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PHYSICAL PERFORMANCE NEEDS IN SILAT OLAHRAGA: A COACHING PERSPECTIVE TO ESTABLISH PLYOMETRIC TRAINING IN SILAT

Mohamad Nizam Mohamed Shapie[2,3,4,5],Dahlia Al-Syurgawi[1], Hazim Samsudin[2], Syahida Mohd Nazri[2], Nasru Syazwan Nawai[2],

[1]Cardiff School of Sport & Health Sciences, Cardiff Metropolitan University, United Kingdom
[2]Faculty of Sports Science and Recreation, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia
[3]Seni Gayung Fatani Malaysia Association (PSGFM), Shah Alam, Selangor, Malaysia
[4]Federation of National Silat Olahraga Malaysia (PESONA), Shah Alam, Selangor, Malaysia
[5]World Silat Federation (WSF), Shah Alam, Selangor, Malaysia

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ABSTRACT

Study Purpose. Combat sports have been classified as grappling, for example, karate, silat, taekwondo, jitsu, judo, wrestling) and striking, as silat, karate or taekwondo depending on their rules and technical actions. As the technical movement and rules vary depending on the sport, it is plausible that physical fitness necessities to achieve high-level in each combat sport are also different. **Materials and Methods.** Despite their determination and identity, the physical and physiological profiles of all combat sports, there were less investigation can be proven on the effects of plyometric training in silat.

Results and Discussions. This current information could be useful for athletes' detection programs for the different combat sports. Based on the past research that have been done, it's have been proved that less research is being done on plyometric training in silat and predominantly on the main physical fitness performance needs (power, agility, cardiovascular endurance, and muscular strength).

Conclusion. Coach as a full drill power in kick and hand

Penulis Korespondensi:

Mohamad Nizam Mohamed Shapie
Faculty of Sports Science & Recreation, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia.
Email: nizam7907@uitm.edu.my

INTRODUCTION

Silat olahraga in general, consisted of so many repetitions of short-term and strenuous exercise in sparring matches. In competition, the best mean to gain victory involves striking first. Powerfull games Silat in Asian Games 2018. To perform this, selected technical combination such as punching, and kicking is needs to be comply. Combat sport like karate, is found to have a similarity with *silat olahraga* combat sport in its offensive and defensive behaviour (Shapie, 2011). According to Shapie et al. (2013a), *silat olahraga* practitioners fight from a preferred offensive and defensive behaviour. The assailant takes the initiatives to make the distance shorter to strike rapidly. The defender forestalls the opponents' action to dodge and afterward to counter. To perform these related tactical traits, loads of physical performance of silat athletes needed to be excellent, as it's needed for swiftness in the shifting displacements that should be an extended element for performance (Shapie, 2020). From the brief literature gathered (Anuar, 1993; Aziz et al., 2002; Shapie et al., 2008; Shapie, 2020; Shapie et al., 2011; Shapie et al., 2013a) *silat olahraga* was described as a unique combat sport which designed

to have its own practical identity, which in general, combining physical and tactical components to perform attacking and defensive self traits.

There was less study described on the details about the demands of *silat olahraga* in terms of the typical physical performance main agillity needs during competition . This is particularly important as the attacking and defensive movement must be initiated with the optimum physical performance level, as this provides the foundation to the athletes' basic needs in supporting elements for co-ordinated *silat olahraga* step-patterns, or the points score will not be valid during the *silat olahraga* match.

Thus, identification of training methodology and activity patterns within a *silat olahraga* match are important to understand the nature of *silat olahraga* competition. Identifying training methodology across *silat olahraga* exponents will enable identification of fitness traits which are most important to performance, helping to inform training (Shapie, 2020). The physical performance needs in *silat olahraga* and the needs of sports specific training methodology such as plyometric are discussed in this paper.

POWER

In performing the movement of kicking, dodging or evade "*elakan*" the optimum power performance provides so much support to *silat olahraga* exponents in order to be advanced in attacking or defending (Shapie, 2020). This practically, provides theories in the general needs of optimum power performance in *silat olahraga* training traits. According to Aziz et al. (2002), it is important to know that any local muscular fatigue experienced during a match may be more likely to take place in the lower limbs due to a large number of kicks performed in a short period of time. It is suggested, silat exponents possess high levels of anaerobic power capability of the lower body, which is supported by the high frequency of kicks. It is necessary for a young exponents to develop their physical skill related components of fitness or motor fitness such as power and reaction time in silat to improve their efficiency and effectiveness of silat movements.

Many research studies have documented the effectiveness of plyometric training on increasing power in the lower extremity. Although applicable to both upper and lower body, typically plyometric exercise training have involved jumping movements starting with rapid lowering of body centre of gravity (the eccentric muscle action component) from a standing position (term a counter movement jump) or from the elevated surface (termed a drop jump) which is followed immediately by a jump in which the athlete tries to attain maximum height or distance using body weight rather than mechanical load to provide the resistance, although weight can be attached to athlete to increase the resistance (Shah, 2012). This idea is supported by Shapie (2020), which informs, the most moves during attacking in silat is in which the exponent benefits from the amount of power on the lower part of the body to gain points during the match.

According to Viitasalo, Salo & Lathinen (1998), the body experiences tremendous impact forces during foot contact with the ground in vigorous locomotion. This is similarly related on the technical motion in *silat olahraga* like "*elakan*" (dodging/ evade) which perform in a jumping motion. Thus, to avoid the attacks, from the opponents, like sweeping or scissors kicking technique, the ability to jump with power and speed can benefit the silat exponents in silat matches. *Silat olahraga* required the exponents to excel in attacking during defending situations. Likewise, Shapie (2011), indicated, an optimum power performance provides a greater benefit to the exponents in their defensive movements. It was necessary for the exponents to develop specific physical performance needs as power, which is the key on the efficiency and effectiveness in silat tactical needs.

AGILITY

On the process in improving agility, plyometric training adapted few movements that including stopping, starting, varying directions in explosive method (Miller et al., 2001; Parsons & Jones, 1998; Yap et al., 2000; Young et al., 2001). Related to this concept of movements, most of it, are mimicking or have similar movements in *silat olahraga* movements as body dodge, fake movements and evading during attacking and defending movements (Shapie, 2020). In the other supportive study that illustrated the importance of agility informed, an optimum agility enables the karateka to avoid the opponent's attacks and to assume the optimal position for efficient performance of karate techniques (Blaevi, Kati & Popovi, 2006).

The importance to have an optimum agility performance in *silat olahraga* have been discussed by Shapie (2020). In performing motion as "*elakan*" (dodging or evade) the elements of agility so important to benefit *silat olahraga* exponents in protecting self or avoids the athletes from the fast strikes of opponents (Shapie, 2020). In the investigation, the agility 3-directional jump was examined by using the contact mat (Smart Jump, Fusion Sport, Australia) to measures body awareness in agility during the jumping ability to move in the different patterns of silat movements, which mimicking evasive movements during silat match. This test was designed to reflect the evading and attacking movements during silat match. The study revealed significant value ($p<0.05$) in gender on 3-kick test between male and female silat athletes. It was necessary for *silat olahraga*

exponents to have optimum motor abilities and skill related components like agility, balance and coordination, reaction time and power (Shapie et al., 2013).

In addition, the activity of *silat olahraga* pattern during a performance in silat arena required silat performer to move around with so many different patterns such as shape pattern, diagonal pattern, zig zag pattern and triangular pattern (Figure 1) which have a similarity in agility movements. These movements are found like a pattern of hexagon agility test which practically can be measurement tools to measure agility in *silat olahraga* exponents. In adding speed and agility in this pattern, it will improve the performer ability to attack or counterattack the opponents (Shapie, 2011, 2020 & 2021; Shapie et al, 2016).

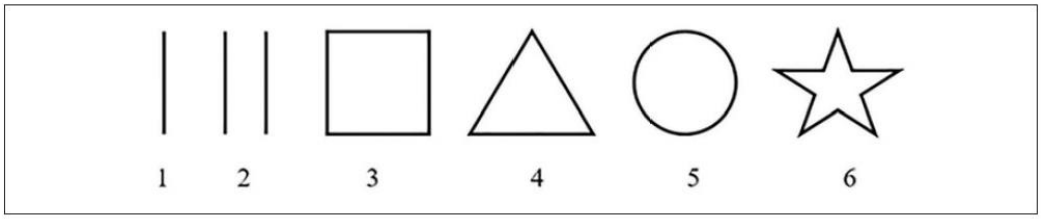

Figure 1: Pattern movements in Silat (Shapie, 2021).

CARDIOVASCULAR ENDURANCE

As an intermittent sport, the nature of *silat olahraga* competition required the silat player to develop both anaerobic and aerobic (cardiovascular endurance) system to compete in the international match. The study described the importance of high aerobic fitness need to be considered when designing appropriate test batteries to monitor the fitness of silat player (Aziz et al., 2002). In the recent studies, Markovic, Misigoj-Durakovic & Trninic (2005) revealed, an adequate cardiovascular endurance was indispensable because it enables relatively fast recovery between rounds and fights in taekwondo competition. An optimum cardiovascular endurance also facilitated faster recovery during or after the training session (Aziz et al., 2002; Markovic et al., 2005).

In addition, the observation by silat expertise and researcher (Shapie, 2020; and Aziz et al., 2002) determine, the aerobic system supported by the efficiency of cardiovascular endurance performance needs to be specifically developed to help aid recovery during the intermittent activity. The optimum cardiovascular endurance provides *silat olahraga* exponents with the ability to maintain their anaerobic capacity during sparring or fighting in the silat arena, which is three minutes to be total up of nine minutes, of three matches.

MUSCULAR STRENGTH

The needs of *silat olahraga* exponents in developing an optimum muscular strength especially on the lower part of the body, have been discussed by (Anuar, 2007; Shapie, 2020; Shapie et al., 2011; Shapie, Oliver, O'Donoghue & Tong 2013a; Shapie, Oliver, O'Donoghue & Tong 2013b). According to this studies, in order to perform movements such as in kicking category for example "*sapuan*" (swiping), "*tendang*" (kicking)," *jatuhan*" (topple) and "*lonjak*" (evade or dodge), the *silat olahraga* exponents must have the basic value of optimum muscular strength on the lower body, practically in order to perform all the movements in strong, explosives and forcefully manner during attacking or counter attack the opponents in matches.

The ability to generate maximum strength in the shortest period of time has been considered as essential to being obtained by *silat olahraga* exponents. The effects of prolonged training using this method for the development of reactive training were studied. It was concluded that the best results followed a six-week training period during the second phase of the preliminary period, following the development of general strength, with at least two training sessions a week (Hagl, 2003).

In addition, during attacking, optimum muscular strength have benefited the silat exponents in gaining the score during the matches. The other important element need to be applied in *silat olahraga* is the category of motion that needs component of muscular strength, for instance, is '*sapuan*' (sweep) involved attacking an opponent's leg which is on the ground to unstabilise him and bring down to the ground. A silat exponent can perform this attacking movement either with his right or left leg, Hence, front sweep '*sapuan depan*' is done by swinging the leg to the front to push an opponent's front leg, while back sweep '*sapuan belakang*' is carried out by swinging the leg backward to hit the back leg (Shapie et al., 2013). The importance of muscular strength on the lower part of the body in combat sports was proved by many literatures (Shapie, 2020; Aziz et al., 2002; Shah, 2012; Davaran, 2014). This is when the importance of strong lower part of the body (hips and legs) may develop a strong and powerful kicking and jumping (Shapie, 2020; Aziz et al., 2002; Shah, 2012; Davaran, 2014) during matches.

ARE CURRENT CONVENTIONAL *SILAT OLAHRAGA* WORKOUT ROUTINES STILL RELEVANT?

The development on a training trait in combat sports describing the system used in several individual combat sports such as boxing and mixed martial arts (Mullan and O'Donoghue, 2001; Hughes and Franks, 2004 ; William and O'Donoghue, 2006). The profile of skills performed by competitors in combat sports gives an indication of fighting style and preferred tactics (Shapie, 2020). In general, the silat conventional workout routine consisted of tactical and technical drill, individual skill and sparring endurance and resistance training. These training traits are commonly practiced in by the elite athletes on average age from teenager category (14-to 17-year) to the adult category (Shapie et al., 2018a,2018b,2018c).

Based on the tactical drill, the training consisted of various kind of movements that design purposely to perform typology actions (offensive and defensive) attack in matches, match period and match time (Anuar, 1993). The technical aspect of silat conventional training consisted of all techniques applied in sparring matches such as punch, block, and kick, topple, catch, dodge, and sweep (Shapie, 2011).

On the endurance fitness aspect, the silat exponents were required to develop both anaerobic and aerobic fitness in order to be compatible with the silat intermittent nature. This was discussed by Aziz et al., (2002), the nature of *silat olahraga* competition required the elite silat exponents to develop both (cardiovascular endurance) system to in order compete in the international match. Overall, the conventional silat workout routine comprised of the very foundation for the silat exponents to be physically fit in matches. The silat workout routine training is designed 2-5 day of training volumes a week but also may vary depends on the objectives of the silat training program.

METHOD

THE PLYOMETRIC TRAINING

Plyometric training can be defined as a type of training program that designed with exercise and drills linking with sheer strength and type of movement which produce an explosive-reactive type of movement (Shah, 2012). The plyometric training drills in plyometric training were illustrated in (Figure 2). The term often refers to jumping drills or exercise using the stretch reflex to produce an explosive reaction. The plyometric term also can be used to describe any exercise that allows the athletes to take advantage of the stretch-shortening cycle to produce an explosive movement (Bompa, 1999). During a plyometric movement, the muscles undergo a very rapid switch from the eccentric phase to the concentric phase. This stretch-shortening cycle decreases the time of the amortization phase that in turn allows for greater than normal power production. The muscles store elastic energy and stretch reflex responses are essentially exploited in this manner, permitting more work to be done by the muscle during the concentric phase of movement (Sankarmani, Ibrahim, Rajeev, Alagesa, 2012). According to Beachle and Earle (2000), plyometric involves of a rapid stretching of muscle (eccentric action) instantly followed by a concentric or shortening action of the same muscle and the connective tissue and it is a category of exercise drill design to produce quick, explosives action and increase the drive of the nervous system, usually for the purpose of enhanced the sports performance. Shah (2012) defined, plyometric actions are defined, when the process of loading the muscle through contracted rapid order stimulated. This process stimulates the strength elasticity and innervations of muscle and adjoining tissues to jump higher, run faster, throw further, subject to athletes training goal (Shah, 2012).

Athletes in all kind of levels can securely be accomplished plyometric exercise. Before, plyometric training was introduced as an only box jumping, now that this exercise tool covers more than only hopping. According to Bompa (1996), plyometric exercise has results in quick mobilization of a greater innervations activity, and generates the recruitment of most motor units and their corresponding muscle fibres. This exercise also increases in the firing rate of the motor neurons and resulted in the transformation of muscle strength into explosive power. However, plyometric training will cause fatigue induced by repeated reactive training that affects eccentric and concentric work capacity. Hence, the most important purpose of plyometric training is to develop the volatility of the neurological receptors for enhanced the reactivity of the neuromuscular system (Bompa, 1996).

Figure 2 : Plyometric training in silat

Plyometric has been proven to be effective and efficient in developing power (Miller et al., 2006; Robinson & Owens, 2004; Thomas & French, 1985). Similarly, plyometric training is an exercise that enables a muscle to reach maximum strength in a short time as possible (Stojanovi & Kostic, 2002). In addition, plyometric training has been proven to contribute in improving the vertical jump performance, acceleration, leg strength, muscle power, increase joint awareness and overall proprioception (Martel, Harmer, Logan & Parker, 2005).

A number of studies practiced plyometric training and have proved that it has enhanced power output and increases explosiveness (Adam et al., 1992) by working the muscles to do more work in the shorter amount of time (Holcomb, Lander, Rutland, Wilson, 1996). This is can be able by maximizing the stretch-shortening cycle, which occurs when the active muscle switches from rapid eccentric muscle action (deceleration) to rapid concentric muscle action (acceleration), (Wagner & Kocak, 1997; Potteiger, Lockwood, Haub, Dolezal, Alumzaini, Schroeder, Zebas, 1999). The rapid eccentric movement creates a stretch reflex that produces an extra forceful concentric muscle action (Wagner & Kocak, 1997) that could otherwise be generated from a resting position (Potteiger et al., 1999). The more rapidly muscle is stretched the better forced is formed to the extra powerful muscle movement (Clutch, Wilton, Mcgown, Bryce, 1983; Wagner & Kocak, 1997). Plyometric training that utilizes the stretch shortening cycle has been shown to develop the ability of the concentric phase of movement (Gehri, Ricard, Kleiner, Kirkendall, 1998) and improve power production (Adams et al., 1992; Paul, Jeffrey, Mathew, John, Michael & Robert, 2003).

RESULT AND DISCUSSIONS

In an attempt to present a six-week plyometric training program, Lori (1996) used six beginner jumping exercises, eight intermediate high jumps, four box jumps, and three depth jumps. In the conclusion about the realized training, the author concluded, plyometric training should be implemented two or three times a week, that jumping should be practiced before training sessions and including the use of weights and that the height of the trunk can be increased during the program in order to increase intensity. In addition, Milic, Nejic & Kostic (2008) informed, the program should be realized over a six to eight-week cycle, so that the final cycle could be completed before the onset of the competition season.

The body responds and familiarization with the exercise and the identification of physiological features define the physiology of exercise relatively than just only define performance (Winter, Bromley, Davidson, Jones & Mercer, 2007). Bird and Davidson (1997) stated seven reasons for undertaking physiological tests including the importance of the information gathered from the tests will assist in selection or identify readiness to resume training or competition. While numerous authors (Adams, Worley & Throgmartin, 1984; Adams et al.,

1992; Anderst, Eksten, Koceja, 1994; Alptekin, Kilic & Mavis, 2013) have been proven that plyometric training has enhanced performance physiologically. Based on many information in the literature, success in many sports performance was depending heavily on athletes' ability to maximize the components of power, agility, and cardiovascular endurance and muscular strength which was developed through the benefits of plyometric training. Therefore, these four components, were selected as the main physical fitness components to be measured in *silat olahraga*.

CONCLUSION

With a reasonable confidence that based on the result of this investigation, it was conclusively proved that plyometric training has a positive effect on the power, agility, cardiovascular endurance and muscular strength performance on silat exponents. This paper provides important details onto silat combat sport particularly, in practicing new training methodology. Clearly, in providing an evidence, plyometric training contributed to a progressive impact on *silat olahraga* exponents' physical fitness.

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