength performance of Taekwondo players.

Variable	Group	N	Test	M	SD	df	t-value	Sig.
Maximum Strength	Experimental	10	Pre-test	130.47	19.67	9	4.16*	0.02
			Post-test	133.73	18.84			
	Control	10	Pre-test	122.29	13.84		3.07*	0.01
			Post-test	122.82	14.01			

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Significant at 0.05 level of confidence** **Tabulated $t_{.05}$ (9) = 2.26

Table 3 shows that the mean and standard deviation values of maximum strength for the experimental and control groups in both pre-test and post-test assessments. In the experimental group, the pre-test mean and standard deviation were 130.47±19.67, while the post-test values were 133.73±18.84. For the control group, the pre-test mean and standard deviation were 122.29±13.84, and the post-test values were 122.82±14.01. A significant difference was found in the experimental group, with a calculated t-value of 4.16, which is higher than the table t-value of 2.26 at 9 degrees of freedom and a 0.05 level of significance. In the control group also showed significant difference, as the calculated t-value of 3.07 was higher than the table t-value of 2.26 at 9 degrees of freedom and a 0.05 level of confidence. The graphical representation of pre-test and post-test mean comparisons for experimental and control groups of maximum strength performance of taekwondo players was shown at figure 2.

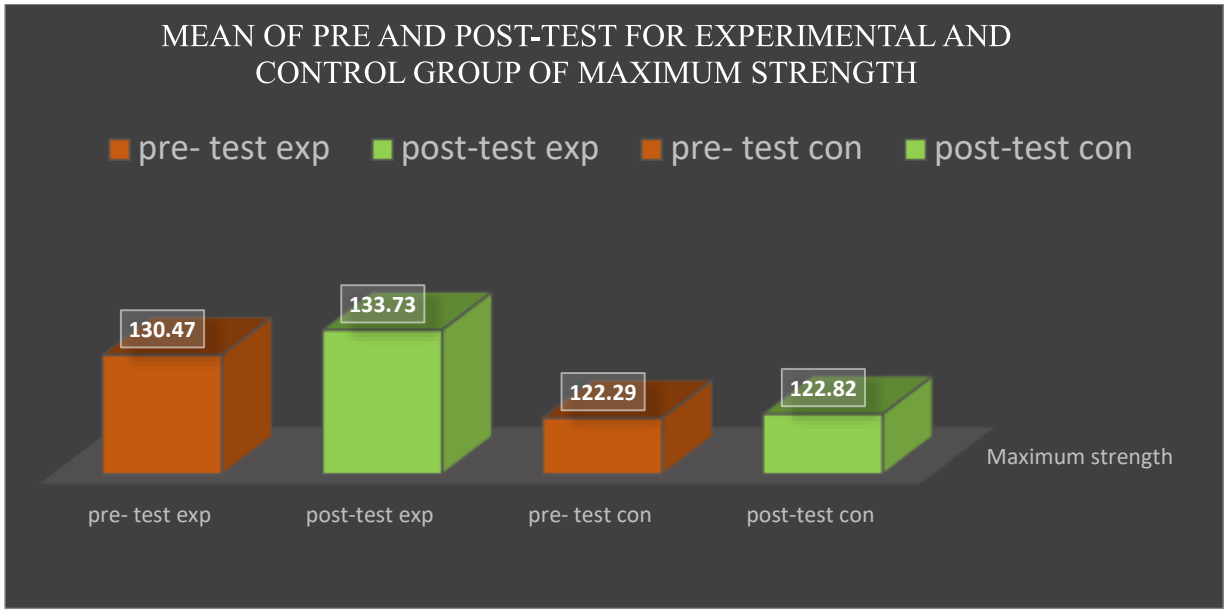

Figure2: The graphical presentation of pre and post-test for experimental and control groups on the maximum strength performance of Taekwondo players.

The analysis of co-variance (ANCOVA) of pre-test and post-test between experimental and control groups for explosive strength of taekwondo players was presented at table 4.

Table 4: Pre and Post mean comparison (ANCOVA) between experimental and control group for explosive strength of taekwondo Players.

Variable	Source	Type III sum of errors	df	Mean Square	F	Sig.
Explosive strength	Group	.457	1	.457	397*	0.00
	Error	19.547	17	1.150		
	Total	8521.770	20			

**** Significant difference at 0.05 level of confidence** **F (1, 17) =4.45 (N=10)***

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Table 4 reveals that there was found significant difference between pre-test and post-test means comparison score of experimental group and control group for explosive strength performance by analysis of co-variance (ANCOVA) as the obtained critical value of F=397* was greater than the tabulated value of F=4.45. Therefore, it was confirmed that six-week neuromuscular training program was effective to improve the explosive strength performance of taekwondo players. The analysis of co-variance (ANCOVA) of pre-test and post-test between experimental and control groups for maximum strength of taekwondo players was presented at table 5.

Table 5: Pre and Post mean comparison (ANCOVA) between experimental and control group for maximum strength of taekwondo Players.

Variable	Source	Type III sum of errors	df	Mean Square	F	Sig.
Maximum strength	Group	41.388	1	41.388	13.148*	0.002
	Error	53.514	17	3.148		
	Total	334648.12	20			

**** Significant difference at 0.05 level of confidence F (1, 17) =4.45 (N=10)***

Table 5 reveals that there was found significant difference between pre-test and post-test means comparison score of experimental group and control group for maximum strength performance by analysis of co-variance (ANCOVA) as the obtained critical value of F=13.148*was greater than the tabulated value of F=4.45. Therefore, it was confirmed that six-week neuromuscular training program was effective to improve the maximum strength performance of taekwondo players.

Discussion

For this study, the objectives of the study was to investigate the effect of agility training on the strength performance of taekwondo players. Initially, the researcher reviewed numerous studies related to the topic to determine the appropriate number of subjects and the tests to be used. A total of 20 subjects were randomly selected from Khangabok Taekwondo Academy in Manipur, all of whom had participated in national-level competitions. Their ages ranged from 18 to 23 years. These subjects were randomly divided into two groups of 10 each: the Experimental Group and the Control Group. The Experimental Group underwent a six-week agility training program conducted in the morning sessions at the Khangabok Taekwondo Academy. This training was administered for five days a week, with rest days on Saturday and Sunday. After the completion of the training program, post-test data were collected from both groups. The collected data were entered into an Excel sheet and analyzed using IBM SPSS software (version 22.0; SPSS Inc., Chicago, IL, USA). The normality of statistical distribution was tested using descriptive statistics. Differences among groups were examined using a paired t-test and ANCOVA. The level of significance for the statistical analyses was set at 0.05.

Based on the results presented, Table 2 shows the mean and standard deviation values of explosive strength for both the experimental and control groups in pre-test and post-test assessments. Significant difference was found in both the experimental group and control group. Similarly, Table 3 presents the mean and standard deviation values of maximum strength for the experimental and control groups in pre-test and post-test assessments. Again, a significant difference was observed both in the experimental group and control group. But the experimental group of both variable were highly positive significance compared to the control groups. Table 4 reveals a significant difference in explosive strength performance between pre-test and post-test mean scores for the experimental and control groups, as determined by analysis of covariance

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(ANCOVA). This confirms that the six-week agility training program effectively improved the explosive strength performance of taekwondo players. Table 5 indicates a significant difference in maximum strength performance between pre-test and post-test mean scores for the experimental and control groups, also determined by ANCOVA. This confirms that the six-week agility training program effectively improved the maximum strength performance of taekwondo players. Chaouachi et al. (2010) was conducted a study on the effect of combined strength and agility training on physical fitness performance in male Taekwondo athletes. The researcher found that agility training, when integrated with strength training, significantly enhanced lower body strength and explosiveness, key elements for Taekwondo athletes. For instance, rapid changes in direction during agility drills strengthen the stabilizing muscles and improve the coordination of muscle groups involved in Taekwondo kicks, leading to enhanced performance. Taekwondo requires a significant amount of core stability for maintaining balance during kicks and defensive movements. Agility training often emphasizes core engagement, and this has direct benefits for strength performance. A study by Khan et al. (2016) found that core stability training improves both agility and strength performance, especially in athletes involved in high-intensity sports like Taekwondo. By improving core strength and stability, agility training allows athletes to better execute powerful and controlled strikes.

Rabbani et al. (2021) demonstrated that Taekwondo athletes who engaged in agility training exhibited improvements not only in their agility performance but also in their strength-endurance capacity. The study suggested that regular agility drills improve neuromuscular efficiency, which could result in greater muscle endurance, helping Taekwondo players maintain strength over prolonged periods of competition. Agility training helps develop the neuromuscular system by challenging the body to move more dynamically and precisely. This leads to enhanced coordination and motor unit recruitment, which in turn aids in producing more forceful and accurate movements. Pang et al. (2014) found that martial artists who underwent agility-focused training had superior muscle activation patterns and were able to produce more force during combat-related movements, including kicking and striking, due to improved neuromuscular coordination. A study by Zabukovšek et al. (2016) compared the effects of strength training versus agility training on the performance of Taekwondo athletes. The findings indicated that although both strength and agility training positively affected performance, the combined approach produced the best results. Agility training was shown to enhance quick, explosive movements, while strength training improved the maximal force output of muscles. The synergy between the two forms of training allowed for improved explosive power, which is essential for Taekwondo players during dynamic, high-speed strikes.

In addition to the physical benefits, agility training also offers psychological advantages that directly impact strength performance in Taekwondo. Agility drills, which require rapid decision-making, concentration, and mental focus, sharpen the athlete's reaction time and strategic thinking during a match. Häkkinen et al. (2019) found that agility training not only improved physical performance but also enhanced cognitive abilities, such as attention and decision-making, which are essential in combat sports like Taekwondo.By training the brain to respond quickly to environmental cues, athletes can anticipate their opponent's actions and react faster, leading to more effective use of strength in dynamic situations. This mental preparedness ensures that the athlete can maintain control over their strength, applying it more effectively in fast-paced combat scenarios. In a long-term study by Sung et al. (2020), it was demonstrated that athletes who incorporated agility training into their regimen exhibited sustained improvements in both their

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strength and agility over the course of several months, highlighting the long-term benefits of this training approach. The long-term effects of agility training on strength performance are also significant. Over time, agility training leads to increased muscle coordination, enhanced force production, and greater muscular endurance, which ultimately contribute to overall performance improvements. Since Taekwondo is a sport that requires quick recovery between high-intensity movements, agility training helps athletes develop a faster recovery rate and the ability to continue exerting maximum force during extended periods of activity. Singh A et al., (2017) did the similar study, effect of a six week agility training program on performance indices of Indian taekwondo players, it also found the significance improved on the experimental group while the other group control group) had no significant changes/ decline in performance was found. Singh et al, (2024) studied six-week neuromuscular training program on the speed and explosive power performance of football players. Based on this study it was significantly improved on the speed and explosive power/strength on the athletes.

Conclusion

It is clear from the study's findings that agility training had significantly improved taekwondo players' explosive and maximum strength performance. Significant progress was made in these areas as a result of the six-week agility training program. Thus, it is quite advantageous to follow such a program in order to improve the athletic performance of taekwondo players. This training program is a great complement to the training plans for taekwondo players who want to improve their overall performance on the field because it is especially good at improving vital physical traits like explosive and maximum strength.

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Conflict of Interest

The authors and subjects in these studies declared no conflict of interest, and no financial support was received for conducting the research. This ensures that the findings are unbiased and solely driven by the pursuit of scientific knowledge and athletic improvement.

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