A Study on the Phased Training Program Development for Performance Ability Improvement of Taekwondo Demonstration

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Abstract

The purposes of this study are to develop a phased training group program and present specifically an optimal demonstration program in order to improve the performance ability of Taekwondo demonstration athletes, which were developed through deducting the determinants of demonstration performance ability of Taekwondo demonstration team. This study was conducted with the men's demonstration team that participated in the phased training group program development for an improvement in Taekwondo demonstration performance ability. This study measured the 12 people from the training group demonstration team and the 12 people from the control group demonstration team at C University, who gave written consent that they would actively participate in the study. The findings thereof were consistent with the findings of the previous studies. However, it is believed that the findings thereof were also consistent with another argument of the previous studies that the muscular improvement speed would be slower with a longer exercise period. The training group had a high degree of improvement in physical strength until the third measurement after 24 weeks. The reason hereof is that they conducted the training by adjusting the intensity and frequency gradually since they could do the basic Taekwondo training together with the physical strength training at the basic phase of program. On that account, it will be imperative to improve the exercise ability with various changes in exercise type, exercise program type and order, break time between sets and frequency.

Keywords: Demonstration, Performance Training, Optimal Program, Taekwondo

1. Introduction

Taekwondo has made significant contributions to the increased awareness of South Korea around the world for various aspects including politics, economy, society and culture. This is the outcome of enormous efforts made at national level since 1960s to develop and diffuse Taekwondo as one of the world-renowned martial art sports. Also, this can be deemed as an outcome of the ceaseless efforts of Taekwondo demonstration team, which was found for the purpose of informing Taekwondo around the world[1]. The most universal and prominent method of the training group for the promotion of Taekwondo demonstration team is to literally pass on the techniques and training group experiences of the instructors. Such method will be represented as similar techniques, standardization of training groups, etc. In the end, it will bring about a result that training method will be determined within the value system and experiences of an instructor[2]. Moreover, there are many cases in which the training group instruction based on the personal experiences of an instructor brings about a negative result.

Thus, it is critical to diffuse the application approach of training group[3]. The most universal and prominent method of the training group for the promotion of Taekwondo demonstration team is to literally pass on the techniques and training group experiences of the instructors. Such method will be represented as similar techniques, standardization of training groups, etc. In the end, it will bring about a result that training method will be determined within the value system and experiences of an instructor[2]. It would be imperative to develop the technical and scientific aspects for an improvement in professional physical strength based on basic physical strength in accordance with different exercise types of competition athletes and demonstration athletes in Taekwondo. Also, it would be imperative to improve the customized professional physical strength for the characteristics and weight class of each individual athlete[4]. As for the currently available studies on the phased training group program for the Taekwondo athletes in South Korea, the programs for competition athletes include "Development of training group program model for an improvement in athletic performance of Taekwondo" of[2], "Cyclization of training program for an improvement in athletic performance of Taekwondo" of[5] and "An effect of application of Periodization training program on the aerobic and anaerobic ability of Taekwondo athletes" of[6]. However, there has not been any study yet that focused on the professional training group program for Taekwondo demonstration team.

The purposes of this study are to develop a phased training group program and present specifically an optimal demonstration program in order to improve the performance ability of Taekwondo demonstration athletes, which were developed through deducting the determinants of demonstration performance ability of Taekwondo demonstration team.

2. Methods

2.1 Subjects
This study was conducted with the men's demonstration team that participated in the phased training group program development for an improvement in Taekwondo demonstration performance ability. This study measured the 12 people from the training group demonstration team and the 12 people from the control group demonstration team at C University, who gave written consent that they would actively participate in the study. The physical characteristics of the study subjects are as shown in Table 1.

2.2 Configuration Approach of Phased Training Group Program
The phased training group program for an improvement in Taekwondo demonstration performance ability was configured based on the data of Institute of Sports Science (2010). The exercise used in the specific main motions only for the demonstration team was planned based on the data of the previous studies. The training period and exercise of phased training group are as show in Table 2 and Table 3.

Table 1. Physical Characteristics of Subjects (M±SD)

Classification	Subject (n)	Age (year)	Height (cm)	Weight (kg)	Force (Degree)	Experience (year)
Training Group	12	20.3	174.2±5.6	66.5±6.7	3.1±0.8	7.3±2.7
Control Group	10	20	175.6±4.0	69.9±11.7	3.9±0.3	7.5±0.9

Table 2. Training Period for Each Phase

Classification	Training	Taekwondo Demonstration Training	Period	Frequency	Exercise
First Phase of Basic Physical Strength	Circuit Training: Full Body Workout	Basic Training (Sitting Position)	4 Weeks	3 Times/Week	6~9
Second Phase of Basic Physical Strength	Circuit/Weight Training Full Body Workout: Intensity Load	Group Training, Basic Technique Training	8 Weeks	3 Times/Week	6~9
First Phase of Professional Physical Strength	Complex Training Plyometric/Weight	Kicking Technique Training	8 Weeks	3 Times/Week	6~9
Second Phase of Professional Physical Strength	Muscular Endurance Weight Training	Advanced Kicking Training	4 Weeks	2 Times/Week	4~6

Institute of Sports Science (2010)

Table 3. Training Exercise for Each Phase

First Phase of Basic Physical Strength (1 to 2 Weeks)	First Phase of Basic Physical Strength (3 to 4 Weeks)	Type and Exercise Intensity	Program Design
Push-up	T-Push-up	Period and Frequency	3 Times a Week for 4 Weeks
Sit-up / V-Sits	Leg Kick	Load (% 1RM)	40 to 60 percent
Burpee test	Side step	Number of Exercises	6 to 9
Back Extension	Arm-Leg Extension	Number of Repetition for Each Set	20 to 30 Times
Lunge	Lunge, Side Lunge		3 to 5 Sets
Squat	Squat Jump	Number of Sets for Each Exercise	30 to 50 Minutes
Ankle Joint Dorsiflexion	Ankle Joint Dorsiflexion	Entire Duration	3 to 5 Minutes Table 4. Exercise and configuration of training
Bench Stepping	Bench Stepping	Break Time Interval between Sets	
PT(Physical Training)	PT(Physical Training)		

2.3 Exercise and Configuration of Training

As for the first phase of basic physical strength, it has a total of 9 exercises in accordance with the basic guideline of training. The study subjects conducted the exercise hereof 20 to 30 times with the exception of specific exercises. The program was configured in the way that would allow the whole body to do exercise to develop fixators rather than particular muscles used in the main motion. The detailed exercises are as shown in Table 4.

Table 4. Exercise and Configuration of Training

Order	First Phase of Basic Physical Strength (1 to 2 Weeks)	First Phase of Basic Physical Strength (3 to 4 Weeks)
1	Push-up	T-Push-up
2	Sit-up / V-Sits	Leg Kick
3	Burpee test	Side step
4	Back Extension	Arm-Leg Extension
5	Lunge	Lunge, Side Lunge
6	Squat	Squat Jump
7	Ankle Joint Dorsiflexion	Ankle Joint Dorsiflexion
8	Bench Stepping	Bench Stepping
9	PT (Physical Training)	PT (Physical Training)

2.4 Assessment of Physical Fitness

This study conducted the physical strength measurement test for a total of 3 times during the period of phased training group program with the demonstration team of C University (the training group for 2 to 4 hours a day) who participated in the phased training group program for an improvement in Taekwondo demonstration performance ability and the demonstration team of J University that was included in the control group. The physical strength test was conducted on the basis of "National Physical Strength Status Survey" of Institute of Sports Science. The results of physical strength test for each factor are as shown in Table 5.

Table 5. Measurement of Physical Fitness

Classification	Factor	Test	Measuring Instrument
Physical Fitness	Power of Upper Extremity	Throwing Basketball	Basketball
	Muscular Endurance	Sit-up	Stop watch
	Agility	Side Step Test	Stop watch
	Flexibility	Bending Upper Body in a Sitting Position	Tapeline
	Balance	Standing on One Leg with Eyes Closed	Stop watch

2.5 Data Analysis

The data obtained from this study was processed using SPSS 12.0 statistical program. The Mean (M) and Standard Deviation (SD) of each variable were calculated. To examine the difference in the variables (third measurement) in accordance with the difference and duration of the training group and control group, this study conducted two-way repeated ANOVA.

The study conducted the post-verification through Bonferroni and set all the statistical significance levels at $p < .05$ if there was a significant difference for each period as a result of variance analysis.

3. Results

3.1 Factor of Physical Fitness

This study explained the result of mean physical strength measurement of the demonstration team and control group demonstration team of the training group for 24 weeks in order to develop a phased training group program for an improvement in Taekwondo demonstration performance ability.

3.1.1 Analysis on the Difference in Power of Upper Extremity

The results of mean physical strength measurement for the quick adaptation of upper extremity of control group and training group are as shown in Table 6.

Table 6. Results of Measurement of Power of Lower Extremity

	Measurement Trial of Physical Strength for Quick Adaptation of Upper Extremity (cm) (M±SM)		
	First Trial	Second Trial	Third Trial
Control Group	13.70 ± 2.14	14.27 ± 1.30	15.01 ± 1.63
Training Group	13.32 ± 2.06	14.05 ± 1.60	14.65 ± 1.96

Table 6 shows the result of repeated measures ANOVA to examine the difference in the time (first trial, second trial and third trial) and the groups (control group and training group) that had a different training group as to the throwing basketball for the measurement of power of upper extremity. There was no significant difference between the groups. However, there was a significant difference (p<.05) in accordance with the measurement time and also there was no interaction effect between the group and time. As a result of conducting the post-verification through Bonferroni since the power of upper extremity had a significant difference, the control group had a higher value in the third trial (M=15.01) than the first trial (M=13.70). The training group also had a higher value in the third trial (M=14.65) than the first trial (M=13.32).

Table 7. Result of Variance Analysis on the Repeated Measurement of Quick Adaptation of Upper Extremity

Source of Variation	SS	DF	MS	F	Sign
Between Groups					
Groups (G)	1.673	1	1.673	.191	.667
Error	175.147	20	8.757		
Within Groups					
Time (T)	19.021	2	9.819	16.955	.001
G×T	.085	2	.044	.076	.922
Error	22.438	40	.579		

3.1.2 Analysis on the Difference in Muscular Endurance

The results of mean physical strength measurement for the muscular endurance of control group and training group are as shown in Table 8.

Table 8. Results of Measurement of Muscular Endurance

	Measurement Trial of Physical Strength for Muscular Endurance (cm) (M±SM)		
	First Trial	Second Trial	Third Trial
Control Group	62.30 ± 14.83	67.20 ± 16.27	67.30 ± 15.22
Training Group	67.67 ± 15.56	83.67 ± 18.48	90.17 ± 13.53

The study conducted repeated measures ANOVA to examine the difference in the time (first trial, second trial and third trial) and the groups (control group and training group) that had a different training group as to the sit-up for the measurement of muscular endurance. There was a significant difference between the groups (p<.05). Also, there was a significant difference (p<.05) in accordance with the measurement time. There was an interaction effect between the group and time. As a result of conducting the post-verification through Bonferroni since the muscular endurance had a significant difference, the training group (M=80.5) had a higher value than the control group (M=65.6). The training group had a higher value in the second trial (M=15.01) than the first trial (M=13.70). The training group also had a higher value in the third trial (M=14.65) than the first trial (M=13.32).

3.1.3 Analysis on the Difference in Agility

The results of mean physical strength measurement for the agility of control group and training group are as shown in Table 10.

Table 9. Result of Variance Analysis on the Repeated Measurement of Muscular Endurance

Source of Variation	SS	DF	MS	F	Sign
Between Groups					
Groups (G)	3632.891	1	3632.891	5.555	.029
Error	13080.200	20	654.010		
Within Groups					
Time (T)	2248.400	2	1236.929	25.057	.001
G×T	855.309	2	470.538	9.532	.001
Error	1794.600	40	49.364		

Table 10. Results of Measurement of Agility

	Measurement Trial of Physical Strength for Agility (Total) (M±SM)		
	First Trial	Second Trial	Third Trial
Control Group	18.80 ± 1.93	22.10 ± 2.96	20.70 ± 2.54
Training Group	20.83 ± 2.76	23.00 ± 2.22	26.08 ± 2.02

The study conducted repeated measures ANOVA to examine the difference in the time (first trial, second trial and third trial) and the groups (control group and training group) that had a different training group as to the side step for the measurement of agility. There was a significant difference between the groups (p<.05). Also, there was a significant difference (p<.05) in accordance with the measurement time (p<.05). There was an interaction effect between the group and time. As a result of conducting the post-verification through Bonferroni since the agility had a significant difference, the training group had a higher mean value (M=23.31) than the control group (M=20.53). The control group had a higher value in the first trial (M=18.8) than the second trial (M=22.1). The training group had a higher value in the second trial (M=23.00) than the first trial (M=20.83). The training group also had a higher value in the third trial (M=26.08)) than the second trial (M=23.00). Lastly, the training group had a higher value in the third trial (M=26.08) than the first trial (M=20.83).

3.1.4 Analysis on the Difference in Flexibility

The results of mean physical strength measurement for the flexibility of control group and training group are as shown in Table 12.

Table 11. Result of Variance Analysis on the Repeated Measurement of Agility

Source of Variation	SS	DF	MS	F	Sign
Between Groups					
Groups (G)	125.758	1	125.758	10.728	.004
Error	234.439	20	11.722		
Within Groups					
Time (T)	152.437	2	106.348	25.675	.001
G×T	59.286	2	41.361	9.985	.001
Error	118.744	40	4.142		

Table 12. Results of Measurement of Flexibility

	Measurement Trial of Physical Strength for Flexibility (cm) (M±SM)		
	First Trial	Second Trial	Third Trial
Control Group	13.70 ± 6.15	13.80 ± 7.44	13.60 ± 8.66
Training Group	19.33 ± 5.26	19.75 ± 4.99	23.00 ± 5.58

The study conducted repeated measures ANOVA to examine the difference in the time (first trial, second trial and third trial) and the groups (control group and training group) that had a different training group as to the bending upper body in a sitting position for the measurement of flexibility. There was a significant difference between the groups (p<.05). Also, there was a significant difference (p<.05) in accordance with the measurement time (p<. 05). There was an interaction effect between the group and time. As a result of conducting the post-verification through Bonferroni since the flexibility had a significant difference, the training group had a higher mean value (M=20.69) than the control group (M=13.70). The training group had a higher value in the third trial (M=23.00) than the first trial (M=19.33). The training group also had a higher value in the third trial (M=23.00) than the second trial (M=219.75).

Table 13. Result of Variance Analysis on the Repeated Measurement of Flexibility

Source of Variation	SS	DF	MS	F	Sign
Between Groups					
Groups (G)	800.546	1	800.546	6.901	.016
Error	2319.939	20	115.997		
Within Groups					
Time (T)	40.528	2	29.750	7.168	.007
G×T	47.619	2	34.956	8.422	.004
Error	113.078	40	4.150		

3.1.5 Analysis on the Difference in Balance

The results of mean physical strength measurement for the balance of left foot of control group and training group are as shown in Table 14.

Table 14. Results of Measurement of Balance

	Measurement Trial of Physical Strength for Balance (Left Foot) (M±SM)		
	First Trial	Second Trial	Third Trial
Control Group	14.15 ± 12.81	28.70 ± 27.52	25.69 ± 35.98
Training Group	15.30 ± 14.14	26.86 ± 17.08	44.42 ± 27.96

The study conducted repeated measures ANOVA to examine the difference in the time (first trial, second trial and third trial) and the groups (control group and training group) that had a different training group as to the standing on one leg with eyes closed for the measurement of balance of left foot. There was no significant difference between the groups (p<.05). However, there was a significant difference (p<.05) in accordance with the measurement time (p<.05). There was no interaction effect between the group and time. As a result of conducting the post-verification through Bonferroni since the balance of left foot had a significant difference, the training group had a higher value in the third trial (M=44.42) than the first trial (M=14.15).

Table 15. Result of Variance Analysis on the Repeated Measurement of Balance

Source of Variation	SS	DF	MS	F	Sign
Between Groups					
Groups (G)	592.062	1	592.062	.615	.442
Error	19263.652	20	963.183		
Within Groups					
Time (T)	4632.768	2	3098.811	6.308	.009
G×T	1346.873	2	900.910	1.834	.184
Error	14688.528	40	491.250		

4. Discussion

The physical fitness, which had the largest difference in the physical fitness of the national demonstration team members and unskilled demonstration team through the preliminary experiment with the ability to maintain the body location in gravity or the ability to maintain the balance of neuromuscular tissues for an efficient reaction in an idle position or control the neuromuscular tissues in a moving position, can be deemed as the balance. In general, it is viewed as balance; however, it is very important to improve the ability to maintain the body balance in a fixed position and the ability to control and maintain the body balance while performing a motion. Both groups showed a similar record in terms of quick adaptation of lower extremity, agility and speed at the first, second and third measurements as compared with the measurements on left and right sides of the control group. Also, the training group had a gradual improvement in the record at the first, second and third measurements in regard to the left and right measurements. It had a significant difference within the group in the balance of right foot. In addition, it was found to have an interaction effect of the group and time. The reason hereof is that the training group, unlike the control group, achieved a high degree of improvement in the balance as a result of conducting the basic physical strength phase and professional physical strength phase 5 times a week for 24 weeks in regard to the rotation exercise (basic gymnastics) of the added program for improving the balance.

Sense of balance, that is to say, the body mechanism of balance is operated through a reflex action of postural muscle (muscle to cope with gravity) that accounts for two thirds of human muscles for upright posture. The postural muscle of each human part maintains the balance of human body by operating lengthening contraction exercise in a reflexive way in order to maintain the stability when taking a complex posture for sports. It is believed that balance test and evaluation will have a huge impact on an improvement in athletic performance and also they will become one of the main subjects to the desires of achieving objectives in accordance with the sports exercises.

As for the control group, the record at the third measurement was decreased in all of quick adaptation of lower extremity, speed, agility, flexibility and balance with the exception of quick adaptation of upper extremity and muscular endurance. The reason hereof is that the size of muscles is generally influenced through the type of

muscular activity. Also, an increase in the load on muscles accelerates the growth of muscles. In contrast, muscular contraction will be caused when muscles are not used. These physiological and metabolic characteristics of muscles are widely known[7].

There has been a change in the load type of exercise due to the change in the type and environment of exercise after the second measurement. The training group had a gradually higher and faster level of physical strength at the first, second and third measurements as a result of training them with the scientifically and systematically prepared phased training group program for an improvement in their demonstration performance ability. The reason hereof is that the degree of physical strength improvement will vary depending on the type and number of muscular tissues, the type and order of exercise programs, break time between sets and frequency[8].

A majority of the training group are the subjects who did not have any exercise experience or did not receive any professional training program before. Therefore, as shown in the previous study[9] reporting that those with no exercise experience would improve their muscles rapidly at the initial phase of exercise, this study also showed that both groups had the most prominent change in muscular strength at the initial phase of training. Also, the other study that was conducted in a short period of time (11 to 16 weeks) reported that most of the muscular strength improvement took place in the first 4 to 8 weeks, which was similar to the results of this study[10].

The other study that was conducted for the period of less than one year reported a similar result[9]. This study showed that the control group had a high degree of improvement in the physical strength in relation to quick adaptation of lower extremity; thus, the findings thereof were consistent with the findings of the previous studies. However, it is believed that the findings thereof were also consistent with another argument of the previous studies that the muscular improvement speed would be slower with a longer exercise period.

The training group had a high degree of improvement in physical strength until the third measurement after 24 weeks. The reason hereof is that they conducted the training by adjusting the intensity and frequency gradually since they could do the basic Taekwondo training together with the physical strength training at the basic phase of program. On that account, it will be imperative to improve the exercise ability with various changes in exercise type, exercise program type and order, break time between sets and frequency.

5. Conclusions

Control group trained with training program of present Taekwondo demonstration team showed improved physical fitness in the second measurement of physical strength after 12 weeks. But measurement of third physical strength after 24 weeks showed lower improvement of physical strength than second measurement. This was caused by deficient time and lack of systematic training program - The time was deficient in making basic motions and basic physical strength necessary for sub-factors for performing Taekwondo skill, and professional physical fitness. And injury risk of beginner was high. Accordingly, it is thought that there are problems in training period and method of training program for improvement of present Taekwondo demonstration team's ability.

In the phased training program for performance ability improvement of Taekwondo demonstration, for quick instinct of lower limbs and balance, there was significant difference within group; mutual interaction effect between group and time. For muscular endurance, speed, agility, and flexibility, there was significant difference between groups; significant difference within group; mutual interaction effect between group and time. It is thought that phased training program for performance ability improvement of Taekwondo demonstration affected speed, agility, flexibility, and balance most.

6. References

1. Yang HS. Korea Taekwondo Demonstration History. Sport and Leisure Studies. 2006; 17(0):145–59.
2. Park JW. Developing model fort raining program to improve performance in Taekwondo. Korea National Sport University [Master`s Thesis]; 2009.
3. Yoo YG. The Effect of One Day Loading Method in Complex Training for Muscle strength and power on Muscle Function of College Woman Students Who Major in Physical Education. Exercise Science. 2007; 16(3): 291–04.
4. Harm WT, Ha CS. The Influence of Basic Strength Training for 8 Weeks for Taekwondo Kyorugi Players. Korean Alliance of Martial Arts. 2009; 11(3):211–21.
5. Lim YT. Periodized Training Program for Enhancing Taekwondo Performance (I): For Enhancing Anaerobic Exercise Capacity. Korea Coaching Development Center. 2005; 7(1):53–63.

6. Lee KH. An effect of application of Periodization training program on the aerobic and anaerobic ability of Taekwondo athletes. Chosun University Dissertation; 2004.

7. Sipila I, Rapola J, Simell O, et al. Supplementation creation as a treatment for gyrate atrophy of the choroid and retina. The New England Journal of Medicine. 1981; 304(15): 867–70.

8. Jackson CG, Dickinson AL, Ringel SP. Skeletal muscle fiber area alterations in two opposing modes of resistance-exercise training in same individual. European Journal of Applied Physiology and Occupational Physiology. 1990; 61: 37–41.

9. Morganti CM, Nelson ME, Fiatarone MA, et al. Strength improvements with 1 yr of progressive resistance training in older women. Medicine and Science in Sports Exercise. 1995; 27: 906–12.

10. Hickson RC, Hidaka K, Foster C. Skeletal muscle fiber type, resistance training, and strength-related performance. Medicine and Science in Sports Exercise. 1994; 26:593–98.