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RELATIONSHIP BETWEEN STANCE WIDTH VARIATION DURING ONE REPETITION MAXIMUM BARBELL HIP THRUST PERFORMANCE AND KICKING SPEED FOR YOUNG ELITE SILAT ATHLETES

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Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

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Abstract

Study purpose. This study aimed to determine the relationship between kicking speed performance and different stance widths during barbell hip thrust (BHT) at one repetition maximum (1RM) scores among young elite Silat athletes.

Materials and methods. 15 male and 15 female Silat athletes with at least one year of resistance training experience and a mean age of 21.3 ± 1.2 years participated in this study. The load indicator performance associated with kicking performance was measured using 1RM load during BHT at varying stance widths. The data was analyzed using Pearson correlation tests through the SPSS Version 25 application.

Results. A significant correlation was found between stance width, physical characteristics, and performance metrics with a low to moderate relationship. For physical features, weight ($r = 0.43$, $p < 0.05$), height ($r = 0.64$, $p < 0.05$), and leg length ($r = 0.44$, $p < 0.05$) show positive relationship. Low to moderate significant relationships were found during WSW-RFK ($r = 0.39$, $p < 0.05$) regarding 1RM and kicking performance. No significant correlations were found between NSW or NRW and the observed variables, except for a negative correlation between NRW and strength ($r = -0.43$, $p < 0.05$). There was a significant difference between males vs. females in RFK-NSW, RFK ($p = 0.006$, $p < 0.05$), and LFK-NRW ($p = 0.001$, $p < 0.05$) in kicking performance.

Conclusions. This study revealed that stance width in barbell hip thrusts moderately correlates with physical characteristics and performance in young elite Silat athletes, where wider stances align with physical characteristics and narrower stances align with lower kicking performance. It also highlighted the importance of personalized training due to observed gender differences in kicking speed.

Keywords: silat, barbell hip thrust, kicking, strength training, combat sport, stance width.

Introduction

Silat is one of the combat sports that originates from South Asian countries. It combines grace, technique, and power to create an elegant yet practical form of self-defence and sport and has noble values (Lisdayanti et al., 2019; Shapie & Elias, 2016). This combat is becoming more and more known in the eyes of the world, and athletes' involvement in this competitive sport is becoming increasingly popular with combat sports fans. Not only that, but the mark of Silat is also getting more and more attention among researchers to be tested. Research related to the sport of Silat has been started since 1983 (Eichberg, 1983), and since then, the positive development every year can be seen through the number of published articles.

Silat has been adapted from a self-defense art to a competitive sport in the modern world. This transformation requires a higher emphasis on physical aspects such as strength, flexibility, coordination, and endurance (Patah et al., 2021). The importance of physical adaptation activities in the sport of Silat is not limited to improving physical fitness alone but also involves improving technical and tactical

performance in complex movements such as attacking, defending, and avoiding. Through intensive training, Silat athletes can develop quick reactions and precision in movements that support competition strategies. These aspects create a competitive Silat athlete who reflects a unique blend of tradition, art, and sports science (Apriantono et al., 2020; Aziz et al., 2002). In addition, it is worth noting that the art of Silat encompasses a diverse range of attacking and defending strategies, with a particular emphasis on using kicking techniques.

This kind of combat sport heavily relies on kicking techniques. Kicking allows athletes to strike their opponents effectively and provides them with various strategic advantages. The importance of kicking in combat sports stems from its effectiveness as an offensive and defensive technique, its ability to create distance and control space, and impact on scoring in competitive matches (Ruzbarsky et al., 2022). The velocity of kicking, expressly, assumes a crucial role in the efficacy and productivity of these actions. In the field of competitive Silat, having the ability to execute fast and forceful kicks holds substantial influence over an athlete's victory.

For several reasons, kicking is essential to Silat and other combat sports. Firstly, the force or velocity of a kick delivered by an athlete is crucial in determining their exceptional fitness. The power generated by a lift is a critical factor in an athlete's overall performance and directly impacts their ability to score points or defeat their opponents. Secondly, using kicks expands the target area for athletes, giving them a greater chance to score points or hinder their opponents. This leads to the differences between winning and losing factors in combat sports settings (Soo et al., 2018). Within the broader framework of sports performance, strength has become acknowledged as a critical determinant in improving kicking techniques.

Strength and conditioning are significant attributes that influence athletic performance across various disciplines, including but not limited to track and field, weightlifting, and different combat sports. Strength training, an indispensable aspect of an athlete's regimen, holds the utmost significance in bolstering kicking power in combat sports (Barley et al., 2019; Da Silva et al., 2015). This form of training explicitly strengthens the leg muscles that are put to work while executing a kick. Stronger muscles equate to more potent kicks, enhancing the range and effectiveness of this crucial combat sport technique. Furthermore, strength training also plays a pivotal role in improving an athlete's balance and coordination, which is crucial when delivering powerful and efficient kicks. Therefore, neglecting strength training could inevitably result in diminished kick performance, thus underscoring its fundamental role in combat sports.

The barbell hip thrust (BHT) is emerging as a crucial exercise for enhancing lower limb power, a vital component in kick-based martial arts like Silat. BHT has been widely used in strength and conditioning programs worldwide (Contreras et al., 2011; Ronai, 2021). Additionally, BHT is one type of horizontal loaded movement contributing to the horizontal direction in specific actions. These exercises have been shown to outperform machine exercises regarding muscle activation. According to Contreras et al. (2011), the barbell hip thrust is a loaded bridging exercise that targets the hip extensor musculature against barbell resistance, leading to improved speed, horizontal force production, and gluteus maximus hypertrophy. Several studies have found the potential benefits of BHT on sports performance. For example, 6 to 8 weeks of training does improve sprint time (Dello Iacono et al., 2018) and increment in jump performance (B. Zweifel et al., 2017). A positive correlation was also found between BHT and post-activation performance in a change of direction (G. Lockie et al., 2020). Despite the potential benefits of barbell hip thrusts in enhancing lower limb power, there is a lack of research examining the application of this exercise in Silat. Even more concerning is the near absence of research studies investigating the application of strength training, particularly barbell hip thrusts, in Silat, a traditional martial art form with a rich cultural history and growing international recognition.

One parameter that can be manipulated during strength training exercises is the position of feet for various stance widths. Stance width during exercises like the BHT can significantly influence the athlete's kicking performance (Asayama et al., 2021; Lahti et al., 2019). Additionally, mastering various stance widths during exercise can improve an athlete's versatility, providing them with the adaptability to deliver an array of kicks with diverse strength profiles. Furthermore, stance exploration helps develop an athlete's understanding of their body mechanics and muscle activity, enabling them to generate maximum force during a kick. The significance of stance width and BHT exercise has been firmly established in several scopes of performance in sports (Hawkins & Sefton, 2011; Otsuka et al., 2021; Rajinikumar, 2019). For example, a study by Mohd Nasir et al. (2023) found an improvement in power and velocity-related performance in kicking when applying narrow stance width during barbell hip thrust exercise among adolescent Silat's athletes. However, exploring its use within the distinctive context of Silat has not been thoroughly investigated, and more study needs to be conducted. The current information gap poses a noteworthy study prospect, as it has the potential to unveil unique associations between strength training and combat sports performance. Thus, the present study aims to fill this research interest by examining the relationship between barbell hip thrust scores during stance widths and kicking speed in young elite Silat athletes. This investigation has the potential to provide new perspectives on improving Silat's performance.

Materials and Methods

Participants

This study used purposive sampling among elite young athletes selected from the state level. A total of 30 elite young athletes (15 male and 15 female) were selected. The participants were free from any diseases or injuries during testing. All participants had participated in competitive Silat competitions for at least five years before the study. They were actively involved in Silat and performance training during testing. The participants were the best elite young Silat athletes representing the state at the National level.

Procedures

The study was structured across four testing sessions, with a 72-hour rest interval instituted between each session to mitigate carryover effects. The initial session was conducted

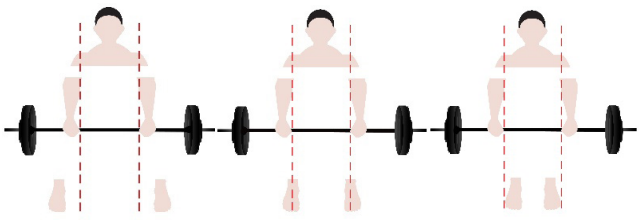
for demographic data collection, including metrics such as weight, height, and years of experience in Silat and strength training. Subsequently, an expert trainer introduced participants to the BHT technique with the inclusion of the various types of stance width – namely, wider than shoulder width (WSW), normal shoulder width (NSW), and narrower than shoulder width (NRW). After the introductory session, the athletes were crossover-randomly assigned to one of three groups based on stance width.

During the introductory session, 1RM procedures were performed to set the weight for the testing session. A general warm-up session was conducted to ensure that the athletes were adequately prepared for the 1-RM tests and to minimize the risk of injury. This was followed by a series of 3 set x 8-10 repetitions with 40% 1RM, 8 repetitions of 50% 1RM, and 6 repetitions of 60% 1RM, with a minimal 5-minute rest between sets. This is to ensure that participants were adequately rested before performing the 1RM of BHT as the final load and repetition to be used as the performance score for this study. The procedures were followed based on guidelines set forth by the National Strength and Conditioning Association (NSCA) (Larsen et al., 2021).

Stance Width

Three different stands were measured in this study (Wider than shoulder width (WSW), Normal shoulder width (NSW), and Narrow than shoulder width (NRW). Table 1 shows the different types of stance widths. Subjects were cross-over, randomized, and assigned according to the difference in stance width. For wider than shoulder width, subjects will put their feet approximately 10cm outside from the acromioclavicular joint with the toes pointing forward. Meanwhile, the subject will put their feet about 10cm inside the body from the acromioclavicular joint for the narrow stance width. Lastly, with normal shoulder width, the feet will be standing directly the same with the shoulder width in line with the acromioclavicular joint.

Table 1. Type of Stance width

Wider than Shoulder Width (WSW)	**Normal shoulder width (NSW)**	**Narrow than shoulder width (NRW)**
		
Approximately 10cm outside the acromioclavicular joint	Directly in line with the acromioclavicular joint	Approximately 10cm inside towards the body from the acromioclavicular joint

Barbell Hip Thrust

The BHT was chosen as the primary exercise metric due to its efficacy in targeting the posterior chain, which is crucial for kicking performance in Silat. During the BHT, participants were guided to elevate the barbell to a predetermined height in each trial, facilitating consistency across attempts. The athletes were positioned with their upper backs against a flat bench, and their feet were placed according to the specific stance width assigned (WSW, NSW, or NRW) while making sure the toes were pointed forward. A barbell pad was used at the crease of their hips to alleviate discomfort. Throughout the execution of the thrust, participants maintained a neutral spine and pelvis. They were provided with real-time, continuous feedback by expert trainers to ensure no tilting of the barbell occurred at its apex, thereby maintaining the integrity of the movement.

Kicking performance

Kicking movements represent a critical aspect of performance in Silat; thus, capturing accurate data was imperative. For this purpose, a high-resolution iPad Pro 11-inch (3rd generation) was employed to record the athletes' kicks. In this study, the front kick for the right and left was measured for each participant. After the recording, the video was imported into the Kinovea application, a specialized sports science motion analysis software. Kinovea's robust feature set allowed for a frame-by-frame breakdown of each video, enabling precise calculation of kicking speed. This technology provided qualitative and quantitative data, enriching the performance analysis's comprehensiveness.

Data Analysis

The data was analysed using descriptive statistics, and Pearson correlation was used to study the relationship between stance width during BHT, physical traits, and kicking performance. Statistical significance was set at $p<0.05$, and all analyses were conducted using SPSS software version 25 (IBM, New York, USA).

Ethical approval

The procedures for involving human subjects were conducted per the applicable national rules and institutional protocols. They were consistent with the principles outlined in the Declaration of Helsinki. In addition, the authors obtained approval from the institutional review boards associated with their respective institutions. Each participant who participated in the research had read and signed the informed consent form approved by the Ethics Committee of Sultan Idris Education University (code 2021-0224-01).

In this study, all participants involved have provided informed consent.

Results

Table 2 presents the demographic data of the participants' physical characteristics for this study. Significant differences existed between the weight, height, and length of the participant's legs but contradicted the results for age, years of Silat experience, and years of strength training experience.

Table 2. Descriptive of physical characteristics of the athletes

Variable	Combine (mean ± SD)	Male (mean ± SD)	Female (mean ± SD)	Male vs Female
Age (years)	20.8 ± 2.2	21.1 ± 2.2	20.5 ± 2.3	0.47
Weight (kg)	61.1 ± 17.6	68.9 ± 20.2	53.2 ± 10.4	0.01*
Height (cm)	166.2 ± 9.7	173.9 ± 5.8	158.5 ± 5.9	0.001*
Silat (years)	6.2 ± 2.4	5.6 ± 2.2	6.7 ± 2.7	0.24
Strength (years)	4.2 ± 2.4	4.2 ± 1.9	4.3 ± 2.2	0.41
Leg length (cm)	91.2 ± 7.7	95.3 ± 6.4	87.1 ± 6.7	0.002*

*Significant value ($p < 0.05$)

Table 3. Summary of 1RM BHT scores

Variable	Combine (mean ± SD)	Male (mean ± SD)	Female (mean ± SD)	Male vs Female
WSW	107.9 ± 22.3	124.2 ± 13.5	91.60 ± 16.5	0.001*
NSW	109.2 ± 26.8	109.4 ± 22.1	109.0 ± 31.6	0.96
NRW	105.7 ± 21.8	105.6 ± 20.9	104.5 ± 23.4	0.89

*WSW= wider than shoulder width, NSW= normal shoulder width, NRW=narrow than shoulder width, significant value ($p < .05$)

Table 4. Summary of Front Kick Performance

Variable	Combine (mean ± SD)	Male (mean ± SD)	Female (mean ± SD)	Male vs Female
RFK- WSW	3.36 ± 0.97	3.63 ± 1.2	3.09 ± 0.6	0.13
LFK-WSW	3.11 ± 0.97	3.37 ± 1.14	2.86 ± 0.73	0.15
RFK-NSW	3.36 ± 1.05	3.84 ± 1.04	2.88 ± 0.74	0.001*
LFK-NSW	3.19 ± 1.11	3.54 ± 1.33	2.84 ± 0.72	0.08
RFK-NRW	3.48 ± 1.10	4.01 ± 1.26	3.03 ± 0.73	0.006*
LFK-NRW	3.22 ± 1.08	3.93 ± 0.94	2.48 ± 0.62	0.001*

*RFK-WSW=right front kick wider than shoulder width, LFK-WSW=left front kick wider than shoulder width, RFK-NSW=right front kick normal shoulder width, LFK-NSW=left front kick normal shoulder width, RFK-NRW=right front kick narrow than shoulder width, LFK-NRW=left front kick narrow than shoulder width.

There were significant differences between males vs. females for weight ($p = 0.01$, $p < 0.05$), height ($p= 0.001$, $p < 0.001$), and leg length ($p = 0.002$, $p < 0.05$).

Table 3 summarises the load scores of 1RM at different types of stance widths while performing the BHT exercise. In the combined group, the average strength for WSW was found to be 107.9 ± 22.3 kg. However, males exhibited significantly higher strength (124.2 ± 13.5 kg) than females (91.60 ± 16.5 kg). The difference is statistically significant with a p-value of 0.001, indicating that males have a higher strength advantage in WSW stance than females. There were no significant differences in strength between males and females for the NSW and NRW stance widths. In NSW, males (109.4 ± 22.1 kg) and females (109.0 ± 31.6 kg) had similar mean strengths, with a p-value of 0.96. Similarly, in the NRW stance, males (105.6 ± 20.9 kg) and females (104.5 ± 23.4 kg) had closely aligned mean strength values, with a p-value of 0.89.

Meanwhile, Table 4 summarises the front kick performance recorded during the data collection. There were significant differences in right-front kick during WSW (RFK-WSW), right-front kick during NRW (RFK-NRW) and left-front kick during (LFK-NRW). No significant difference was found for both legs during NSW and left-front kicks during WSW (LFK-WSW). There was a significant difference between males vs. females during RFK-NSW ($p = 0.001$, $p < 0.001$). For the NRW stance, both RFK ($p = 0.006$, $p < 0.05$) and LFK ($p = 0.001$, $p < 0.001$) showed significant differences when comparing males vs. females.

Table 5 presents a correlation analysis highlighting the distinctive relationships between 1RM scores in different stance widths, physical characteristics, and front kick performances. The WSW stance shows significant positive correlations with height (r=0.64), weight (r=0.43), and leg length (r=0.44), as well as with right front kick (RFK) performance (r=0.39). However, NSW and NRW stances exhibit weaker and non-significant correlations with these physical characteristics. Notably, a negative correlation exists between NRW 1RM and strength training (r=−0.42). These numerical values provide a clear understanding of the strength of the correlations observed in the study.

Discussions

This study investigated the correlation between 1RM scores during barbell hip thrusts across different stance widths and front kick performance in young Silat athletes. The kicking performance was measured for right and left front kicks. The study's major finding revealed a low to moderate correlation between the measured variables (BHT vs Kicking performance) for all stance types.

Table 5. Correlation analysis between 1RM scores during stance width vs. Physical Characteristic and Front Kick Performance

Variable	Correlation value (r)							
	Age	Weight	Height	Silat	Strength	Leg length	RFK	LFK
WSW	0.14	0.43*	0.64**	-0.09	0.04	0.44*	0.39*	0.16
NSW	-0.06	-0.14	-0.41	0.07	-0.26	-0.06	0.16	-0.19
NRW	-0.05	-0.25	-0.14	-0.12	-0.42*	0.14	-0.19	-0.01

*WSW= wider than shoulder width; NSW= normal shoulder width; NRW=narrow than shoulder width; RFK= right front kick; LFK= left front kick; significant value ($p < .05$)

There are significant physical differences between male and female athletes regarding weight, height, and leg length. The data suggests that male athletes tend to have a higher 1RM in a WSW stance (124.2 ± 13.5) than females (91.60 ± 16.5), indicating a gender-specific advantage or preference for this stance in maximizing strength. This difference in performance could be attributed to physiological differences or training adaptations that favour males in wider stance positions. Interestingly, NSW and NRW stances do not show such pronounced gender disparities, suggesting a more uniform potential for strength development across these stances. The current study's findings contradict those of a previous study on gender preferences. According to Kittilsen et al. (2021), both genders showed similar improvement relative to their one-rep maximum (1RM) during four sets of four repetitions of leg press exercise at 85-90%. However, the differences between the maturity and chronological age of the sample during the current study and the previous study affect the result.

Moreover, the results indicated a significant relationship only in the case of the WSW stance with kicking performance compared to the other two stances, namely, NSW and NRW. The significant differences ($p<.001$) only can be seen between males and females in the WSW stance. This finding is interesting as stance width is often considered an essential factor in the execution of kicks, as it can affect balance, stability, and power generation during the kicking motion (Larsen et al., 2021; Lorenzetti et al., 2018). However, the results of this study suggest that in the specific context of barbell hip thrusts and their relationship to kicking speed, stance width does not play a significant role. One possible explanation could be that the barbell hip thrust exercise focuses primarily on hip extension strength and power rather than the specific mechanics of the kicking motion (Ronai, 2021). Conversely, any lower limb exercise with hip extension movement should have a transferrable effect into specific action during the traditional practices. This did not happen for this population during this study, contradicting the previous research. Lahti et al., (2019) found a significant difference between narrow and wide stance performance for sagittal and frontal plane motion.

As in this case, the kicking action involves these two planes of motion. This is the first study to examine the effect of barbell hip thrust associations on kicking performance for different types of stance width for combat sports. Another setting of lower limb exercise on different stance widths showed significant improvement in terms of muscle activity during wide stance in Romanian deadlift (Koderi et al., 2020), which focuses more on external knee movement, which involves more bicep femoris activated, as this is also one of the significant muscle contributions during in kicking action. Gender preferences in barbell hip thrust studies have not been extensively researched. However, the few studies conducted align with prior recommendations (Contreras et al., 2016). Furthermore, differences in torso structure between genders should also be considered, as broader male shoulders may exhibit different movement patterns compared to narrower female shoulders. This suggests that inherent differences in shoulder width between males and females could impact the execution and biomechanics of exercises such as the barbell hip thrust. Additionally, this study is the first known comparison of males and females in Silat and combat sports studies, specifically using barbell hip thrust as an exercise parameter.

Another observation from the current study is that the study found a low to moderate association between 1RM of WSK-RFK exercise. In contrast, a low negative correlation was observed during NSW-LFK and both NRW-RFK and NRW-LFK. This finding suggests that as the load increased during the exercise, there was a decrease in kicking speed among the young elite Silat athletes. This intriguing finding raises questions about the relationship between strength training and explosive movements such as kicking. It is well known that strength training can improve power and force production, which are essential factors in generating explosive moves like kicks in combat sports (Subekti et al., 2020). The intersection of barbell hip thrust exercises with kicking performance in combat sports remains a largely uncharted domain in the existing literature. Historically, sports science has emphasized understanding how foundational lower body exercises influence generic athletic outputs. For instance, the classic squat has been extensively researched for its potential to boost vertical jump and sprint performance (Atalağ et al., 2020; Chelly et al., 2009). Nevertheless, the current research uniquely bridges the gap in the literature by focusing on the barbell hip thrust exercise, which still needs to be represented in sports science research.

Conclusions

In conclusion, this research contributes valuable insights into the role of strength training, specifically BHT, in enhancing kicking speed among Silat athletes. Overall findings indicate a low to medium correlation between strength during BHT and the variety of stance width on kicking performance among young Silat athletes. The findings underscore the potential benefits of incorporating BHT exer-

cises with varying stance widths into martial artists' training regimens to optimize their kicking performance. Future research might delve deeper into other types of kicking, such as sidekicks, roundhouse kicks, back kicks, etc. Manipulation of load and repetition also should be investigated to see the differences among the Silat athletes. Application BHT on various levels of Silat athletes and genders also provides training options for lower limb intervention. The effect of BHT can also be explored on jumping performance in Silat athletes, which power element contributes to in attacking and defending techniques in Silat settings.

Conflict of interest

The authors state no conflict of interest during this study.

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ВЗАЄМОЗВ'ЯЗОК МІЖ ВАРІЮВАННЯМ ШИРИНИ СТІЙКИ ПІД ЧАС ВИКОНАННЯ ВПРАВИ З ПІДЙОМУ СТЕГОН ЗІ ШТАНГОЮ ЗА ОДНЕ ПОВТОРЕННЯ З МАКСИМАЛЬНОЮ ВАГОЮ ТА ШВИДКІСТЮ УДАРІВ НОГАМИ В МОЛОДИХ ЕЛІТНИХ СПОРТСМЕНІВ ІЗ СИЛАТУ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 8 с., 5 табл., 29 джерел.

Мета дослідження. Метою цього дослідження було визначити взаємозв'язок між показниками швидкості ударів ногами та різною шириною стійки під час виконання вправи з підйому стегон зі штангою з положення лежачи з упором верхньої частини тулуба на лавку («Сідничний міст») за одне повторення з максимальною вагою (1ПМ) серед молодих елітних спортсменів із силату.

Матеріали та методи. У цьому дослідженні взяли участь 15 спортсменів і 15 спортсменок із силату з досвідом тренувань зі спротивом щонайменше один рік і середнім віком 21,3 ± 1,2 року. Ефективність показників навантаження, пов'язаних з ефективністю ударів ногами, вимірювали з використанням максимального навантаження за одне повторення (1ПМ) під час виконання вправи «Сідничний міст» за змінної ширини стійки. Аналіз даних проводили з використанням коефіцієнтів кореляції Пірсона на програмному забезпеченні SPSS версії 25.

Результати. Було виявлено статистично значущу кореляцію між шириною стійки, фізичними характеристиками та показниками продуктивності зі зв'язком від низького до середнього ступеня. Стосовно фізичних характеристик, позитивний зв'язок демонструють вага ($r = 0,43$, $p < 0,05$), зріст ($r = 0,64$, $p < 0,05$) і довжина ніг ($r = 0,44$, $p < 0,05$). Під час аналізу кореляції WSW-RFK («ноги ширше плечей» – «прямий удар правою ногою») ($r = 0,39$, $p < 0,05$) було виявлено статистично значущі зв'язки від низького до середнього ступеня стосовно 1МП та ефективності ударів ногами. Між стійкою NSW («ноги на ширині плечей») або NRW («ноги вужче плечей») і спостережуваними змінними значущих кореляцій виявлено не було, за винятком негативної кореляції між стійкою NRW («ноги вужче плечей») і силою ($r = -0,43$, $p < 0,05$). Спостерігалася статистично значуща різниця між чоловіками та жінками в ефективності ударів ногами за показниками RFK-NSW («прямий удар правою ногою» – «ноги на ширині плечей»), RFK («прямий удар правою ногою») ($p = 0,006$, $p < 0,05$) та LFK-NRW («прямий удар лівою ногою» – «ноги вужче плечей») ($p = 0,001$, $p < 0,05$).

Висновки. Це дослідження показало, що ширина стійки під час виконання підйому стегон зі штангою середньою мірою корелює з фізичними характеристиками та результативністю молодих елітних спортсменів із силату, де ширші

стійки відповідають фізичним характеристикам, а вужчі стійки – нижчій результативності ударів ногами. У ньому також підкреслюється важливість індивідуалізованого тренування через спостережувані гендерні відмінності у швидкості ударів ногами.

Ключові слова: силат, підйом стегон зі штангою, удари ногами, силове тренування, єдиноборство, ширина стійки.

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