

Effect of Muay-Thai Functional Training Program on Physical Fitness and Muay-Thai Skills: A Pilot Study

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Abstract

Purpose: This research aims to study the effects of Muaythai functional training on physical fitness and Muaythai skills

Methods: Sample of this study is 20 Muaythai boxers ages between 19-25 years old. They were divided into two groups: experimental group (n = 10) and control group (n = 10). The experimental group was trained by Muaythai functional training program combine with regular training 3 days a week for 8 weeks. Whereas the control group was trained by regular program of boxing camp only. After 4 and 8 weeks of training, physical fitness and Muaythai skills were tested, data collected, and measured by statistical analysis. Data were presented as mean and standard deviation, compare between group by independent sample T-test and One-way ANOVA with repeated measures, Compare the difference between pair with Tukey test. A level of significant was set at p-value < 0.05.

Result: After 8 weeks of training, the experimental group had a great improvement in physical fitness : arms and legs strength, muscular endurance, cardiovascular endurance, agility and Muaythai skills: Diagonal kick, Diagonal knee, Push-kick, Straight punch. (a level of significant was set at p-value < 0.05.)

Conclusion: The Muaythai functional training program helped Muaythai boxer to improve physical fitness and amount of Muaythai skills using.

Keywords: Muaythai / Muaythai functional training program / physical fitness / Muaythai skills

I. INTRODUCTION

Muaythai is the Thai martial art for a long time and make fame to Thailand. Foreigners accept that It's the best and unique martial art of the world also is regular sport of Thailand. In the past, Muaythai was trained for fighting enemy and protect themselves. When no war, Thai people take advantage of free time to train it for competition and showing off on any occasions. It makes people more interest Muaythai and bring it to train himself. It leads to many Muaythai school camp. (S, Phosawat. 2013: 147). In the past, Muaythai training was lacks of Muaythai equipment, it has form and folkways. For example, long run across the farm, meditational run with charming (Muaythai boran lesson), vine climbing, lemon punching, etc. (S, Phosawat. 1989: 390). It expands constantly from the past to now.

Muaythai had been developed from protected martial arts to exercising martial arts and the best of sports. (J, Soravit. 2014: 38). We bring it to train for all of ages (exercising people or athletes). It has developed Muaythai training programs to improve physical fitness's all of ages exercisers and athletes of any sports. For example, bring it to aerobic exercise (Keta-Muaythai) for improvement of overweight soldiers' physical fitness. (K, Thunchanok. 2010: 4), applied Muaythai boxing dance to dynamic balance, flexibility, and nervous condition to fall on female elderly persons, etc.

Functional training is the way to exercise with co-ordinate working of muscles and joints to improves daily life or sport activities. (Tong TK, McConnell AK, Lin H, Nie J, Zhang H, and Wang J. 2016, Thompson CJ, Cobb KM, and Blackwell J. 2007.). It can be used in the real situation and has many movements follows any predetermined objective. (Department of physical education, Ministry of Tourism and Sports. 2015). It helps to reduce the injury of average or athletes of any sports. This program is popular at present time. For example, Bodyweight training, TRX training, Battle rope training, car tire training, etc.

Functional training for martial arts is focusing on muscles and joints movements together for physical fitness and skills improvement. It helps to reduce and heal the injury, and rehabilitation. For example, MMA (Mixed martial arts) is the martial arts with many ways to fight enemy. Athletes must learn and have experience about boxing, Muaythai, wrestling, Ju-Jitsu covering other form of movements. They must prepare for competition or real fighting. It sometimes is scuffle. They need to use power, strength, balance, speed, and agility to win the enemy. If they make a mistake for one time, it causes to win or lose in the competition. Functional training is very important to this sport because athletes must learn and prepare for movement from experiences and imaginary between fighting. The advanced functional training affects to competition directly (result to win or lose), reduce and heal the injury, and rehabilitation. Unstable and Functional training help muscles to learn and reaction in abnormal condition. Their make muscles and body to adapt with this condition. Functional training helps to improve physical fitness and reduces training time so It's super benefit in the short time training appropriate to present time. When joints are ready to work in form of functional training, muscles must move and work by power, strength, agility result in fat burning between exercises. If any parts of muscle are more working, it's benefit from three movements (sagittal, frontal, and transverse). Athletes are ready to fight naturally because muscles learn and react to external stimuli between competition and unexpected situation. (Kevin Kearns. 2015). Doug Dupont, martial art coach and the expert of MMA and BJJ (Brazilian Ju-Jitsu) said "Functional training in MMA at the first period of training is focusing to improves physical fitness especially on strength and endurance for fundamental development of physical training on next time. Second period is focusing on cardio workout. Third period is focusing to improves strength. Fourth period is focusing on flexibility and movements training. And final weeks of month is focusing on lose weight for competitive preparation. On each period, do 3 times a week, 3-4 sets, and sufficient rest between sets for injury protection. For example, Deadlift workout 3 sets, 8-10 reps / maximum strength = 10 or weight adding and maximum strength if you don't feel exhausted. (Premium training plans. 2016)." After that it's used to trains physical fitness in Muaythai sport by functional training program. It is specific using of applied Mae-Mai Muaythai, knowledge, equipment, and modern sport science technology. It's the way to imitate actions or daily life exercises (Cannone and Jesse. 2007) including sports playing for better joints movement (stable and efficient). It helps to reduce the variables of injury between athlete exercises. It affects to nervous systems and muscles and helps athletes to improve physical fitness: muscular strength, muscular and cardio-vascular endurance, flexibility, co-ordination body system, balance, agility, speed, power, and reaction-time (W, Adithep, 2019). It makes sport performance, natural movements, to reduce training and competitive accidents. It's very popular now. The problems of Muaythai athletes are happened indirectly because it's striking and fighting sport. They almost use part of the body to fight so it makes them hurt, have an accident between the training and competition. For example, some Muaythai athletes have Myofascial shoulders pain syndrome, shoulder dislocation, and pull it back between fighting so they must be cured by operation (Thailand National Sports University, Chumpon campus. 2007). Functional training is the way of exercise to adapts your goal and makes super benefits to athletes. It saves times and area, makes muscles working in one exercise automatically. For example, Elbow strike push-up: workout with applied bodyweight training by use elbows to exercise, Kicked shrugging: workout your shoulders and push-kick at the same time, etc. It has the principles to training as follows: many ways to movement depend on the goal of coach. It makes exercisers use muscles at the same time. This training makes Muaythai athletes to have better physical fitness, skills, and movements, reduce, protect, and rehab injury of training and competition together.

The study indicated that Functional and Muaythai training can help to improve physical fitness and Muaythai skills. However, most research in Thailand is lacks of knowledge about this exercise, Sports Sciences technology, Functional training, various forms of exercise, so it makes Muaythai athletes injure from training and competition. Muaythai functional training can helps athletes to improve their reaction-time, muscular strength, power, muscular and cardio-vascular endurance, balance, agility, speed, Muaythai skills, movement skills, in addition to reduces, protects, and rehabs injury from training and competition together.

From the reason above, it makes researcher interest to improve Muaythai training program by combination of general Muaythai training and modern sports sciences equipment, knowledges and technology or it's called "Muaythai functional training program" that is the great and effective combination of general Muaythai training

and functional training so it makes Muaythai athletes and general people have better physical fitness viz. reaction-time, strength, power, muscular and cardiovascular endurance, balance, speed, agility, and Muaythai skills together in short time. It makes them ready to train and fighting, reduce, protect, and rehab injury on next time.

II. MATERIAL AND METHOD

A. Participants

The sample of this study is 20 Muaythai athletes ages between 19-25 years old, weight 55-75 kilograms that studying in bachelor's degree of Sports science, Physical education, Rajabhat Mahasarakham university, Thailand National Sports university (Mahasarakham campus), and Mahasarakham university. They were divided into two groups: control group (n=10) and experimental group (n=10). The participants who have average scores of 8 physical fitness tests (reaction time, strength, power, muscular and cardiovascular endurance, balance, speed, and agility), ever pass amateur and semi-professional Muaythai competition.

Procedure and Protocol

The control group was trained by Muaythai training program (150 minutes or 2 hours 30 mins): warm up exercises for 5-10 minutes, running 5-10 kilometers about 30 minutes, Jumping rope 5 minutes / 3 sets (15 minutes), shadow boxing 5-10 minutes, kick sandbag 15 minutes, kick padding 15 minutes, clinching 15 minutes, sparing 15 minutes, Exercises for 30 minutes as fast training workout (not full-ranged exercises), 45-60 seconds rest between sets : Sit-ups 50 reps / 4sets, Push-ups 25 reps / 4 sets, Pull-ups 10 reps / 5 sets, Dumbbell curls (2.5 kg) 20 reps / 5 sets, and cool down 5-10 minutes. They trained 3 days a week on Monday, Wednesday, and Friday for 8 weeks.

The experimental group was trained by Muaythai functional training program (150 minutes or 2 hours 30 mins): warm up exercises for 5-10 minutes, running 5-10 kilometers about 30 minutes, Jumping rope 5 minutes / 3 sets (15 minutes), shadow boxing 5-10 minutes, kick sandbag 15 minutes, kick padding 15 minutes, clinching 15 minutes, sparing 15 minutes, Muaythai functional training program for 30 minutes (do 4 exercises for 1 set continually, do it all total 5 sets, and 2 minutes rest between sets): Shadow boxing with 1 kg weight cuffs (punches, kicks, knees, elbows) 1 min, AGI ladder by using; punches, kicks, knees, elbows 1 min, Applied bodyweight training for Muaythai 1 min, Sandbag attacking (punches, kicks, knees, elbows) 1 min, and cool down 5-10 minutes. They trained 3 days a week on Monday, Wednesday, and Friday for 8 weeks.

After 4 weeks of training, the intensity training of control group is no difference, but in the experimental group is improved by decrease rest time than before 2 minutes become 1 minute only.

Outcome Measurement

8 Physical fitness (reaction time, strength, power, muscular and cardiovascular endurance, balance, speed, agility) and Muaythai skills (Diagonal kick, Diagonal knee, Push-kick, Straight punch) were measured before, after 4 weeks, and after 8 weeks of training at Thailand National Sports University, Mahasarakham campus. Reaction time was measured by eye-hand coordination trainer: whole body reaction type2 (seconds). Strength was measured by handgrip and back-legs dynamometer (kilograms). Power was measured by Vertical jump test (centimeters). Muscular endurance was measured by one minute sit-up test (repetitions). Cardiovascular endurance was measured by 1.5 miles run test (milliliter/kg/minute). Balance was measured by balance test: Fitness Technology; KMS optosmart sensor (seconds). Speed was measured by Sprint test; 50 meters (seconds). Agility was measured by hexagonal test (seconds). In addition, Muaythai skills (Diagonal kick, Diagonal knee, Push-kick, Straight punch) were measured by Muaythai skills test of Ngammeesri Krongjuk, 2005 (repetitions).

Data Analysis

The data were presented by Mean and S.D. (standard deviation) of physical fitness (reaction time, strength, power, muscular and cardiovascular endurance, balance, speed, and agility) and Muaythai skills (Diagonal kick, Diagonal knee, Push-kick, and Straight punch). One-way ANOVA with repeated measures was used to test the differences of inner experimental group (before, after 4 weeks, and after 8 weeks of training). Tukey test was used by compare between the pairs. A level of significant was set at p-value < 0.05.

III. RESULT

The data of fundamental physiology's sample showed that average age 21.75 years old, weight 66.05 kilograms, and height 167.9 centimeters.

Table 1 Mean, standard deviation, and T-value of physical appearances of control group and experimental group before training

Physical appearances	CT		EX		t	p-value
	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
Age (years)	21.90	2.07	21.60	2.11	0.320	0.75
Weight (kilograms)	66.20	2.57	65.90	4.12	0.195	0.84
Height (centimeters)	167.70	5.33	168.10	3.31	-0.201	0.84

*different statistically significant at p-value < 0.05

Table 2 Compare the difference of mean and standard deviation of physical fitness before, after 4 weeks, and after 8 weeks of training experimental group.

Test items	Experimental group						F	p-value
	Before		week 4		week 8			
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
1.Reaction time (s)	0.63	0.07	0.62	0.10	0.61	0.19	.861	.43
2.Strength								
Arms muscle (kg./kg.)	0.53	0.06	0.58	0.07	0.70	0.11	10.979	0.00*
Legs muscle (kg./kg.)	1.98	0.32	2.42	0.42	2.97	0.49	13.869	0.00*
3. Legs power (cm.)	48.10	4.12	49.70	3.53	51.00	3.09	1.623	0.21
4. Muscular endurance (reps.)	52.40	6.45	56.40	4.84	59.20	3.12	4.690	0.01*
5.Cardiovascular endurance (ml./1 kg bodyweight /mins.)	13.24	0.73	12.31	0.85	10.53	0.50	37.743	0.00*
6. Balance (s)	13.28	0.97	13.47	0.76	14.08	0.50	2.973	0.06
7. Speed (s)	9.52	0.74	9.38	0.71	8.81	0.64	2.883	0.07
8. Agility (s)	0.71	0.10	0.65	0.05	0.60	0.05	5.314	0.01*

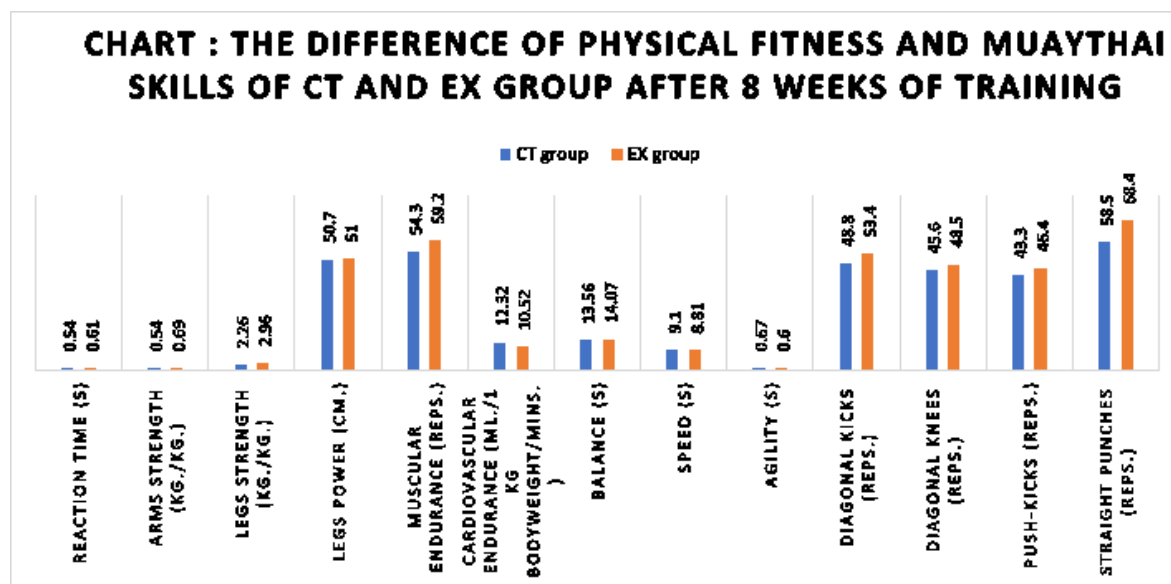
* P < 0.05

Table 3 Compare the difference of mean and standard deviation of Muaythai skills before, after 4 weeks, and after 8 weeks training of experimental group.

Test items (reps)	Experimental group						F	p-value
	before		Week 4		Week 8			
	$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.		
1.Diagonal kicks	46.60	4.67	48.00	5.21	53.40	4.43	5.644	0.00*
2.Diagonal knees	42.90	3.14	45.30	2.41	48.50	3.03	9.536	0.00*
3.Push-kicks	40.40	1.90	42.40	4.20	46.40	3.06	9.157	0.00*
4.Straight punches	56.10	13.88	58.00	11.82	68.40	5.32	3.648	0.04*

* P < 0.05

After 4 weeks of training showed that reaction time, arms strength, legs power, cardiovascular endurance, balance, speed, agility, and Muaythai skills (Diagonal kick, Diagonal knee, Push-kick, Straight punch) were no difference but legs strength and muscular endurance were increased at a level of significant was set at p-value = 0.05.



After 8 weeks of training showed that the experimental group had no difference of reaction time, Legs power, and speed, in addition to arms and legs strength, cardiovascular endurance, balance, muscular endurance, agility, and Muaythai skills (Diagonal kick, Diagonal knee, Push-kick, Straight punch) were increased at a level of significant was set at p-value = 0.05.

IV. DISCUSSION

The functional training program of researcher is exercise to use coordination of muscles and joints, to move more directions, to improve physical fitness. After 8 weeks, the experimental group has more arms and legs strength, muscular and cardiovascular endurance, and agility. It is better than before and after 4 weeks due to Muaythai circuit training is like real fighting situation. This program is used to improve physical fitness and aerobic power of Muaythai athletes especially in VO₂max (Maximum volume of oxygen consumption). The intensity of this exercise is high in short periods, repeated doing. (N, Ariyatuch and B, Wunchai. 2020); referred Khanna G.L. and Manna I., 2006). This program helps to improve Muaythai skills of experimental group after 8 weeks corresponding to P, Suthon (2005) who studied about the level of Muaythai skills of male students (Higher diploma in Physical education, Institute of physical education, South of Thailand, 2004) founded that Muaythai skills; Diagonal kick, Diagonal knee, Push-kick, Straight punch of male students was improved respectively (average; 42.17, 51.13, 42.50, and 107.48 repetitions) due to students do it regularly and effectively cause students have more physical fitness and Muaythai skills.

The experimental group was trained by Muaythai functional training program, high-low intensity. It helps to improve physical fitness. We can explain that transitional period before competition to main time of competition is very important and be main goal of physical fitness improvement's plan of athletes because this program can adapt maximum strength to power, muscular endurance and applied it to use in sport situation effectively (Bompa, 1993). Power training was divided into kinds of sports such as Muaythai, sport that repeated training has different intensity forms of training (power, muscular endurance, and muscular power endurance), amounts of training, and rest time. It is high-low intensity training, do 3 repetitions / 3-4 sets for a week, sufficient rest between sets to protect injury. According to N, Ariyatuch (2018) that studied the effect of Muaythai circuit training to aerobic exercise using of Muaythai professional athletes. The sample of this research is 16 male Muaythai professional athletes, ages between 19 to 22 years old, divide to two groups; experimental group (n=8) was trained by Muaythai circuit training program 3 days a week combine with normal training for 6 weeks, control group (n=8) was trained by normal training of Muaythai camp. They were tested

aerobic exercise using between EX group and CT group and founded that after training, EX group has more VO2max, heart rate recovery, and amounts of Muaythai skills than CT group at the level of significant .05. Concluded that, Muaythai circuit training program can improve endurance of Muaythai athletes appropriately.

The experimental group that trained by Muaythai functional training after 8 weeks, has better Muaythai skills than before training so we can explain that Muaythai functional training program effects to improve physical fitness and Muaythai skills (amounts of using) better than CT group at the level of significant .05. The amounts of using, frequency, power of skills result from endurance; VO2max increasing (Kamandulis et al., 2018).

After 4 and 8 weeks of EX group showed that reaction-time, legs power, balance, and speed have no difference. It will better if adding time to training, according to Wilmore and Costill (1999). Said "strength and muscular endurance will increase at 4-6 weeks of training; first period is adaptation of muscular nervous system. After 8-10 weeks, the factors of nervous system will decrease and muscle growing (Hypertrophy) that effect to fast and powerful contraction." Corresponding to Thomas (Thomas, 2000, 118) said "training will be increase after 2-3 weeks and be better 4-6 percents/week if you train continuously." Moreover, K.Jareun (2002) said "after 2-3 weeks of training, your body will be changed and better after 6 weeks. The body has more strength, power, fast and powerful contraction. You should add training time because the EX group that trained by Muaythai functional training program like a real Muaythai competition including Muaythai skills (punching, kicks, knees, elbows), Kick side step, Reverse foot work steps with punches, and Hook punches steps, Kicks padding, Clinching, kicks and knees by resistance band, bodyweight workout (Pull-ups, Push-up, Sits-up). Intensity of this program is low to high for body adaptation. A, Suttikorn (2019) said "Anatomy changing phase for strength of Tendon stiffness improvement is the way to high intensity training, Hypertrophy phase is the way to improve physical fitness after off season by traditional training or weight training, and Circuit training (Bompa, 1993 ; McArdle et al., 1996; O'shea, 2000) to improve strength and VO2max. Intensity of this program is 40-67 percentages of 1 RM or 67-80 percentages of 1 RM if you want to increase muscle fibers, and high intensity is depended from any sports. It is normal time of training about 8-10 weeks for beginner athletes and 4-6 weeks for experienced athletes that Heavy resistance circuit training at 85 percentages of 1 RM or 6 RM will help to improve strength and cardiovascular system." (Alcaraz et al., 2008). Training program's design in this phase must in line with kind of sports and choose Functional training to exercise by reminding of various way of exercises, such as: vertical, horizontal, and rotate according to types of movements, such as; push, pull so Functional training can link sport movements and reduce injury of sports. According to Functional training by researcher, research of P, Suttipong, and T, Duangkrai (2017) that studied the effect of aerobic exercise by Maemai Muaythai and Lookmai Muaythai to physical fitness of 2nd students showed that cardiovascular endurance was improved at the level of significant. From the studied of Jason A and et. al,(2020) in the topic; Muscle-strengthening Exercise Epidemiology founded that exercises for 2 days a week or more will help to improve muscular strength, cardiovascular systems, and mental fitness. In control group that trained by Muaythai program showed that after 4 and 8 weeks, physical fitness and Muaythai skills were no difference at the level of significant.

V. CONCLUSION

The Muaythai functional training program has helped professional Muaythai boxers to improve their physical fitness: arms and legs strength, muscular endurance, cardiovascular endurance, agility, and amount of Muaythai skills using. (Diagonal kick, Diagonal knee, Push-kick, Straight punch)

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