Review of Agility and Power Performance between Gender in Muay Thai Athletes

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Abstract

This paper aims to provide the comprehensive review between the gender among of Muay Thai (MT) athletes consists of the definition, risk of injury, gender issue, gender recognitions, fitness components, motivation factors, agility and power performance, instrumentations, training, and past research. It compares agility and power performance between male and female MT athletes, investigating the effectiveness of each. Agility enables rapid directional changes without compromising precision and balance. Power, defined as the combination of speed and force development, correlates positively with agility. Martial art studies, positioned within a paradigm emphasizing active knowledge production, intersect with critical feminist perspectives, providing a foundation for proactive advocacy and positive social change. Gender dynamics in MT sports are scrutinized, addressing opportunities for female practitioners and debates about male participation influenced by physical and physiological factors. The literature highlights the scarcity of research in MT sports in Malaysia, particularly in fitness and body conditioning. The findings are crucial for stakeholders seeking accurate information to promote MT sports and guide potential practitioners in the country. The study contributes to the broader understanding of MT sports, fostering its growth and development among enthusiasts in the present and future.

Keywords: combat sports, martial arts, self-defense, gender

1. Introduction

Muay Thai (MT) is a high-intensity activity that requires complex skills, tactics, and techniques for success. MT is a combination of sports related to running, pad work, and sparring. A problem arises if strength is not a fundamental component in combat sport athletes. Combative sports require agility and power for athletes to leverage their advantages during competitions in the ring. Agility is particularly useful for MT athletes when they need to evade attacks from opponents. Furthermore, power is utilized by athletes to overcome opponents through various techniques such as kicking, punching, kneeling, and elbowing. According to Bounty, Campbell, Galvan, Cooke, and Antonio (2011), combat sports like MMA, which includes various disciplines such as Boxing, MT boxing, and Brazilian Jiu-Jitsu, are physiologically demanding. Combat athletes are subjected to challenges across all energy systems, and the risk of overtraining is a legitimate concern.

MT, also known as Thai Boxing, is a combat sport popular worldwide and one of the most recognizable Thai cultural exports alongside food. As a martial form, MT incorporates almost all parts of the body, including fists, elbows, knees, and feet, earning it the name 'the Art of Eight Limbs.' Its fighting techniques encompass punches, elbows, knee strikes, kicks, and grappling. Matches typically consist of five rounds, accompanied by traditional music, and commence with a ritual dance in which boxers pay respect to their teachers (Vail, 2014).

Turner (2009) added that MT, known as the art of 8 limbs, allows athletes to kick, punch, knee, elbow, and grapple with their opponents. An MT match lasts up to five rounds of three minutes each but may be adjusted based on the athletes' skill levels. Similar definitions of MT are presented in Table 1, leading the researcher to conclude that MT is the art of 8 limbs, enabling athletes to use a combination of kicks, punches, knees, elbows, and grappling techniques against their opponents.

Table 1: Summary of Muay Thai (MT) Definition

Author (year)	Definition	Description

Turner (2009) Vail (2014)	Art of 8 limbs	Athletes can kick, punch, knee, elbow, and grapple with their opponents.

Risk of Injury Issue

Injuries pose a significant risk to combat athletes involved in the martial arts arena. According to previous studies, Gartland et al. (2001) reported on injury rates and types of injuries in Muay Thai kickboxing athletes, revealing that hematomas and soft tissue injuries were common, with lacerations being the most prevalent. The research also indicated that professional combat athletes experienced fewer injuries compared to younger participants with less experience, who had a higher percentage of injuries. Furthermore, the data suggested that injuries were more prevalent in males compared to females.

In the early 90s, Muay Thai (MT) was predominantly dominated by male athletes, with only a few female athletes involved in this type of combat sport, making their presence challenging to find. However, over the past fifteen years, combat sports, especially MT, have been recognized as defining masculinity. Despite this, acknowledging the absence of female athletes' participation became an unavoidable challenge. Halil et al. (2010) emphasized that injury is an inherent part of combat sports or martial arts that athletes cannot avoid. The study revealed MT as one of the highest-risk sports for injuries, with both genders susceptible even during training. Interestingly, no statistically significant differences were found between elite male and female athletes regarding the type of injury and the number of instances of incomplete involvement in competitions due to injuries during training. Elite female athletes tended to experience more lower extremity injuries than their male counterparts. In conclusion, combat sport athletes need to be well-prepared for involvement, recognizing the inherent risk of injuries in these martial arts.

In the past decade, discussions about genders in the martial arts arena have often justified gender imbalances or inequalities as "normal." There has been a positive shift in beliefs about female athletes, acknowledging their ability to meet the psychological and physiological demands of participating in tough competitions, which carry a high risk of injury and require a tolerance for pain traditionally associated with masculine experiences. Davies and Deckert (2020) reported that female participants challenge conventional feminist impressions in unique ways. Severe injuries during competition, such as nosebleeds, swollen lips, and broken ribs, are seen as manifestations of masculine success. The study highlighted that elite female combat athletes serve as a source of inspiration for feminist recognition of emotional, mental, and physical strength, challenging conventional norms of beauty and affiliation.

Gender Issues

Butler (1999) reported that in the context of its origins in combat sports, the impression is widely accepted by many gender theory interpretations, even in contemporary times. While various scholars may articulate the concept differently, at its core is the idea that gender is not a natural expression, a core identity, or a sex-linked quality. Instead, it is viewed as a socially constructed reality shaped through human behaviors and individual interactions. Gender is something that people continually reconsider and negotiate to conform to or challenge, aiming to correctly recognize specific types of masculinity and femininity. The study emphasizes the importance for researchers to understand how individuals perceive and perform gender within martial arts or combat sports, particularly in Muay Thai (MT). This understanding helps shed light on the powerful expectations regarding the behaviors of men and women, shaping their embodied practices, and how individuals negotiate conflicting potentials along the way.

In the present day, gaining a deep understanding of gender is crucial for comprehending various aspects of the experience in martial arts (Parnabas et al., 2022). The combat sports industry has encountered intriguing moments where gender is questioned, challenged, and at times overlooked, marking significant sociological experiences. Connell and Messerschmidt (2005) reported that gender constructions exist within hierarchical distributions of power, and studying gender provides insights into exploitative, exemptive, or harmful manifestations of norms and deflections of social privilege within the martial arts or combat sports domain. The symbolic proximity of combat sports, such as Muay Thai (MT), to physical violence sets it apart from other physical cultural pursuits like water games, dance, and field sports. The periodization program of training and competition plays a vital role in physical development and the ability to perform, conquer, and dominate others, or effectively resist opponents (Matthews, 2016). Martial arts are particularly significant for gender studies, uncovering gender issues and shedding light on the physical dominance intertwined with unclear constructions of masculinity and the consequent power differences.

The debate about gender comparison persists, encompassing global scopes of physical

performance, self-appearance, strength, and power scales. Klomsten, Skaalvik, and Espnes (2004) noted that women tend to score lower percentages in physical ability and appearance compared to men, with women maturing approximately two years earlier, especially in growth factors. The studies demonstrated that after puberty, significant gender differences emerged in muscle strength and aerobic power, aligning with speculation from previous studies. Furthermore, the research found that gender differences, especially in muscle strength and maximal aerobic power, become more pronounced after puberty.

Throughout the decades, it has been proven that athletes' expectations for success are influenced by task-specific beliefs about competence and gender differences. Li, Lee, and Solmon (2006) explained that gender plays a role in attribution differences, with men more likely to attribute success to firm factors like talent or ability, while women are more inclined to attribute success to unstable factors like effort. Athletes aiming for persistent success should focus more on effort in their training regimen, as the common saying goes, "hard work will beat talent." There is evidence that both genders hold different beliefs about the role of innate capability in physical performance, with men tending to attribute natural ability as an influential factor in performance and skill level.

In current academic studies, mixed martial arts has often focused on men, leaving a lack of comparative analysis of women practicing martial arts as a sport. Tompkins and Borer (2014) noted that combat sports or mixed martial arts are not typically considered feminine, even by female athletes who practice them, leading to a lack of understanding about why women engage in such extreme activities. Gender, as the activity of managing situated behavior, adheres to normative conceptions of attitudes and activities considered appropriate for one's sex category, which is typically male. However, in the social world of martial arts, these norms are not always clear, and some female athletes may adopt a masculine role to maintain gender order. The study suggests that gender is fluid in nature, with symbols and characters of gender being negotiable and subject to change. The gender order, often created through social norms, presents significant challenges for women in combat sports, and some female athletes may adopt masculine characteristics to recreate a sense of gender order while embracing their femininity.

Gender-related issues in sports, including martial arts, have been subjects of ongoing debate. Table 2 provides a summary of these gender issues, particularly in combat sports like Muay Thai (MT), which historically has been oriented towards men. Notably, women tend to score lower percentages in physical ability and appearance compared to men. Additionally, in terms of biological development, women mature faster than men. After puberty, significant differences between genders emerge, particularly in muscle strength and maximal aerobic power. These findings underscore the gender disparities present in combat sports and highlight the need for further examination and consideration of these issues within the context of sports like Muay Thai.

Table 2.2: Summary of the Gender Issues

Author (year)	Descriptions
Klomsten et al. (2004)	i) Women score a lower percentage of physical ability and appearance more than men. ii) Biological perspective women are being matured faster than men. iii) After puberty there are significant different between gender, especially in muscle strength and maximal aerobic power.
Li et al. (2006)	i) Men are more likely to attribute success to firm factor such as talent or ability whereas women are more likely to attribute success to unstable factor like effort. ii) Both genders have different beliefs about the role of inmate capability in physical performance.
Tompkins & Borer (2014)	i) Combat sport or mixed martial arts is not considered a feminine sport. ii) Character of gender that always can be negotiated and change. iii) Some female athletes adapted masculine character to recreate a sense of gender order in purpose to embrace their femininity.

Gender Recognition

Martial arts, also known as combat sports, provide a platform for debates, arguments, and

discussions challenging normative constructions of gender. Bowman (2014) emphasizes the importance of training methods in martial arts that attempt to transcend gender differences. When in a cage, octagon, or ring, contenders are recognized simply as boxers, irrespective of gender. The study highlights that disciplines in combat sports often involve mixed-gender setups, and women's participation in competitive combat sports, such as One Championship (OC) or Ultimate Fighting Championship (UFC), is on the rise, becoming more visible and common in the martial arts industry.

Martial arts are pursued for purposes such as self-defense, mental discipline, mental consistency, and physical conditioning. Malcolm, Mierzwinski, and Velija (2014) note that historical ideologies about sport masculinity were deeply rooted in arguments on biological and social differences between genders. Traditionally, male and female roles were portrayed as diametrically opposed in nature and biology. The study points out that research on women's involvement in combat sports or martial arts remains limited, and women entering these sports often face resistance, discrimination, and mockery. Despite this, the participation of women in combat sports holds empirical and theoretical importance, warranting further study. The empowerment felt by elite female combat sport athletes should not be underestimated, as their involvement contributes to the movement toward greater gender equality.

Martial arts, broadly defined as fighting movements and skills with or without weapons, challenge societal norms regarding gender-appropriate sports. In contrast to the established norms, women breaking into male-dominated sports, such as martial arts, resist gender norms and challenge gender ideologies. Female fighters not only embrace masculine traits but also secure their femininity, engaging in a balancing act to defy societal expectations. The study emphasizes that gender, from a martial arts perspective, is not about sexes but involves a gender experience that encourages men to treat women fairly and moderately, potentially promoting proactive engagement.

The history of combat sports, predominantly practiced by a male majority, is experiencing a shift with increasing numbers of female athletes joining martial arts, particularly in promotions like mixed martial arts (MMA). Jakubowska, Channon, and Matthews (2016) note the empowering experience for individual female athletes and the changing cultural perception of female fighters challenging traditional notions of physiological power and the gendered nature of combat sports or martial arts.

Table 2.3: Summary of The Gender Recognition

Author (year)	Descriptions
Bowman (2014)	i) Contenders are not a man or woman when in a cage, octagon or ring, there are only one that people are recognize as boxer
Malcolm et al. (2014)	i) Female participant in sport maintains considerable empirical and theoretical importance and deserve to further study. ii) The sense of empowerment elite female combat sport athletes should not be underestimated
Follo (2012)	i) That female fighter might be challenging male dominated sport by their brave participation in it, they do accept the fact that the sport is more sided to male and defined such as resulting also to show their femininity. ii) Female martial artistry is must not only embrace masculine traits but make sure that their femininity is secure following the feminine paradox especially who are bravely enter male dominated sports and this balancing act to decrease the expectation or reassures gender society paradox. iii) Sexes does not ascend to martial arts perspective, but there is a gender experience that force men to be fair and moderate with women and perhaps to be proactive.
Jakubowska et al. (2016)	i) A number of women's entry this combat sport has seen as a new phenomenon.

ii) Existing information presented to upgrade and improved the knowledge that recognize the potential that elite female athletes hold to overthrow, challenge and rewrite conventional gender topic.

The researchers contend that gender studies scholars should pay close attention to combat sports as a site of research, addressing the historical dominance of males in these sports. They argue that discussions about gender inequality within sports media are often absent from public discourse. In conclusion, the researchers stress the importance of enhancing knowledge about elite female athletes, recognizing their potential to challenge and rewrite conventional gender norms.

While combat sports like Muay Thai (MT) have historically been male dominated, there is a recent trend of more women bravely engaging in these extreme sports traditionally associated with men. Some scholars advocate for equal and fair treatment for males in combat sports. Table 2.3 supports the idea that female involvement in MT is a relatively new phenomenon, with promotions and information widely available contributing to the maturation of females in this challenging sport.

Fitness Component

In the current scenario, fitness components play a crucial role, especially when combined with agility and power exercises in a mixed training program for combat sport athletes. This approach can significantly enhance the physiological capacity of athletes participating in combat sports. Thibault et al. (2010) noted that the analysis of 82 quantifiable events since the beginning of the Olympic era revealed that men generally outperform women in terms of skills and tactics in sports. Genetic and hormonal differences contribute to this performance gap between men and women, having sex a significant factor influencing best performances in all sports.

Martial arts are activities deeply intertwined with the body, serving as a central construction through which gender differences are understood. Farrer and Whalen-Bridge (2011) emphasize the importance of the body in shaping meanings linked to gender differences. In the realm of martial arts, particularly in studies related to gender, there is a need for focused attention on the combat sports side in various research sources, especially within academic contexts.

For combat sports, particularly Muay Thai (MT), maintaining a high level of general fitness is crucial. Athletes must possess immunity, solidity, explosiveness, as well as the fitness and endurance to last until the final round. MT athletes need stability, strength, power, and agility to sustain top performance. Weaving (2013) notes the traditional view that tends to objectify female athletes as bodies, in contrast to the perception of male athletes as active participants in their bodies. This philosophy has contributed to an imbalance and incompatibility between women and sports over the years. In mixed martial arts (MMA), where the entire body is required to move with force and determination, female athletes could truly engage in a lived body experience. Challenging the traditional gender ratios continues to break down expectations that female athletes are less physically aggressive than their male counterparts. The training regimen of Muay Thai not only strengthens the body but also builds mental courage, challenging physical and psychological limits, and requiring persistence to succeed.

The information presented in Table 2.4 unmistakably illustrates that men generally outperform women in various aspects, encompassing both mental and physical dimensions. This performance disparity is significantly influenced by gynecological factors and hormonal differences inherent in both genders. In the context of Muay Thai (MT), the sport places a premium on mental, spiritual, and physical strength, crucial elements for athletes to endure and succeed in this combat sport. The necessity for systematic and precise training is paramount, as it not only enhances the physical prowess of athletes but also cultivates a resilient mindset essential for navigating the challenges inherent in Muay Thai. A holistic and comprehensive training program, therefore, becomes integral in fortifying both the body and the mental fortitude of athletes in the demanding landscape of Muay Thai.

Table 2.4: Summary of The Fitness Component.

Author (year)	Descriptions
Klomsten et al. (2004)	i) Men are better than women in terms of performances (skills and tactical) in sports due to genetic and hormonal differences. ii) Sex is a major factor influencing best performances in all sports.

Farrer and Whalen-Bridge (2011)	i) The body is the central construction that means linked to gender differences. ii) The body is their tool or weapon, and it is totally identified in MT. iii) Athletes need to be immune, solid, and explosive yet the fitness and endurance to cope. iv) MT athletes should have good stability, strength, power, and agility to sustain top performance.
Weaving (2013)	i) Masculinity nature generally define female athletes as body object but the other contrast to the meaning of male athletes is body participants. ii) Traditional genders ratio raises the expectation the female athletes are less physically aggressive than male athletes. iii) Training regimen of MT helps the athletes to build mental courage. iv) MT not only strengthens the body but also the athlete's mind.

Motivation Factor

Muay Thai has gained immense popularity as one of the most renowned martial arts in Malaysia, standing alongside other martial arts like Silat (Shapie et al., 2022; 2023) and Taekwondo (Kusrin et al., 2022; Shapie & Intan Nur Marliana, 2016). Motivation is a key component essential for encouraging combat athletes to take specific actions to achieve their desired satisfaction. In the context of combat sports, physical fitness and self-defense emerge as crucial motivators.

According to Ong and Ruzmin (2016), gender-related motivation in martial arts and combat sports tends to focus on exercise, sport, and game involvement. In the realm of Muay Thai, there is a significant difference in motivation levels between elite male and female athletes. The researchers emphasized that both genders of Muay Thai athletes are highly motivated by the existence of factors related to physical conditioning. It is noted that male Muay Thai athletes may exhibit a greater eagerness to engage in combat sports or martial arts, possibly influenced by factors related to growth and development. However, the biological evidence suggests that females tend to reach maturity faster than males, adding complexity to the motivational dynamics in Muay Thai.

Based on table 2.5, the motivation to participate in this MT sport is for exercise only and rather than competition. The study found that there are differences between the motivational factors between genders for this MT sport. Male motivation is found to be more likely in this combat sport than female. This may be due to the physical condition of the male compared to female.

Table 2.5: Summary of The Motivation Factor

Author (year)	Descriptions
Ong and Ruzmin (2016)	i) That motivation among genders related to martial art combat sport more focus in exercise sport game involvement. ii) There is a significant difference of motivation level between elite male and female athletes in combat sport especially in MT. iii) Both genders of MT athletes were highly motivated by the existence of an element or factor which is physical condition. iv) Male MT athletes has more eager to practice combat sport or martial artistry than female athlete because growth development factor but biological prove that female tend to reach maturity faster than male.

Agility and Power

Lephart, Ferris, Riemann, Myers, and Fu (2002) asserted that males exhibited better knee flexion after impact on the ground than females. The study highlighted that the controlled involvement of knee flexion in females may be related to the quadriceps, which show an abrupt stiffening of the knee. Males significantly exhibited

more knee flexion and lower limb internal rotation impact than females. This is because females had less maximum angular displacement than males, and it takes a shorter time to reach their maximum knee flexion. There is a lack of consistency in study design and variable response in gender-related differences, resulting in a more abrupt absorption of the impact force of landing.

Hewett, Ford, Myer, Wanstrath, and Scheper (2006) reported knowledge regarding the development of dynamic hip movement during the acceleration of three different types of single-leg landings. Female athletes have a greater risk, six times more than male athletes, of being involved in anterior cruciate ligament (ACL) injuries because the strength on the knee is not enough during dynamic movement (agility). Additionally, the combination of an increased position of knee valgus and hip adduction can prevent female athletes from getting involved in ACL injuries.

Muay Thai (MT) is a tough combat sport and a traditionally graceful martial art, which narrows down to no different than in the ring. The way MT is practiced and trained can toughen up the athlete's mentality. Moreover, MT is an excellent way to learn self-defense, and it also teaches combat athletes to develop a strategic mind and courage in the face of opponents. The capability to jump height is considered vital in many sports, including combat sports (Walsh, 2007). A great explosive power movement of lower limb muscles can yield different impacts and results to achieve great jumping performance. The study also stated that there are significant differences in psychological and physiological aspects between male and female athletes that may affect power performance, including differences in muscle fibers, anthropometrics, muscle strength, and power. Furthermore, male, and female athletes react differently to the results of power performance when jumping movement patterns are changed. Finally, the researcher highlighted that male athletes have greater force in vertical jump movements when using the arm full swing compared to female athletes.

Most combat sports are similar in certain ways to sports and are massive on both physiological and psychological demands. Elite male and female athletes must be physically prepared for even a normal and ordinary level of fighting; they must have a great fundamental level of general and specific health and fitness. Buse and Santana (2008) reported that power can be improved by a variety of training modules, including body coordination, agility drills, and plyometric training. Thus, the condition development should be channeled to endurance and power training for most combat sports, except MT, which delivers great kicking techniques with a repetitive and powerful impact over the course of matches. The scholars highlight that power training methods are strongly suitable for full-contact sparring, appraising biomechanical demands except in actual competitions.

Stereotypes among female combat sport athletes often aim to prove that females can't be involved in these sports. However, a female fighter is more than her gender. Furthermore, once elite female athletes are in the ring, it depends on the fighter to show and prove that they can pose a danger to their opponent. Sporiš, G., Milanović, L., Jukić, I., D., and S (2010) stated that it is very important to have complete motor ability as well as cardiovascular fitness to compete at a high level. Agility requires high power output, rapid force development, and the ability to use the stretch-shortening cycle in ballistic movement. Agility can be increased by training methods to improve the dynamic athlete's performance and explosive leg power.

Agility and Power Performance are significantly important in combat sports such as MT and other martial arts. Table 2.6 compiles scholars' views on the importance of both performances. Studies have shown that males exhibit better knee flexion and lower limb internal rotation and greater force in vertical jumping than females. Females were found to have a higher risk of anterior cruciate ligament (ACL) injuries than males. Power jumps and explosive power in lower limb muscles are considered vital in MT sports. Finally, males and females have different psychological and physiological aspects that affect power performance.

Table 2.6: Summary of Agility and Power

Author (year)	**Remarks**		
	Description	**Male**	**Female**
Lephart et al. (2002)	Amount of knee flexion subsequent to impact on the ground.	More	Less
Hewett et al. (2006)	Anterior cruciate ligament (ACL) injury.	Less	More
(Walsh, 2007)	Jumping Performance Important Power Performance. Vertical Jump.	More	Less
Sporiš. G et al. (2010)	Agility requires high power output and rapid force development and as well the ability of effort to use to		

	the stretch-shortening cycle in ballistic movement. That agility can be increase by the training method to improve the dynamic athlete performance and explosive leg power.	More	Less

Muay Thai Instrumentation

There is a long and significant argument about how many fighters actually practice in real-life combat situations when considering the benefits and advantages of martial arts. Martial arts are not just about fighting; MT, on the other hand, has proven to have a significant impact in real-life applications. Neuromuscular function is widely used to assess lower limb injury and muscular performance (Ceroni, Martin, Delhumeau, and Farpour-Lambert, 2012). The researchers argue that all factors adversely affecting proprioception, including neuromuscular control, joint mobility, muscular strength, and power, will affect overall functional performance. The researchers also state that they chose the Vertical Jump Test as a power performance test because the assessment is a great standard and an example of a move that benefits from the stretch-shorten muscle cycle. The scholars also state that female athletes have a significantly greater muscle force production for both lower limbs compared to male athletes, but male athletes have significantly better maximal explosive power than female athletes. Finally, the researchers highlight that there is a significant difference in Vertical Jump performance between male and female athletes, especially when they reach the age of 15 years old.

Performance-based outcomes, such as the Illinois Agility Test (IAT), have been used by Raya et al. (2013) to assess agility among elite athletes. The study reports that improving agility capabilities can benefit in improving body stability during high-intensity movement, increase intramuscular coordination, and reduce the risk of injury. The Illinois Agility Test was created in 1942 as a measurement of motor ability, specifically running and dodging agility. The agility movement test is normally used in sports for athletes but is seldom used for clinical situations. Likewise, sports medicine physicians and trainers could apply this test to assess athletes' recovery during and after the rehabilitation phase in elite athletes if the baseline performance has been reviewed. The outcomes of this study may also help coaches and exercise physiologists gain an idea of proper goal setting and treatment approaches that more closely relate to a specific sport or activity for athletes during rehab intervention. Finally, the Illinois Agility Test could set a benchmark for agility for athletes and help identify where deficit movement in different planes of motion may occur compared to their peers, helping structure athletes' strength and conditioning programs.

Based on Table 2.7, the researchers found that Vertical Jump Test (VJT) and Illinois Test (IAT) were reliable and valid to test the agility and power performance for MT practitioner. Agility Test could set benchmark of agility for strength and conditioning program for the athletes. VJT was found as a power performance test because the assessment is the great standard and examples of a move that benefit from stretch shorten muscle cycle.

Table 2.7: Summary of the Instrumentation

Author (year)	Descriptions
Ceroni et al. (2012)	i) Vertical Jump Test as a power performance test because the assessment is the great standard and example of a move that benefit from stretch shorten muscle cycle ii) Vertical Jump performance between male and female athletes especially when they reach the age of 15 years old.
Raya et al. (2013)	i) Illinois Agility Test (IAT) have been used Raya et al. (2013) to assess agility among elite athletes. ii) Illinois Agility Test could set benchmark of agility for the athletes and help to identify where deficit movement in different plane of motion may occur as compare to their peers in order to help structure athletes strength and conditioning program

Training Intervention

Understanding the physical aspect in martial arts or combat sport is crucial for identifying the proper training methods and providing support for athletes to excel and thrive in any game or competition. In martial arts, having outstanding leg power and strength is particularly essential for lower limb strikes, standing, and jump kicks. Abidin and Adam (2013) reported that, with the same amount of body fat percentage, female athletes have approximately 26% lower vertical jump height than their male counterparts. The study highlights that reducing body fat through a proper training regimen can significantly boost and improve explosive leg power. Furthermore, it emphasizes that success in combat sports requires good anthropometrical status, proper technique, and disciplined physiological training.

The debate over gender equality in combat sports remains contentious. Martial arts and combat sports serve as a mirror to society, reflecting contradictions in equal rights between genders within this realm. Gender equality and rights have become more prominent and widely discussed within the sports community. According to Cormie et al. (2007), strength power training has proven to be as effective as power training in enhancing maximum jump height and maximum power output in the jump squat. Strength power training has shown greater progress and improvements in jump height and power output across a broader range of loads in the jump squat. It is well-established that increasing the cross-sectional area and mass of a muscle can led to a more forceful contraction and result in greater improvements in strength and conditioning training.

Training is a crucial factor in developing power and strength in all sports, including combat sports such as MT. As indicated in Table 2.8, according to many researchers, body fat can be reduced with proper fitness training, leading to improved explosive leg power. Strength power training has shown the ability to increase and enhance maximum jump height and maximum power output in the jump. Furthermore, strength power training has demonstrated greater progression and improvements in jump height and power output. Power can be improved through various training modules, including body coordination, agility drills, and plyometric training.

Table 2.8: Summary of The Training Method and Effects

Author (year)	Remarks		
	Types	Descriptions	Effects
Abidin and Adam (2013)	Proper training Regimen	Reduce body Fat Good anthropometrical status,	Power performance
Cormie, McCaulley, and McBride (2007)	Strength power training	Increasing and improving maximum jump height and maximum power output in the jump squat Attracted greater progression and improvements in jump height and power output through a greater range of loads in the jump squat.	Power Performance
Buse and Santana (2008)	Body coordination, agility drill and plyometric training.	highlights that power training method shown a strongly suitable for a full contact sparring that appraise bio-mechanic demand except in actual competitions.	Speed

Past Research

Wongputthichai, Suttitum, Manimanakor, and Kittinon (2017) reported that a 12-week plyometric program led to increased physical performance, muscle strength, and muscle power in male Thai boxing athletes. The combination of strength and power training, along with plyometric training, resulted in an increased power output and a greater load-power relationship compared to power training alone. The researchers also emphasized gender-specific influences on balance, speed, and power in agility performance. The study indicated that the influence of power on agility performance is significantly lower in women than in men.

Bartolomei, Grillone, Di Michele, and Cortesi (2021) stated that power per kilogram of body mass still serves as evidence for gender

differences. The researchers found that differences in power performance and jumping ability between elite male and female athletes could not be explained solely by differences in lean muscle mass. Their findings highlighted that there were no significant gender differences in muscle fiber units, and the quality of neuromuscular differences did not account for the observed disparity in power. The study concluded that muscle thickness and lean body mass still significantly influenced the power output generated by the lower limbs in both genders. Finally, the study underscored the significant gender differences in power performance relative to muscle thickness and lean body mass.

Sekulic et al. (2013) found that males scored higher than females in agility and body balance, indicating that males are more advanced in agility manifestations. Although females demonstrated a decrease in power and speed agility, the study reported that females had a higher value in agility predictors when compared with power. The research by Horička, Hianik, and Šimonek (2014) emphasized that agility involves the ability to intercept opponent movements, process information, and react to specific game situations. The study highlighted that agility not only depends on changing direction abilities but also on perceptual components such as decision-making and critical thinking. While no significant relationship was found between agility performance and complex reaction and speed components tested by the Illinois Agility Test (IAT), the study emphasized the importance of agility training in game preparation for enhancing athletes' dynamic balance and overall welfare.

2. Conclusion

This study delves into the comparison of agility and power performance between male and female Muay Thai (MT) athletes, exploring their effectiveness. MT is recognized for promoting mental and physical development, emphasizing discipline, spirituality, and respect. Agility, the ability to start, stop, and change directions rapidly, is linked to muscle hypertrophy. Power, a combination of speed and force development, positively correlates with agility. Acknowledging feminism in gender studies is vital for proactive advocacy and positive social change in martial arts. The literature discusses gender participation in MT, addressing fitness, training, and motivation factors. The scarcity of research in MT sports in Malaysia, particularly in fitness and body conditioning, highlights the need for comprehensive studies. Bridging this gap can offer insights for stakeholders and promote MT sports effectively.

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