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Sho Ito

Waseda University, Tokorozawa, Saitama, Japan

Larry Crawshaw

Portland State University

Kazuyuki Kanosue

Waseda University, Tokorozawa, Saitama, Japan

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Differences between male and female elite free-style wrestlers in the effects of “set up” on leg attack

Authors' Contribution:

- A** Study Design
- B** Data Collection
- C** Statistical Analysis
- D** Manuscript Preparation
- E** Funds Collection

Sho Ito^{1ABCD}, Larry Crawshaw^{2D}, Kazuyuki Kanosue^{3ABCDE}

¹ Graduate school of Sport Sciences, Waseda University, Tokorozawa, Saitama, Japan

² Department of Biology, Portland State University, Portland, Oregon, USA

³ Faculty of Sport Sciences, Waseda University, Tokorozawa, Saitama, Japan

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Abstract

Background and Study Aim:

Leg attack is the most basic skill in free-style wrestling. Before executing a leg attack, balance and anticipation of the opponent must be disrupted. We defined this action as the “set up”. The aim of this study is knowledge about the effects of “set up” on the success rate of leg attacks, and answer to question: whether or not a gender difference exists in the use and effectiveness of “set ups” in the elite level of the wrestling matches.

Material and Methods:

We analyzed video recordings of 57 matches of male free-style wrestling seniors, 58 matches of female seniors, 60 matches of male cadets, and 59 matches of female cadets all in international competitions (not necessarily the same). Analyzed were: (1) the use of “set ups” before a leg attack; (2) the result (success or failure) of the leg attack; (3) the points given to the attacker in relation to the leg attack. To examine the associations between “set up” and success/points, we performed a chi-square test.

Results:

In male free-style wrestler seniors there was a statistically significant association between the presence of a “set up” and success of the leg attack, as well as between the presence of a set up and the points received for the leg attack. However, in female seniors, and male and female cadets there was no significant relationship for either of the above associations.

Conclusions:

In men’s freestyle wrestling, the “set up” before a leg attack improves the success rate of the leg attack and also increases the points awarded to the attacker. However, senior women and the cadet generation of both males and females did not exhibit either of these relationships.

Keywords:

centre of gravity • feint • match • reaction time • “set up” • wrestling

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Author’s address:

Sho Ito, Graduate school of Sport Sciences, Waseda University, 2-579-15 Mikajima, Tokorozawa, Saitama, 359-1192, Japan; e-mail: wuwc.f57@fuji.waseda.jp

Wrestling – *noun* a sport in which two contestants fight by gripping each other using special holds, each trying to force the other's shoulders onto a mat [19].

Match – *noun* **1.** a contest between opponents, especially a sporting contest **2.** somebody or something capable of competing equally with another person or thing [19].

Centre of gravity – *noun* **1.** the point at which a body can be balanced. Abbreviation **CG** **2.** the point through which the force of gravity acts [19].

Score – *noun* **1.** the total number of points gained by a player or team at the end of or during a match or game **2.** a record of the number of points gained by a player or team in a match or game **3.** an action that leads to the gaining of a point or points in a match or game ■ *verb* to gain a point or goal [19].

Reaction time – *noun* the interval of time between the application of a stimulus and the first indication of a response [19].

Feint – *noun* a deceptive move in a competitive sport [19].

Kuzushi – to break down the opponent's *kamae*, or to unbalance him [20].

Tsukuri-to-kake – in *jūdō* *tsukuri* refers to the action of setting up to technique, and *kake* is the execution [20].

INTRODUCTION

Wrestling utilizes weight classes, and many wrestlers cut weight to increase the proportion of lean body mass in the overall body weight. There is no difference in body composition, isokinetic contraction muscular strength or reaction time between elite and university student wrestlers [1]. There is also no difference in body weight and body composition between top elite and sub-elite wrestlers [2]. Thus, good skill and advanced strategy are more important for winning wrestling matches at this level.

Since an important aim of combat sports such as wrestling, sumo, and judo is to take down a standing opponent, breaking the opponent's balance is very important in these matches [3, 4]. In freestyle-wrestling, in which the use of legs is allowed for both offense and defense, leg attack is one of the most fundamental skills. Tünnemann & Curby [5] found that gold medalists in freestyle wrestling in the 2016 Rio Olympics earned the most points by leg attacks in both men's and women's free-style-wrestling. In addition, athletes who achieved excellent results at the women's world championships earned many points by leg attack [6]. Thus, leg attack in freestyle wrestling is one of the most important factors in determining the outcome of a match. To execute a successful leg attack against a quality opponent, the balance and anticipation of the opponent must be disrupted. This can be accomplished in many ways, which include fake attacks and changes in tempo or speed. In judo, this disruption is referred to as "kuzushi" or "balance breaking". English speaking wrestlers usually refer to it as a "set up". In an effective "set up", the centre of gravity of the opponent is raised, and moved away from the midpoint of the base of support.

An important premise of our research is the fact that first author (S.I.) has a great deal of experience in both the participation and coaching of wrestling. It seemed to him that the attack strategy differed between genders.

The aim of this study is knowledge about the effects of "set up" on the success rate of leg attacks, and answer to question: whether or not a gender difference exists in the use and effectiveness of "set ups" in the elite level of the wrestling matches.

MATERIAL AND METHODS

Analysis of competition

For male free-style wrestling seniors, we analyzed video clips of 57 matches (Table 1) in the finals and bronze-medal matches of the 2018 seniors European Championships, and the finals, bronze-medal matches and 5th-place decision matches of the 2018 World Cup matches. For female seniors, we analyzed video clips of 58 matches (Table 2) for the finals and bronze-medal matches of the 2018 seniors European Championships and the 2018 seniors World Championship Tournament. For male cadets, we analyzed video clips of 60 matches (Table 3) in the finals and bronze-medal matches of the 2018 cadet European Championships and 2018 cadet World championships. For female cadets, we analyzed video clips of 59 matches (Table 4) for the finals and bronze-medal matches of the 2018 cadets European Championships and the 2018 cadet World Championship Tournament.

Video clips of the matches were obtained from the United World Wrestling (UWW) official web site. The video clips were downloaded to a PC

Table 1. The number of matches analyzed in each weight class (male free-style wrestler seniors).

Weight class	57kg	61kg	65kg	70kg	74kg	79kg	86kg	92kg	97kg	125kg	total
Number of analyzed matches	6	5	5	6	6	6	6	6	6	5	57

Table 2. The number of matches analyzed in each weight class (female free-style wrestler seniors).

Weight class	50kg	53kg	55kg	57kg	59kg	62kg	65kg	68kg	72kg	76kg	total
Number of analyzed matches	6	6	6	6	5	6	6	6	6	5	58

Table 3. The number of matches analyzed in each weight class (male free-style wrestler cadets).

Weight class	45kg	48kg	51kg	55kg	60kg	65kg	71kg	80kg	92kg	110kg	total
Number of analyzed matches	6	6	6	6	6	6	6	6	6	6	60

Table 4. The number of matches analyzed in each weight class (female free-style wrestler cadets).

Weight class	40kg	43kg	46kg	49kg	53kg	57kg	61kg	65kg	69kg	73kg	total
Number of analyzed matches	5	6	6	6	6	6	6	6	6	6	59

(Lavie, NEC, Tokyo, Japan) as MP4 files using the screen recording function. We clipped and saved the entire match from the original video. For playback of the video, we used a Quick time player (Apple Inc, California, U.S.A). For the match in each video clip, our analysis utilized the following criteria:

(1) Presence of “set up”

The action of the attacker prior to a leg attack which can be recognized as an attempt to disturb the opponent’s defense was defined as a “set up”

(Figure 1). Each leg attack was classified according to whether there was a “set up” or not.

(2) Result of leg attack

In order to clarify the effects of the “set up”, the results of each leg attack were investigated. We categorized a leg attack as a success or failure depending upon whether the attacker caught the opponent’s leg or not.

(3) The points given to the leg attacker

In wrestling, if no one is pinned, the person who



Figure 1. An example of a “set up” (1 face each other; 2-3 attacker (red) pulls opponent’s right hand; 4 attacker release opponent’s right hand; 5-7, succeed leg attack). This picture was taken in the Japanese 2018 Inter College Championship and the permission was obtained to use photos from the relevant athletes.

gets the most points in a match wins, so we also determined the points achieved that were directly linked to a leg attack. When judges gave points to the attacker after a leg attack, the attack was classified as “scoring points”. If following the leg attack no points were scored or points were lost, the attack was categorized as “other”.

The above criteria were determined by two evaluators. One was an author (S.I) and the other an active wrestler (2014 Youth Olympic champion). When the evaluations of an encounter did not match between the two evaluators, that particular encounter was excluded from the analysis.

Other exclusion criteria

When two athletes were in close proximity [6], it was difficult to judge whether or not a “set up” was performed, and such situations were excluded from the analysis. Also, just before the end of a match, the losing athlete knows that the only hope is to attack, often a bit wildly. This creates a very different situation. Therefore, the last 30 seconds of each match were excluded from the analysis.

Statistics analysis

Our analysis utilized specialized statistical software (SPSS statistics version 24, IBM, U.S.A). A cross tabulation table was made and a chi-square test was conducted to investigate the relationship between the “set up” and the ensuing result of a leg attack, as well as the relationship between set up and points achieved. A p-value of less than 0.05 was considered statistically significant.

RESULT

Seniors

In male seniors, the chi-square analysis indicated a significant association between the presence of a set up and success rate of the leg attack ($p < 0.05$, Figure 2A). However, in female seniors there was no such significant association ($p = 0.199$, Figure 2B).

In male seniors a significant association was also found between the presence of a set up and the points awarded for a leg attack ($p < 0.05$, Figure 3A). However, in female seniors there was no significant association for this latter relationship ($p = 0.183$, Figure 3B).

Cadets

In cadets, there was no significant association for either relationship in either sex (Figure 4 and 5).

DISCUSSION

In the men’s senior freestyle matches there were statistically significant associations between the presence of a set up and the success of a leg attack as well as the presence of a “set up” and the points awarded for a leg attack. Since this study involved elite athletes participating in international competitions, their skill levels were very high. For such athletes, one expects that it would be very difficult to carry off a successful takedown with the opponent in a stable posture. Therefore, before a leg attack most wrestlers perform a set up to disrupt the opponent’s balance.

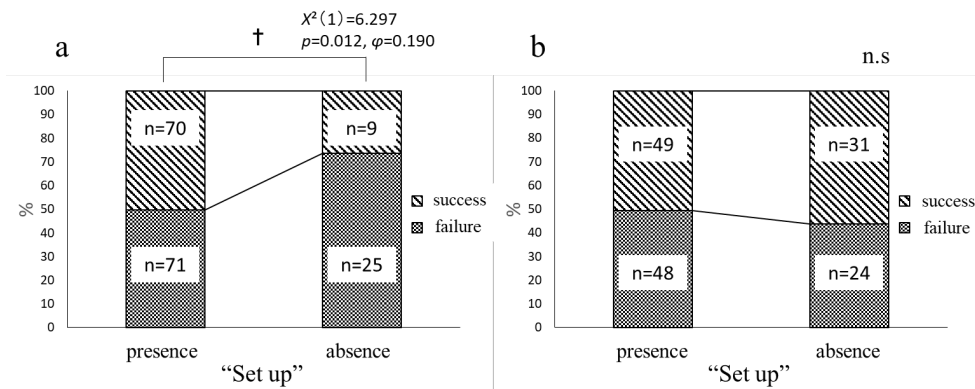


Figure 2. The success rate of leg attack for free-style wrestler: male seniors (A) and female seniors (B).

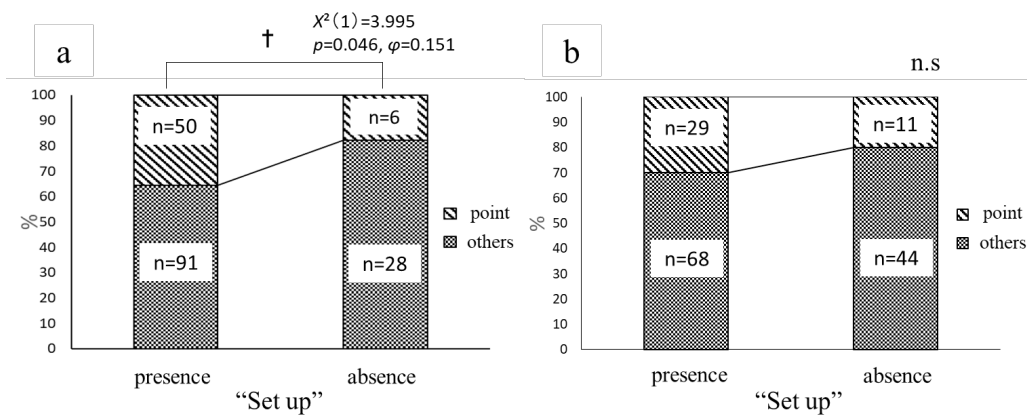


Figure 3. The rate of leg attackers scoring points for free-style wrestler: male seniors (A) and female seniors.

In judo, throwing skills are ordered into three successive steps: *kuzushi* (balance breaking), *tsukuri* (positioning), and *kake* (application). It has been shown that a smooth throwing motion can be best accomplished by disrupting the opponent's centre of gravity with *kuzushi* and *tsukuri* [7]. When judokas attempt a throw, they first apply the force to the opponent in a direction opposite to the direction they wish to throw the opponent in the *kuzushi* phase. The opponent then typically makes a slight movement to counter this *kuzushi*, creating a motion (and position) that makes it easier for the attacker to throw the opponent [8].

For karate competitors, Mori et al. [9] measured the reaction time involved in anticipating the attack of an opponent. Experts had shorter reaction times than novices. Most likely, the experts' reaction times were shorter because they were

better able to predict the intended action of the opponent. The subjects of this study also have a high skill levels. This undoubtedly includes a top-level ability to predict the movements of their opponents. Thus, the success rate of a leg attack that followed a "set up" would be expected to be higher than one without a set up. An expert attacker would be able to predict an opponent's reaction and use this knowledge to get the opponent off balance.

In almost all sports, feint actions are used to deceive the opponent, and their effectiveness has been repeatedly demonstrated [10-13]. Mori & Shimada [14] conducted experiments with rugby players by utilizing video clips to evaluate the effectiveness of a feint. The players had to predict which direction a player in the video would go after a turn. In some clips the athletes being

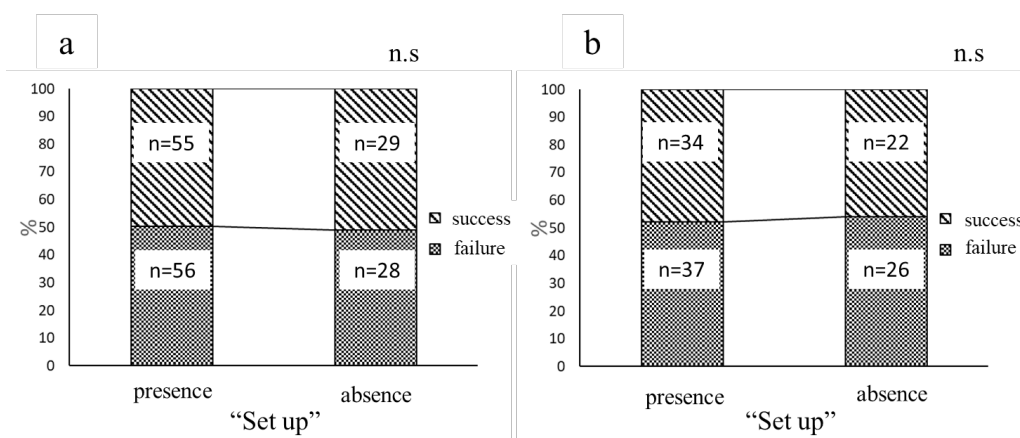


Figure 4. The success rate of leg attack for free-style wrestler: male cadets (A) and female cadets (B).

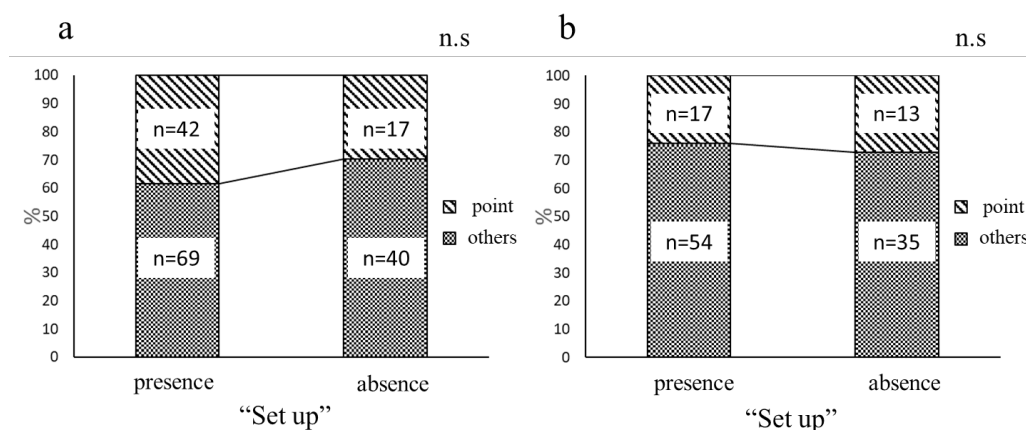


Figure 5. The rate of leg attackers scoring points for free-style wrestler: male senior (A) and female cadets (B).

viewed made a feint, and in some they did not. The correct answer rate decreased significantly for those plays in which the player in the video made a feint in the opposite direction just before turning. Thus, the deception created by a well executed feint gives an advantage to the attacker by making it more difficult to predict the attacker's desired movement.

The "set up" in wrestling operates in a similar manner by both deceiving and breaking the balance of the opponent. This helps delay the opponent's reaction, or possibly causes them to execute an incorrect counter response. Thus, a properly executed feint can increase the possibility of success for almost any attack, including the leg attack in wrestling. For male seniors, a significant association was found between both the presence of a "set up" and the result of a leg attack as well as the points awarded to a leg attacker. However, in female seniors there was no such association for either relationship. What might account for such a major difference between male and female competitors?

One factor could involve differences in physical characteristics. In basketball [15] and volleyball [16], there are differences between males and females in both skills and strategy that are due to differences in physical characteristics of the two sexes. Similarly, Pallarés et al. [17] found a number of attributes that differed between males and females and were likely to affect wrestling performance. These included dissimilarities in lean body mass, body fat percentage, anaerobic energy supply capacity, jump height, and muscle

strength. There were also differences between males and females in how points were scored in wrestling matches. In the Rio Olympics, female champions (0.25 points / game) got more points by counter attacking than did male champions (0.13 points / game) [5].

A second factor leading to the gender differences might involve a disparity in level of maturity of male and female wrestling traditions. While men's wrestling was a part of the very first modern Olympic competition, it wasn't until 2004 that women's wrestling was adopted as an official Olympic event. This amounts to a one hundred year lag [18]. There is also a major difference in the population of potential competitors. In middle eastern countries, wrestling is a very popular national sport, but women cannot wrestle since they are forbidden to expose their skin. Also, in many western countries, while men's wrestling is very popular at the high school and college level, women's wrestling is quite rare. Thus, their skill level is less sophisticated than the men's.

Likewise, the cadet generation's skill level is less sophisticated than the seniors because cadets are inexperienced; if cadets fought with seniors in the same weight division, the cadets would lose in most cases. Female seniors, as well as both male and female cadets didn't exhibit a significant association between set up and leg attack success. When skill levels are less sophisticated, the "set up" is apparently not as important. Thus body composition, muscle strength, and reaction time become relatively more important for winning matches.

CONCLUSIONS

In men's freestyle wrestling, the "set up" before a leg attack improves the success rate of the leg attack and also increases the points awarded to the attacker. However, senior women and the cadet generation of both males and females did not exhibit either of these relationships.

In the future it will be necessary to further investigate the physical characteristics of female wrestlers and to clarify how the technical characteristics of female wrestlers are related to these characteristics. In this research we used

video analyses to examine the effect of "set up" on the success rate and scoring of points for leg attacks. However, it is impossible to reveal the precise dynamics of an opponent's reaction to a set up. This advance will require a thorough bio-mechanical analysis.

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