ANALYSIS OF STANDING UP IN FREE RUNNING PARKOUR BETWEEN STRAIGHT BACK FLIP 360° AND 720°

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Abstract

Backward standing is considered as one of the most important and commonly-used movements in free running parkour, where it may take place at any point while performing the skills. The study sample consisted of (1) player from the academy of Parkour and free running in Basra, where the participant trains in the hall of gymnastics training center of Basra directorate of education. Data were taken by 240 photo/second by using iPad 2020 camera, and this allowed the calculation of kinematic data. The results revealed that as the numbers of rotation increase, the communication angle at which the athlete lands on the mat while standing up decreases. In the back flip with one rotation (360°), the angle average was (51.9°), while in the back flip with two rotations (720°), the angle average was (49.3°). These results contribute to improving the technical training among parkour athletes.

Key words: Kinematic. Parkour. Body weight center. Kinova

Abstracto

Estar de pie hacia atrás se considera uno de los movimientos más importantes y de uso común en el parkour de carrera libre, donde puede tener lugar en cualquier momento mientras se realizan las habilidades. La muestra del estudio consistió en (1) jugador de la academia de Parkour y carrera libre en Basora, donde el participante entrena en la sala del centro de entrenamiento de gimnasia de la dirección de educación de Basora. Los datos se tomaron a 240 fotos/segundo usando la cámara iPad 2020, y esto permitió el cálculo de los datos cinemáticos. Los resultados revelaron que a medida que aumenta el número de rotaciones, disminuye el ángulo de comunicación en el que el atleta aterriza en la colchoneta mientras está de pie. En el back flip con una rotación (360°), el ángulo promedio fue de (51,9°), mientras que en el back flip con dos rotaciones (720°), el ángulo promedio fue de (49,3°). Estos resultados contribuyen a mejorar el entrenamiento técnico de los deportistas de parkour.

Palabras clave: Cinemática. Parkour. Centro de peso corporal. Kinova.

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Introduction and Importance

Each sport has its kinetic, physical, technical and mechanical characteristics as well as its skilled requirements that distinguish it from other sports. The sport of Parkour developed at the global level, and is, currently, practiced in the various cultural contexts. This sport combines technical performance, risk and innovation; it is a difficult sport, since its movements include frequent rolling, jumping, and running, flying and landing while performing the course of motion. In this vein, the law of Parkour mainly focused on achieving security and innovation among athletes while moving from one point to another.

The sport of Parkour was first introduced in France in the late 1980s, and was performed in a film called "Casino Royale"; one of James Pond series films, introduced in 2006. When this sport spread, some international organizations were established as representatives to it, including the international federation of Parkour and free running in 2008. Indeed, Britain was the first country that officially recognized parkour as an official sport, and allowed practicing it in schools and competitions in 2016, where it was described as an interesting and motivating sport (Lindsay, 2017).

The sport of Parkour was also introduced by the French navy officer "George Herbert", who encouraged practicing sports skills based on the models of the original tribes that he saw in Africa, where he suggested that those tribal people have marvelous, flexible and resistant bodies, even though they have no gymnastics coaches, and that nature has sculptured their bodies. Herbert became a teacher of physical education in the university of Reims in France, where he introduced a natural way that consisted of (10) basic sets; these are walking, running, jumping, quadrupedal movement, climbing, balancing, swinging, self-defense and swimming. All these movements aim to develop the three main vital powers that include (willingness, courage, and firmness), the morale powers (favor, assistance, and honesty), and the physical health that represents muscles and breathing. During the first and second World Wars, education gained more extension in this domain, where it became a standard system for teaching and military training.

The French man "David Belle" is the founder the sport of Parkour, where he learned it from his father "Raymond Belle", while training on the performance of some of its movements during army recruitment. Indeed, David developed the movements of Parkour and shared what he learned with others, until this sport gained more popularity and was practiced by more professional athletes. David derived the name parkour the classic obstacle course in military training of the French army, where this name was suggested by David's friend (Liberton, 2010).

Parkour is one of the sports that depends on intuition and high physical fitness; this sport encompasses motion arts, including humping skills with the ability to pass obstacles with the highest possible speed. The core basis of Parkour depends on the idea of escaping and the attempt of getting away from embarrassing situations; it highly resembles the movements of gymnastics (Kidder, 2013).

Parkour is a sport that depends on moving across obstacles with the highest possible speed, the easiest methods and with the least energy consumption while moving from one point to another. This sport resembles gymnastics, as it is a sport derived from the military martial arts that aims to moving quickly and effectively across a complex physical environment (Barow, 2000; Atkinson, 2009).

As far as the researchers know there is paucity in the studies that analyzed the structures of Parkour movement in detail.

Borms, et al analyzed back flip with a full rotation from a kinetic perspective, where he focused on the movements that are responsible for the body's rotation, particularly the arms. (Van Gheluwe, et al., 1997) conducted a study which aimed to investigate the Gymnastics athletes that use back flip- the two axes theory (known as cat's rotation) and the Hula theory (based on the gyroscopic effect). (Frohlich, 1979) investigated several possibilities for the body's position during rotation along the various body axes while flying, and compared it with certain movements in gymnastics. (George) explained the important vital mechanical rules for the good rotations in sports gymnastics. Also, (Pascal, 2011) conducted a study which investigated the general physical principles for the human body rotation while performing the Gymnastics skills. He explained how flips are generated, performed, and stopped, and demonstrated whether simultaneous flips across the different body axes affect each other. (Sands, et al., 2008)addressed the changes in some gymnastics elements, where they described the characteristics of quadrupedal movement and compared it with a triple rotation movement. (McCharles, 2006) also addressed rotation from an educational point of view, where he determined the criteria based on which we can decide the direction in which the Gymnastics athlete can achieve the best performance of rotation.

(Kristofic, 1996) addressed the physical principles that contribute to achieving the back flip with several rotations. He also investigated the forward speed acquired while running, the momentum movement of lower limps while stopping and the principle of inertia that ensures the constant rotation, the rules of angle speed of rotation with the change in inertia, as well as the

generation of secondary rotation based on the principle of gyroscopic effect and Coriolis effect. During the stages of running, jumping and back hand jumping, there is a decrease in angle between the parts of the lower limps and extends to the muscles of the standing leg, where a part of the motor energy is changed into a stable energy for the flexibility of the leg muscles. This form of mechanical energy is enhanced by the contraction of standing leg muscles and transformed into a motor energy during the stage of standing after the ideal performance of the standing stage that affects the following flying stage, and results in a completely mastered skill. The standing stage aims to transforming the acquired horizontal speed towards a slanted direction that results in an escalating motion for the athlete's body based on the optimal standing angle. This change in the speed direction along the legs' line according to a certain angle ensures the maximum optimal height and rotation for the body along the body's cross axis for a certain number of rotations. Indeed, the maximum height allows performing the maximum numbers of rotations along the body axis during the flight stage. The optimal angular speed for rotation during the flip is considered as a condition for the optimal implementation for the landing stage. The rotation starts on the longitudinal line of the body during the micro stages, when the standing power pass by the gravity center. Accordingly, the moment of rotation is established and the body rotates across the body axis that passes by the gravity center. During the flight stage, the athlete performs a secondary rotation along the body's axis based on asymmetric movements of the arms according to the gyroscopic effect and Coriolis effect.

One of the most important parts is related to the stage of communicating with the mat once again. If the performance of the previous flight stage was ideal for the temporal domain and the athlete has no problem below and above the flip, his body will be pushed downwards by the inertia. Based on the decentralized activity of the legs' muscles, the body's kinetic energy is transformed into various forms of energy and the body is given a stable position.

In sum, there is much information and a good understanding for the requirements of air flips. However, there is less information concerning the biomechanical comparison between the flip techniques in all the skill stages. Therefore, the current study aims to extend the domain of knowledge in this topic and come up with new ideas and facts. This study was conducted to analyze the stage of standing up in the straight back flip according to various rotation angles and selected kinematic variables.

The stages of practicing parkour

Practicing parkour is based on three basic stages that can't be overlooked; these are:

The first stage: This stage includes the set of movements that contribute to building the athlete's body and giving him power and physical fitness in order to have more tolerance, since this sport requires in order being able to promote training tolerance and do the required skills completely without any physical constraints.

The second stage: It is the stage of learning all the forms of movements. Before learning these movements, we should consider that those movements are difficult and dangerous, where individuals could be exposed to injuries while performing those movements. Therefore, individuals should select a suitable place for training, such as a garden or sports hall, and the place of training should be equipped with some objects that protect the individual while performing the movements and falling. For example, they could bring cushions or wet objects in order to alleviate the level of pain. Also, they can train on sand (Beach sand), and can ask for help by some friends, who can help the trainee or train with him. It is noteworthy that exercises should be performed accurately without exerting too much effort on the body in order to avoid harm.

The third stage: In this last stage, the learnt parkour movements are reviewed. Here, the athlete performs the movement that he learned while training, where he performs in front of his peers to prove hisskill in performing parkour movements. We assert that athletes should not risk themselves to show their skills unless they are certain about their abilities. See https://m3luma.com.

The study objectives

This study aims to identify the characteristics of standing up in free running parkour between straight back flip 360° and 720° among parkour athletes.

The study hypothesis

The researchers suggested that the angle of standing increases the level of rotation.

The study domains

The human domain: athletes from the academy of Parkour and free running in Basra.

The temporal domain: the period (5/5/ 2022 – 7/9/2022).

The spatial domain: the hall of gymnastics training center in Basra directorate of education.

The Study Procedures

The study sample

The study sample consisted of (1) player from the academy of Parkour and free running in Basra, where the participant trains in the hall of gymnastics training center of Basra directorate of education. He was (17) years old, his height is (165) cm, his weight is (73) kg, and his training age is (3) years. The athlete performed three attempts for straight back flip 360° and 720°, and the two skills were analyzed by using Kinova software v. 9.5.

The used devices and equipment

1. iPad 2020 pro camera with one triple holder, with a speed of 240 photo/second.
2. Dell computer (1).
3. A device for measuring weight and height.
4. A 12-meter long mat.

Kinova software.The pilot study

The researchers conducted a pilot study on Sunday 15/4/2022 at 6 pm with the help of assistants' team. The study was conducted in the hall of gymnastics training center of Basra directorate of education, on a sample that consisted of (1) player; knowing that the player was selected from outside the original study sample.

The objectives of the pilot study

1. Verifying the validity and availability of the required devices and instruments for taking the photos.

2. Determining the horizontal distance at which the camera should be placed to determine the horizontal range for taking the photos for the study variables accurately.

3. Determining the vertical height of the camera.

4. Identifying the kinesthetic variables that can be measured accurately by using camera.

5. Verifying the hall suitability for photographing.

6. Identifying the suitability of photographing.

7. Identifying the suitability of the phosphorus signs that show the body anatomical features (joints) and instrument.

The main study

The researchers conducted the main study on Sunday 22/5/2022, where the photographing place was prepared with the help of assistants' team in the hall of gymnastics training center of Basra directorate of education. The camera was placed vertically on the performance motor course at a distance of (10) meters and a height of (1.50) meters. The photographing reference was placed with a measurement of (1.5 m × 1.5 m). The athletes were prepared and were given a sufficient time for warning up, and for taking the values of mass, height and weight of athletes (Figure 1).

Displaying and Discussing the Results

The researcher assumed that the angle of standing increases rotation (Table 1).

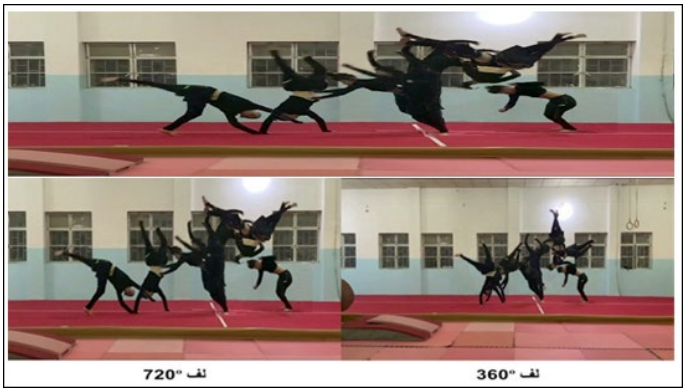

Figure 1: The study skills.

Table 1: The results of measuring the straight back flip with different rotations.

Number of rotation	Angle (degree)	Speed (m/sec)	Height (m)
Attempt (1) 360º	55.83	4.55	1.46
Attempt (2) 360º	52.443	4.46	1.61
Attempt (3) 360º	51.325	4.57	1.54
Attempt (1) 720º	51.15	4.57	1.47
Attempt (2) 360º	50.542	4.49	1.38
Attempt (3) 360º	48.014	4.65	1.29

Results

The results showed that there are changes in the angles during the stage of standing based on the number of rotations in the straight back flip performed after the round off.

Discussing the Results

The data proved our assumption related to dealing with the angular characteristics at the beginning of the standing stage in the straight back flip with different numbers of rotations. Due to the lack of previous studies that addressed this topic, we cannot compare our results with the results of any other study. Based on the theory and results, the course of body center is determined completely according to the variables at the moment of standing completion; these are standing speed, standing angle and the height of gravity center in that moment. (Sands, 2008) suggested that the standing angle in the back flip with a triple rotation is lower than it in the back flip with quadrupedal rotation. It is important to know that these changes resulted from the previous stages. The study demonstrated the effect of communication stage on the flight stage with regard to long jump in high jump in athletics (Linthorne, 1998; Yeadon, 2000), where reaching the maximum height and length is so viewed as a beneficial factor to performance. Our results also revealed that the requirements of the flight stage or the number of rotations during the contact stage result in changes in the contact angle. If the angle is smaller, the athlete will be able to change the horizontal speed into a vertical one in a better way. Also, the speed of running and the changes in that speed determine critical variables in the completion of the standing stage.

Conclusion

In the light of the results, the researchers concluded that when the number of rotations increases, the contact angle at which the athlete lands on the mat at the beginning of the flight stage decreases. In the back flip with one rotation (180°), the average angle is (54°), and in the case of (1080°) of the back flip, the average angle is (45.9°). These results may contribute to improving the technical training among gymnastics athletes.

Recommendations

In the light of the results, the study recommended the following:

1. Training athletes based on qualitative trainings that contribute to improving gymnastics skills.

2. Conducting similar studies about kinematic variables related to the skill of triple rotation and its relationship with performance.

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