IJPESS
Indonesian Journal of Physical Education and Sport Science
p-ISSN 2775-765X | e-ISSN 2776-0200
Volume 4, No. 4, December 2024 Page. 486-496
http://journal.unucirebon.ac.id/index.php ijpess

Motion Analysis of Sreng Traditional Game: The Ideal Technique

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Received: 18 October 2024, Approved: 10 November 2024, Published: 30 Month 2024

Abstract

Studi purpose. This study aims to determine the ideal technique in playing Sreng game.

Materials and methods. This research uses a descriptive analysis method to present a complete explanation of the results of quantitative research. The data collection techniques used in this study include surveys, observations and documentation which are then analyzed to retrieve kinematic data such as time, angle and distance. The population in this study were students of the Faculty of Sports Science, Universitas Negeri Semarang who were members of KDOT as many as 20 people. The data analysis technique uses Kinovea Software version 0.9.5, which makes it easy to observe movements clearly and in detail.

Results. The results found that the average step distance obtained was 1.493 ± 0.172 meters, the limb angle was 54.36 ± 8.695 degrees, the right elbow flexion angle was 129.04 ± 12.055 degrees, and the torso flexion angle was 20.03 ± 6.225 degrees. The time required to perform the movement obtained an average of 0.733 ± 0.136 seconds with an average speed generated of 2.10 ± 0.458 m/s. The average height of the handle produced was 0.707 ± 0.080 meters and the height of the iron was 0.158 ± 0.066 meters.

Conclusions. This study found that based on the analysis of footsteps, there is a significant difference between the right and left steps, which is due to the adjustment of movements to balance the Sreng. In addition, grip height and iron contact also play an important role in maintaining balance to be able to control the Sreng iron well, iron contact must be low and close to the ground, so that balance in steps and controlling Sreng can be maintained.

Keywords: Traditional Games, Motion Analysis, Sreng, Ideal technique

DOI: https://doi.org/10.52188/ijpess.v4i4.865

Introduction

Traditional games are relatively simple games, but have enormous benefits if we dig deeply into their meaning. Children's play environment has changed, causing traditional games to be rarely played (Husein MR, 2021). Most of the traditional games and sports are indigenous cultural expressions and lifestyles that contribute to human identity in general, but many have disappeared and those that still survive are in danger of being lost due to the impact of globalization and efforts to harmonize the diversity of the world's sports heritage (Boro et al., 2015). Space and time constraints in schools, due to the large number of students

and limited playground space, are one of the main obstacles in organizing traditional games during school breaks and class meetings (Kovacevic & Opic, 2014).

In this era, many people are entering the era of globalization. In fact, almost all developed societies follow the times in this globalization era. Traditional games have begun to be forgotten by children, not even a few children who do not know what traditional games are (Anggita et al., 2018). People's lifestyles are changing from traditional life to modern life. This rapidly developing technology can affect the fading of Indonesian culture (Rut et al., 2020). Along with the development of technology, children tend not to move when playing it (Q.A.P. & Irfansyah, 2015). The loss of traditional games is caused by several factors, namely: (1) lack of facilities and places to play; (2) time constraints, especially the increasingly complex demands of the times, which are increasingly burdensome for children; (3) Traditional games Modern foreign games are being launched, do not take up space and are not limited by time, you can play them during the day, morning, afternoon, and night without waiting. Another role is, (d) the disruption of cultural heritage that previous generations did not have time to record, document, and socialize it as a socio-cultural product to be passed on to future generations (Tedi, 2016).

These traditional games need to be preserved because in addition to being an entertaining, fun and social sport, they also have the potential to improve the physical fitness of the participants (Hakim, 2019). In addition to preserving the culture and character of the nation and providing joy for the players, traditional games that have been passed down from generation to generation have many benefits and are beneficial for psychological development, increasing creativity, agility, enthusiasm and initiative. It can also be used as an exercise method to improve physical fitness (Mudzakir, 2020). Traditional games need to be developed to maintain their existence because traditional games are not just games, but also have inherent cultural values and elements (Zuliyanti & Galuh, 2021). Traditional games contain elements of noble teachings from the owner and can also instill moral values from the owner of the traditional game itself (Handoko & Gumantan, 2021).

Physical activity, also known as external activity, refers to a series of body movements that utilize force or energy (Widiyatmoko & Hadi, 2018). Common terms often associated with physical activity include wellness, newness, and opportunity (Shoesmith et al., 2020). In general, traditional games tend to utilize physical activity (Kuswanto et al., 2022). In contrast to modern games that focus more on mental activities. Thus, games that emphasize physical movement can indirectly also be considered a form of exercise. Traditional games have a great impact in improving physical health, fitness, and social interaction because they involve physical activity (Smith, 2019). Besides being entertaining, these games also help in the development of motor skills, coordination, and body strength (Jones & Brown, 2020). Across cultures, traditional games have an important value as part of the cultural heritage that is passed on from one generation to the next (Garcia & Nguyen, 2018).

There are various traditional games that can be played with the characteristics of each region. In Semarang Regency there is one game that is characterized by the Sreng game. Sreng is a game made of iron shaped like a wheel. The way to play Sreng is by rolling the iron wheel and keeping it straight directed using a handle or “gantol” made of iron as well (Budiawan, 2024). The beginning of the emergence of this game was around the 1970s, at which time in Semarang Regency there was an oil company that stored its raw materials using iron barrels or drums (Maulana et al., 2023). Then from the many unused iron barrels or drums, the workers cut the bottom circle of the barrel which was then used to play during breaks. That's where the emergence of this game was named Sreng because it is based on the sound when played.

In general, traditional games look easy to play, but require the correct technique so that the movements are optimized (Rahesti et al., 2023). Technique is divided into several

aspects in traditional games including (1) body strength, (2) body flexibility, (3) movement speed, and (4) reaction ability (Ardiyanto, 2019). Each traditional game has a unique method that must be learned and mastered by the players. In addition, the ability to plan strategies and tactics is also an important aspect of playing traditional games, where players must be able to interpret game situations, make smart decisions, and adjust their strategies according to changes that occur during the game (Irawan et al., 2024).

On April 23, 2024 the author saw students playing Sreng games in the event of strengthening the profile of Pancasila students at Hidayatullah Islamic High School with a total of 25 students. Of the 25 students who can play it correctly only 5 students. Then on May 15, 2024 the author made observations on Sports Science students who are members of KDOT as many as 20 students. Of the 20 students who can control the iron with a stable speed, only 7 students. Traditional `Sports Community (KDOT/Komunitas Dolanan Olahraga Tradisional) is a community established with the aim of preserving traditional games within the scope of the Faculty of Sports Science, Universitas Negeri Semarang. From the observations made, there are still many problems found in playing the Sreng game. The iron only rolls a few meters then turns and falls. This is because they have not been able to control the iron properly and correctly. The technique of contact with the iron and a strong grip are very influential in controlling this game. If the grip is not strong and consistent and the contact with the iron is not right, the iron will be difficult to control or even unable to walk.

In his research Wibisona et al. (2019), said that the traditional game of egrang has dominant physical elements, namely balance, endurance, body coordination and muscle strength. This is in line with the Sreng game which also relies on balance components and muscle strength. Balance is needed so that the iron can run stably and is easy to control. According to Santoso & Setiabudi (2020), tug-of-war games as part of physical activity or sports, can affect hand muscle strength, leg muscle strength, shoulder muscle strength, and teamwork. In addition to balance, in tug of war games muscle strength is also needed, especially arm muscles in order to control the grip on the iron so that it does not easily turn and fall.

Good performance is inseparable from good physical condition, because basically the traditional Sreng game also includes several physical components, namely balance, speed and arm strength (Irawan & Prastiwi, 2022). Motion analysis is needed by both coaches, teachers, athletes, and biomechanics experts to identify movements and muscles that can improve ability and know the function as an active motion mechanism tool, joints, bones and nerves that will help perfect the movement, because each movement requires effective energy to achieve the desired result or goal and to avoid injury when performing the movement (Irawan et al., 2023). This view is reinforced by research from Irawan & Long-Ren (2019), which reveals that learning movements to achieve effective and efficient techniques can reduce the risk of injury. Therefore, the author intends to analyze traditional games in movement analysis both anatomically, mathematically, and also in terms of physics in detail. The purpose of this study is to determine the movements as well as the proper iron grip and imposition techniques in playing Sreng.

Materials and methods

Study participants

The population in this study were 27 students of the Faculty of Sports Science, Universitas Negeri Semarang who were members of KDOT. The sampling technique in this study used purposive sampling technique. Purposive sampling is a sampling technique based on the consideration of the researcher or evaluator about which samples are the most useful and representative (Babbie, 2004). Of the 27 people, only 20 people were taken who fit the

criteria, namely being present at the time of sampling and agreeing to be sampled from the beginning to the end of the study.

Study organization

This research uses descriptive analysis methods to present a complete explanation of the results of quantitative research. According to Samsu (2021) descriptive research method is a method in researching the status of a human group, an object, a condition, a thought, or a current event. Descriptive methods are used to create a systematic, factual and accurate description or description of existing phenomena. The data collection techniques used in this study include surveys, observations and documentation which are then analyzed to retrieve kinematic data such as time, angle and distance.

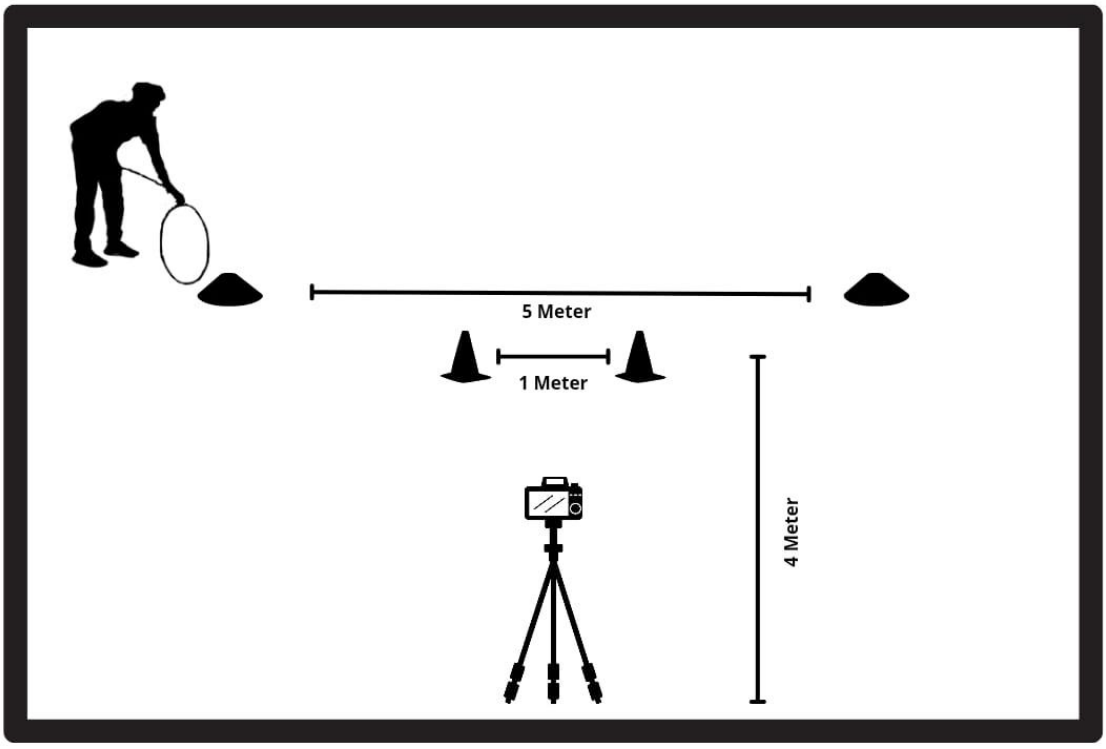


Figure 1. Sketch of Data Collection

In this research, there are several tools used such as 1) books and stationery, 2) cellphones, 3) SRENG, 4) Sony A6600 type cameras, 5) tripods, 6) cones, 7) laptops with Kinovea 0.9.5 software applications. Quantitative data in this study includes kinematics data which is divided into three phases: preparation phase, implementation phase, and final phase. The data were obtained through documentation in the form of video recordings with a Sony A6600 camera placed perpendicular to the right side of the sample at a distance of 4 meters and focused on the participant's movements within 5 meters. The placement of the tool when taking documentation is shown in Figure 1. The research was conducted using the following procedures: (1) The researcher prepared the facilities and infrastructure that would be used as a place to conduct research; (2) All 20 samples gathered at the prepared place; (3) The sample was given an explanation of the test to be carried out; (4) The sample was given the opportunity to perform the Sreng play movement with a distance of 5 m; (5) The researcher conducted documentation by recording video when the sample performed the movement.

Statistical analysis

In this study, the data analysis technique used Kinovea software version 0.9.5, which makes it easier to observe movements clearly and in detail. The data collected was transferred to a laptop that had Kinovea software installed. This software provides a complete range of video analysis tools, so that each stage of the movement can be analyzed in detail. Furthermore, the data was inputted into the Kinovea software to identify the angles of movement and possible errors made by the subject when performing movements in the Sreng game. The final results in the form of images that have been processed and analyzed show the deficiencies or weaknesses of the subject's movements while playing Sreng.

Results

Sample data regarding height, weight, BMI, and limb length are shown in Table 1. Based on the results of the study, the average height was 1.69 ± 0.084 meters, body weight was 66.3 ± 19.271 kg, BMI was 22.97 ± 5.40, and limb length was 0.825 ± 0.092 m. This study produces indicators such as height, weight, step distance, leg angle, elbow flexion angle, torso flexion angle, time, speed, grip height, and iron contact height. The movement analysis in this study was divided into three stages: preparation, execution, and end. The results of the movement analysis can be seen in Table 1.

Table 1. Anthropometric Data

N=20	Mean ± SD	Min	Max
Body Height (m)	1,69 ± 0,084	1,5	1,8
Body Weight (kg)	66,3 ± 19,271	41	120
BMI (kg/m²)	22,97 ± 5,40	15,24	39,18
Limb Length (m)	0,825 ± 0,092	0,71	1,03

Based on the data in table 2, as many as 20 Sports Science students who are members of traditional game courses in the phase 1 step, the average step distance obtained is 1.493 ± 0.172 meters, the limb angle is 54.36 ± 8.695 degrees, the right elbow flexion angle is 129.04 ± 12.055 degrees, and the torso flexion angle is 20.03 ± 6.225 degrees. The time required to perform the movement obtained an average of 0.733 ± 0.136 seconds with an average speed generated of 2.10 ± 0.458 m/s. The average handle height produced was 0.707 ± 0.080 meters and the height of the iron imposition was 0.158 ± 0.066 meters. The 1-step phase is a series of movements of 1 right step and 1 left step.

Table 2. Kinematic Data of SRENG Game

N=20	Mean ± SD	Min	Max
Phase 1 Step			
Step Distance (m)	1,493 ± 0,172	1,15	1,8
Limb Angle (°)	54,36 ± 8,695	41,9	69,15
Right Elbow Flexion Angle (°)	129,04 ± 12,055	105,8	144,8

Torso flexion angle (°)	20,03 ± 6,225	13,9	37,9
Time (s)	0,733 ± 0,136	0,5	1
Speed (m/s)	2,10 ± 0,458	1,57	3,12
Grip Height (m)	0,707 ± 0,080	0,52	0,88
Iron Contact Height (m)	0,158 ± 0,066	0,04	0,28
Right Step Phase			
Step Distance (m)	0,754 ± 0,101	0,54	0,91
Right Limb Angle (°)	55,26 ± 10,287	40,6	73,1
Right Elbow Flexion Angle (°)	129,035 ± 11,77	106,8	152,4
Torso Flexion Angle (°)	20,19 ± 6,146	13	35,1
Left Step Phase			
Step Distance (m)	0,739 ± 0,084	0,61	0,92
Left Limb Angle (°)	53,45 ± 8,52	37,9	67,9
Right Elbow Flexion Angle (°)	129,04 ± 13,034	104,8	156,2
Torso Flexion Angle (°)	19,85 ± 6,710	13,2	40,7

In the right step phase, the average step distance was 0.754 ± 0.101 meters, the limb angle was 55.26 ± 10.287 degrees, the right elbow flexion angle was 129.035 ± 11.77 degrees and the torso flexion angle was 20.19 ± 6.146 degrees. In the left step phase, the average step distance obtained was 0.739 ± 0.084 meters with a limb angle of 53.45 ± 8.52 degrees, a right elbow flexion angle of 129.04 ± 13.034 degrees and a torso flexion angle of 19.85 ± 6.710 degrees.

Discussion

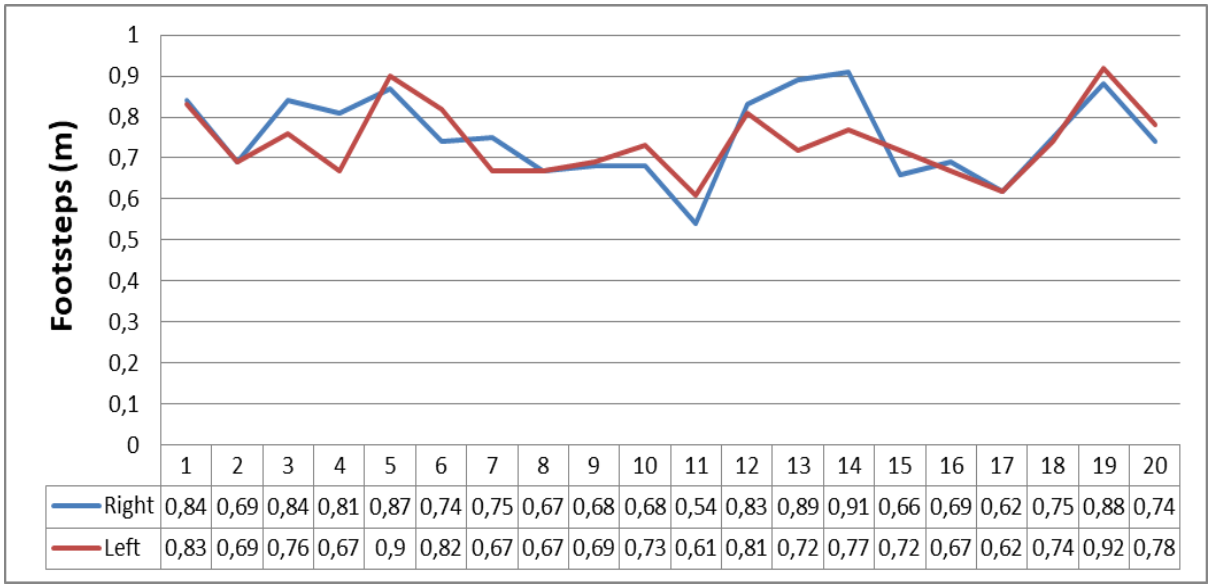
Based on the results of the motion analysis research of the Sreng game, kinematic data taken such as step distance, leg angle, right elbow flexion angle, torso flexion angle, time, speed, grip height and iron strike height obtained from video documentation that has been analyzed using Kinovea as shown in Figure 1.

Figure 1. Analysis of Sreng Play Motion

In the Sreng game, the series of movements is divided into three phases, namely the preparation phase, the implementation phase, and the final phase which can be seen in Figure 2. The kinematic data taken focuses on the implementation phase which includes the right step and left step movements to find out the correct technique in playing the SRENG game. Balance is very necessary in playing this game, this is because if it is not balanced then the iron will easily turn directions and can fall.

Figure 2. SRENG Motion Phase

The data displayed in Figure 3 is the distance of the right and left footsteps. From these data there are several samples that have right footsteps and left footsteps that have a large difference in distance as in sample 3 which has a right footstep distance of 0.84 meters and a left footstep of 0.76 meters, sample 4 right footstep distance of 0.81 meters and left footstep of 0.67 meters, sample 13 right footstep distance of 0.89 meters and left footstep of 0.72 meters, and sample 14 right footstep of 0.91 meters and left footstep of 0.77 meters. The longest right footstep distance was 0.91 meters and the shortest was 0.54 meters and the longest left footstep distance was 0.92 meters and the shortest was 0.61 meters.

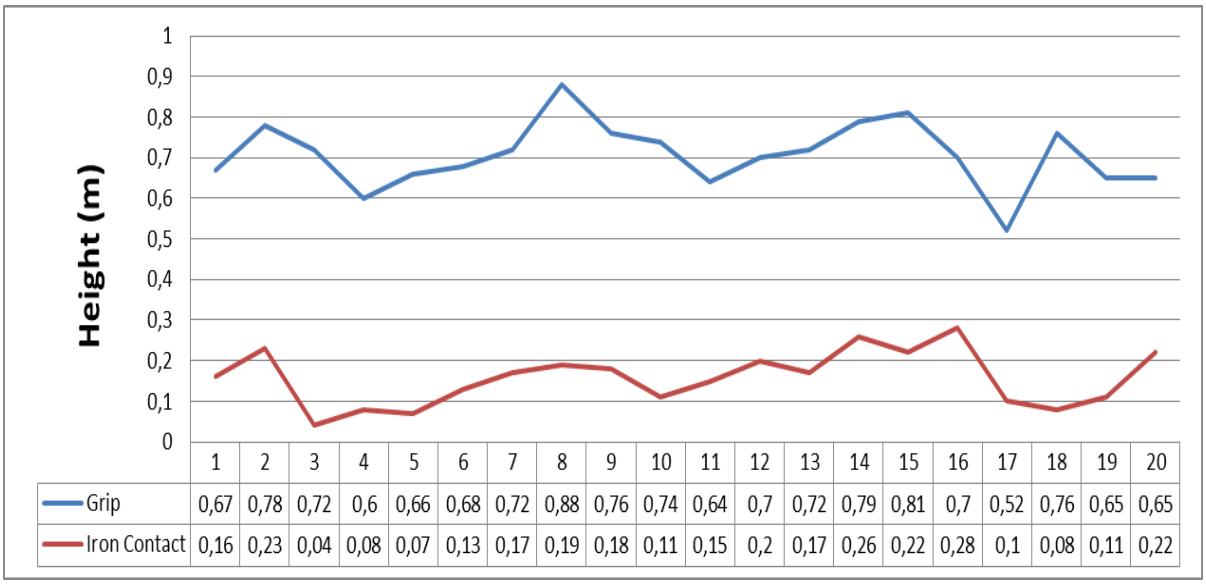


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Right	0,84	0,69	0,84	0,81	0,87	0,74	0,75	0,67	0,68	0,68	0,54	0,83	0,89	0,91	0,66	0,69	0,62	0,75	0,88	0,74
Left	0,83	0,69	0,76	0,67	0,9	0,82	0,67	0,67	0,69	0,73	0,61	0,81	0,72	0,77	0,72	0,67	0,62	0,74	0,92	0,78

Figure 3. Footstep Graph

After analysis, the difference in distance between the right footstep and the left footstep is due to the sample's imbalance when controlling the iron, which makes the sample have to adjust the movement towards the direction of the iron, thus affecting the distance of

the next footstep. This is what makes the difference between the right footstep and left footstep. In addition to the distance of the footsteps, the height of the handle and the imposition of the iron also affect the balance when performing the movements of playing Sreng which can be seen in the data in Figure 4.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Grip	0,67	0,78	0,72	0,6	0,66	0,68	0,72	0,88	0,76	0,74	0,64	0,7	0,72	0,79	0,81	0,7	0,52	0,76	0,65	0,65
Iron Contact	0,16	0,23	0,04	0,08	0,07	0,13	0,17	0,19	0,18	0,11	0,15	0,2	0,17	0,26	0,22	0,28	0,1	0,08	0,11	0,22

Figure 4. Graph of grip height and iron contact

Based on the data displayed above is the data on the height of the handle and the height of the iron. From the data, the highest grip was owned by sample 8 of 0.88 meters and the lowest was owned by sample 17 of 0.52 meters. In the iron imposition data, the highest was owned by sample 16 of 0.28 meters and the lowest was owned by sample 3 of 0.04 meters. From the results of the analysis based on the data above, it was found that in order to be able to control the iron in the SRENG game properly, the iron must consistently hit the lowest part or close to the ground and not too high. This is because the iron will be easier to control. From the image data above, several findings are obtained, namely if the iron is low and the handle is high as in sample 3 with a handle height of 0.72 meters and an iron imposition height of 0.04 meters, there will be an imbalance in stepping due to adjustments to the iron that moves unbalanced. If the grip is low and the iron imposition is high as in sample 16 with a grip height of 0.70 meters and an iron imposition height of 0.28, there will be an imbalance in the iron movement because the impetus given will make the iron difficult to control.

Conclusions

The conclusion of this study found that the footsteps showed significant differences between the right and left steps, which resulted from the imbalance when controlling the iron. This led to movement adjustments to follow the direction of the iron, thus affecting the distance of the next step. In addition, grip height and iron contact also play an important role in maintaining balance. A grip that is too high or low, as well as an iron strike that is not close to the ground, will make it difficult to control the iron and cause imbalance in movement. In conclusion, to be able to control the Sreng iron well, the iron contact must be low and close to the ground, so that the balance in the step and control of the Sreng can be maintained.

Acknowledgment

The researcher would like to thank KDOT and the sport biomechanics team of Universitas Negeri Semarang.

Conflict of interest

There is no conflict of interest of this study.

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Cite this article as: Achmad Setiyo Wibowo *et al*. (2023). Motion Analysis of Sreng Traditional Game: Ideal Playing Technique. *Indonesian Journal of Physical Education and Sport Science (IJPESS)*, *4*(4), 486-496. https://doi.org/10.52188/ijpess.v4i4.865