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Russian vs. American Kettlebell Swing – Which One to Choose?

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Abstract

Kettlebell swing exercises have been proposed as a method for developing power, strength, endurance, and aerobic capacity. There are two distinctive techniques or styles of kettlebell swing: Russian (RKBS) and American (AKBS), and the purpose of this study was to quantify the specific differences within each exercise. The aim of this paper was to determine which style offers greater mechanical output in the form of power, velocity and momentum, with consideration of energy expenditure and injury risk, and which represents a safer version of training operator for developing specific dimensions of strength and power along with muscular endurance. The selected population of physically active men (n=15; age: 27.5±4.5 years; height: 185.9±14.1 cm; weight: 96.1±11.1 kg; kettlebell swing experience: 3.6±2.4 years) were recruited to perform kettlebell swings of both styles. They performed eight maximal swings using a 24 kg kettlebell (~25% bodyweight), during which the concentric and eccentric phases and their respective amplitude, duration, peak and mean velocity, momentum and average power were analysed. The results of the paired sample t-test showed a statistically significant difference between styles in cycle duration, momentum, amplitude and velocities, while power generated was similar for both styles. In conclusion, both styles are viable training options, though the RKBS style presents a potentially safer alternative due to its biomechanical properties.

Keywords: *kettlebell training, power, strength, muscle endurance*

Introduction

Kettlebell training has been gaining in popularity among the professional and amateur population and even military and police organisations (Andersen et al., 2015), since it enables the simultaneous development of strength, power and muscular endurance, as well as improving aerobic capacity (Frrar et al., 2010). The kettlebell swing forms the technical base of most other kettlebell exercises, though it is often used on its own in many training programmes (Frrar et al., 2010).

The ballistic nature of this exercise is characterised by potentially great amounts of mechanical work in a short period of time via functional acceleration and deceleration (Brumitt et al., 2010). Its relatively low technical demands and use of relatively light loads makes this exercise effective in power development via quick force production in the lower extremities (Lake & Lauder, 2012). In addition, the power generated during the movement enables greater activation of motor units, which can be beneficial in the development of strength (Maulit et al., 2017).

There are two distinctive techniques of kettlebell swing: Russian (RKBS) and American (AKBS). Both are characterised by specific ballistic flexion, followed by ballistic extension of the hip joint. After initial launch, the kettlebell is brought into the bottom position by the means of active hip flexion, which is determined by hamstring flexibility and the ability to maintain a neutral spine position (McGill & Marshall, 2012). Following this, explosive hip extension is used to bring the kettlebell into the end position where the main difference lies. RKBS ends when the arms are in front of the body, parallel to the floor, whereas AKBS ends with the

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arms overhead and perpendicular to the floor (Kruszewski et al., 2017). The movement is repeated as many times as necessary.

While the RKBS and AKBS styles have similar overall mechanical characteristics, there are specific differences within each exercise (Bullock et al., 2017). Specifically, RKBS exhibits less vertical impulse, vertical displacement, and time (Lake & Lauder, 2012; Falatic et al., 2015) during the propulsion (up) phase and the braking (down) phase than AKBS (McGill & Marshall, 2012; Lake et al., 2014; Bullock et al., 2017). The decreased cycle time in RKBS is associated with a smaller amount of time under tension, which may elicit lower internal joint and tissue loads than AKBS during the swing-braking (down) phase, while simultaneously generating similar peak loads as AKBS (Mohamad, Cronin, & Nosaka, 2012).

Although some kinematic and kinetic similarities and differences are known between the two kettlebell swing styles, it is still not clear which is better or more appropriate for developing strength, power and endurance. Based on the present experiences and those from professional practice, we can assume that both styles have their respective roles in the training process of professional and recreational athletes, so the aim of this study was to determine which style offers greater mechanical power output, velocity and momentum, taking account of energy expenditure and potential risk of injury, to determine which technique represents a safer training operator. To the extent of our knowledge, there are no studies that have conducted kinematic and kinetic analysis based on tracking the kettlebell only.

Methods

Participants

Fifteen healthy, physically active male participants volunteered in the study (age: 27.5±4.5 years; height: 185.9±14.1 cm; weight: 96.1±11.1 kg; kettlebell swing experience: 3.6±2.4 years). There was a mandatory orientation session for a minimum of 72 hours before testing, during which technical corrections were made and for participants to become accustomed to a heavier weight than usual as this could affect their performance, especially during AKBS where the kettlebell ends in the overhead position.

Subjects restrained from performing any exercise for 72 hours before testing. None of the subjects had a recent history of any injury. After verbal introduction about the goal and potential risks of the study, each subject read and voluntarily signed a detailed informed consent form. The Ethics Committee of Faculty of Kinesiology, University of Zagreb approved the study protocol (Decision number: 75/2020, 3 March 2020). The study is in compliance with the Helsinki Declaration.

Variables

The following variables were measured under two conditions (RKBS and AKBS) during the kettlebell swing and recorded: distance (L) during the concentric and eccentric phase of the swing expressed in meters (m), concentric and eccentric phase duration (t_{avg}) expressed in seconds (s), peak (v_{max}) and average velocity (v_{avg}) of concentric and eccentric phase of the swing expressed in meters per second (m/s), peak (p_{max}) and average (p_{avg}) momentum expressed in kilogram-metre per second (kg·m/s), and average kinetic energy (E_{avg}) expressed in Joules (J). The average power generated was calculated based on the average kinetic energy and time during the concentric phase of the swing ($P_{avg} = E_{avg} / t_{avg}$) and expressed in watts (W) (Hamill & Knutzen, 2009).

Procedure

Standardised warm-up preceded testing and consisted of a low intensity running protocol and dynamic stretching, followed by specific warm-up in the form of 10 repetitions of kettlebell swings using ~10% of participant body mass. The testing procedure was performed during a single training session and procedures were done with at least five minutes of rest between conditions.

After assuming the proper starting position, participants performed eight maximal kettlebell swings with a 24 kg kettlebell, which is close to 25% of their body weight. Due to the nature of kettlebell training, there is no established standardised recommendation for weight selection during exercise, nor is it based on a one repetition maximum, so a percentage of the averaged group body mass was used to provide as close an approximation as possible to the same resistance regardless of body mass differences (Levine et al., 2020). The first and last repetition were excluded from the analysis primarily because they were affected by initiation and cessation of the exercise (Levine et al., 2020).

Two Dimensional (2-D) Kinematic Analysis

Video was captured by smartphone video camera (Iphone 12, Apple, CA) filming at 1080p HD at a rate of 60 frames per second. The purpose of kinematic analysis was to determine kinematic variations that can be identified from the sagittal view (Van Gelder et al., 2015). The use of sagittal plane video analysis has been shown to be a valid and reliable measure of movement patterns during a dynamic functional task (Norris & Olson, 2011). The camera was positioned laterally, 3.7 meters away from the position of the subject. A marker (2.5 cm white circle) was placed in the middle of the kettlebell to provide a reference point for consistency in measurements of kettlebell trajectory. Videos were archived onto a laptop for analysis. Tracker, a free video analysis and modeling tool from Open-Source Physics (OSP) v 5.0.6. program was used to analyse the collected video materials.

Statistical analysis

All data collected was processed using STATISTICA, ver. 13.4 for Windows. Basic descriptive statistic parameters were calculated as means and standard deviations and paired samples t-test was used to determine whether there was a statistically significant difference between RKBS and AKBS with regards to distance, peak and mean momentum, peak and mean velocity and mean power. The accepted level of significance in this study was $p<0.05$.

Results

The mean values and standard deviations of amplitude, duration, peak and mean velocity, peak and mean momentum, and peak power for the concentric and eccentric phases of the Russian and American kettlebell swing styles are shown in Table 1. Paired samples t-test showed significant differences ($p<0.05$) in all tested variables, with the exception of mean power ($p=0.681$; Table 1).

Table 1. Differences between Russian and American Kettlebell Swing Style.

	Variables	Russian kettlebell swing	American kettlebell swing	p
Concentric phase	Amplitude (m)	1.92±0.19	2.49±0.22	0.000*
	Duration (s)	0.73±0.05	0.89±0.08	0.000*
	Peak velocity (m/s)	4.71±0.82	5.43±0.70	0.000*
	Mean velocity (m/s)	2.41±0.28	2.56±0.22	0.006*
	Peak momentum (kg·m/s)	116.39±14.97	130.28±16.83	0.000*
	Mean momentum (kg·m/s)	57.32±6.25	61.51±5.21	0.000*
	Mean power (W)	126.96±33.9	125.14±27.34	0.681
Eccentric phase	Duration (s)	0.86±0.06	1.05±0.09	0.000*
	Peak velocity (m/s)	5.02±0.59	5.63±0.73	0.001*
	Mean velocity (m/s)	2.43±0.21	2.53±0.13	0.039*
	Peak momentum (kg·m/s)	120.01±14.18	135.02±17.50	0.001*
	Mean momentum (kg·m/s)	58.16±5.28	60.47±3.17	0.040*

Note. Results are presented as means±standard deviations; *p<0.05.

Discussion

The study showed that the American kettlebell style had greater velocities, duration, and amplitude as well as peak and mean momentums in both the concentric and eccentric phases than the Russian style, though the power output was the same for both styles. Does this suggest that the American style is better than the Russian style? And if so, better for what? This is no single answer to this question, as each of the variables needs to be considered separately and placed in the context of the goal that the exercise seeks to achieve.

First, it should be noted that the higher eccentric phase velocity and momentum makes it a viable prevention tool for hip extensor muscles. Matthews and Cohen (2013) showed that sudden loading during the eccentric phase, followed by rapid contraction of the hamstring muscles, meets the specific requirements for the rehabilitation and prevention of hamstring injury (Comfort et al., 2009). On the other hand, the higher velocity and momentum also makes it a higher risk. It should be emphasised that a person using AKBS must have a higher level of technical proficiency and intramuscular coordination to decelerate and stop the movement of the kettlebell (Lake & Lauder, 2012). Mitchell et al. (2015) analysed the biomechanical requirements during AKBS and reported higher compression forces on the shoulder joint and appurtenant musculature during the end of the concentric phase of the swing. The presence of great compression force indicates that the momentum generated during the swing, unless controlled, can cause high shear forces, greatly increasing the risk of injury, even though the compression is relatively small. According to McGill and Marshall (2012) in terms of the relative risk, compressive loads from AKBS are not problematic, though the large shear to compression load ratio on the lumbar spine suggests that AKBS may be contraindicated for some individuals with spine shear load intolerance (McGill & Marshall, 2012).

Moreover, it is worth noting that if the shoulder mobility is not sufficient during the performance of AKBS, compensation movements are developed, especially lumbar lordosis (Hulsey et al., 2012). This is a mechanism that creates compression during spinal flexion, which is a common cause of disc protrusion (Keilman et al., 2017).

In contrast, RKBS does not include the trajectory part that creates unwanted compression, and it offers constant muscle tension, which can prove beneficial in developing shoulder stabilizer strength. In addition, Jay et al. (2011) suggested that the use of ballistic cyclic training, which generates high peak forces, substantially reduces lower back, neck and shoulder pain.

Other variables to consider are the amplitude and duration of the swing cycle. Results also showed that AKBS has significant 30% higher amplitude and 22% longer cycle duration. Therefore, we can assume that AKBS could ensure better development of muscular endurance than RKBS with equal training volume (i.e., equal number of sets and repetitions). Bullock et al. (2017) compared several kinematic parameters of the Russian and American style as well as the Indian club swing and similarly found a 34% greater cycle duration of the American style and subsequently greater workload compared to other types. Frrar et al. (2010) concluded that kettlebell training is more effective than circuit training using free weights when metabolic demand is considered. Furthermore, Falatic et al. (2015) showed that kettlebell training provided greater benefits than free weight and bodyweight training in oxidative capacity by increasing VO2max levels without losing weight.

The final feature is that both styles ensured equal mechanical power production, which is similar to the results reported by Lake, Hetzler, and Lauder (2014). Since the styles differ significantly in concentric phase duration, amplitude, and velocity, mechanical power output was expected to be similar, but was not. Given the benefits and risks that both styles provide, it seems safer to choose RKBS when the exercise goal is mechanical output in terms of power, as RKBS provides equal power output with less risk.

However, there are some limitations to this study. First, kinematic analysis was performed in two dimensions, meaning that every video was recorded in a single plane, with the possibility that a certain loss of data occurred regarding kettlebell trajectory in other planes. However, considering that the kettlebell swing is performed only in the sagittal plane and that there is less than two degrees of lateral deflection (McGill & Marshall, 2012), we can presume that any loss of data is minimal and negligible. Secondly, the body mass of subjects was highly variable (±11.1 kg), meaning that lighter subjects were in a relatively disadvantaged position during the performance of the swing. And finally, only one kettlebell weight was analysed, so we can presume that using a different weight would likely alter some of the relations between the mechanical outputs. In addition, Wesley and Kivi (2017) suggested that by changing the load, it is possible to significantly affect training outcomes during kettlebell exercise.

Conclusion

Kettlebell swing has taken its rightful place in the fitness industry among the "arsenal" of strength and conditioning coaches as an exercise that can be considered an important tool in developing strength, power and muscle endurance thanks to its unique ballistic nature. Both styles, American and Russian, offer unique possibilities such as rapid contraction and relaxation cycles that emphasise hamstring and hip extensor strength and power development. In addition, both styles offer considerable stimulus on the trunk stabilizers, which maintain their integrity and the natural curvature of the spine. However, the higher compression to shear ratio put on the lumbar spine during AKBS can be contraindicated for people with low back pain. Therefore, RKBS is recommended as it offers equal power output attained in a much safer manner.

In conclusion, despite their specific nature, both styles offer the same power output, though RKBS attains it in a safer manner and therefore could be used in rehabilitation purposes, while AKBS could potentially offer unique benefits when muscular endurance is the primary goal, all while maintaining the highest levels of technique mastery.

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Conflict of Interest
The author declares that there is no conflict of interest.

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