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Upper Limb Ambidexterity in the Wrestling Snap Down Technique

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Introduction

Wrestling is a sport of antiquity, popular throughout recorded history. Egyptian and Babylonian reliefs from 3000 BCE, records in India from 1500 BCE, Chinese documents from 700 BCE, and Japanese texts from the 1st century BCE all attest to its popularity (Augustyn, Chauhan, Cunningham, Lotha, Shepherd and Young, 2014). Wrestling became infamous in ancient Greece. It was well established by the first Olympic Games in 776 BC (Augustyn et al., 2014). With the decline of Greek culture and rise of the Romans, wrestling was adopted by Romans but without the popularity and brutality of the Greeks. When the Roman Empire crumbled, references to wrestling all but vanished from European documents until approximately 800 CE (Augustyn et al., 2014). Wrestling made the voyage to the New World with the first settlers from England. Colonists also found wrestling quite popular among the Native Americans. Only the catch-as-catch-can style survives from colonial times, and it has evolved into the modern form of collegiate wrestling (Augustyn et al., 2014). New York City held the first national wrestling tournament in 1888; Saint Louis became the site of the first wrestling competition in the modern Olympic Games in 1904. The first NCAA Wrestling Championships officially began in 1912 in Ames, Iowa (“History of Wrestling”, n.d).

Folk style wrestling, also known as collegiate wrestling, is a subdivision of the sport most popular in the United States’ high schools and universities. It differs from other forms because the focus is on wrestlers learning to control their opponents rather than developing explosive action. There are also rules specific to this style. To avoid injuries, wrestlers are discouraged from throwing their opponents (“The History of NCAA Wrestling”, n.d). The length of each period is also different, with the first period three minutes in duration while the second and third periods are only two minutes apiece. Another rule unique to Folk style is riding time. It refers to the scoring system, which states that if a wrestler stays in the top position for more than a minute, the athlete is awarded an extra point (“The History of NCAA Wrestling”, n.d).

Within Folk style wrestling, pinning is achieved and points accrued through the technical and skilled application of a variety of moves and motions. One such move is the snap down technique. It is a basic skill taught to all wrestlers, yet its successful execution can determine the outcome of a match. It involves tying up with the opponent, one arm behind the opponent's head with the opposite hand gripping one of their triceps (Hamel, n.d). The wrestler then executes an explosive “snap” motion with both arms, as if to spike the opponent's head into the mat. Simultaneously, the wrestler is launching their feet behind them in a sprawling position to gain additional power in snapping the opponent's head down (Hamel, n.d). If performed correctly, this rapid motion will cause the opponent to stumble toward the ground. In the event that the opponent drops to their knees, the wrestler then quickly circles behind to secure points (Hamel, n.d). If not, the maneuver is repeated to produce the desired result. Certain opponents are difficult to topple with this motion, but it can still be used as a strategic intimidation tool in preparation for a different take down wrestling move. By snapping them forward, the opponent’s reaction is to pull back and up, thereby exposing their legs for a follow up shot (Hamel, n.d).

The importance of ambidexterity in wrestling should not be underappreciated. During a match, the ability to perform a technique, such as the snap down skill, on either side of the body can swing the outcome in one’s favor and determine victory or defeat. Wrestlers should be taught how to perform all wrestling techniques from both sides; if an opponent is preventing a right-sided striker from launching a takedown maneuver, a wrestler who possesses the ability to execute the move on the opposite side can surprise the opponent. Often, the likely result is a win for the wrestler. However, the question of proper performance of the snap down skill is not well understood. There is a lack of scientific literature that examines the mechanics of wrestling skills in the field of sports biomechanics. Much of the literature has examined the sport of wrestling in a number of different ways: from a psychological perspective, such as the mental perception of wrestling (Leng, Kang, Lit, Suhaimi, and Umar, 2012), the efficacy of wrestlers’ technique in relation to their body measurements and motor coordination (Cvetkovic, Maric and Marelic, 2005), and the effect of various coaching styles on wrestling performance (Polansky, 1999). Yet none have examined the sport from a biomechanical perspective.

In sports such as rugby and soccer there have been studies conducted to examine the kinematics of particular skills. Dorge, Andersen, Sorensen and Simonsen (2002) examined the mechanics and kinematic variables of instep soccer kicking between the dominant and non-dominant legs of seven skilled

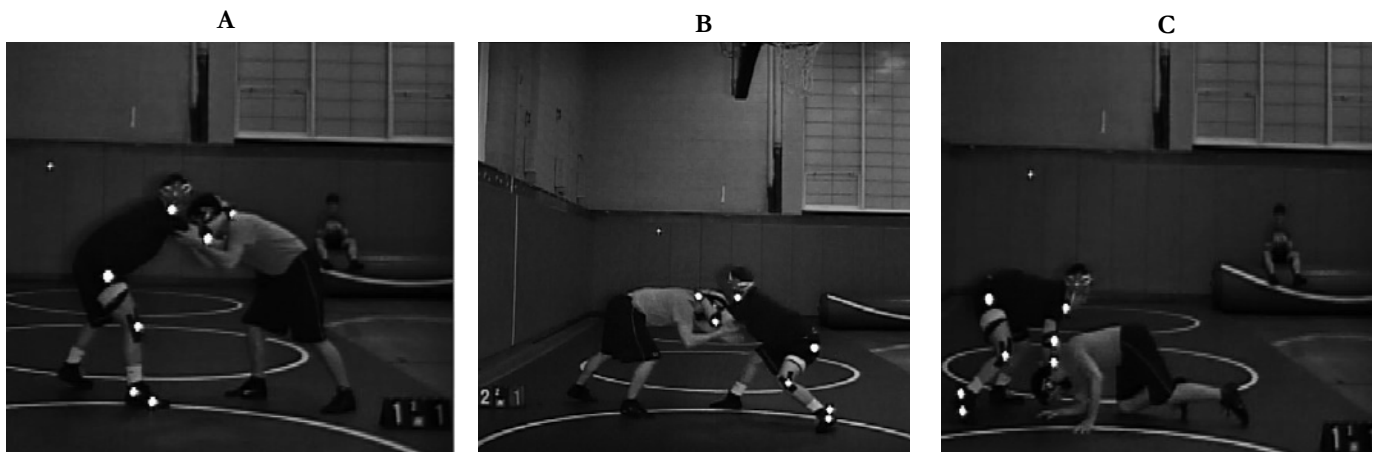


Figure 1: The progression of the snap down technique from the right side: A) start position, B) executing, and C) finish position.



Figure 2: The progression of the snap down technique from the left side: A) start position, B) executing, and C) finish position.

soccer players. Prior to testing, 30 skilled players were asked to kick a ball eight times with each leg. A Doppler radar gun was used to measure ball velocity. The research team then selected seven players with the most constant ball velocity using both legs for participation in the study. Each participant was asked to perform three instep place kicks on a stationary ball at full speed, using both dominant and non-dominant legs. Testing randomization was utilized between trials. The authors found that the ball's velocity was higher with the dominant leg due to higher foot velocity from a smoother, more fluid motion during kicking technique. A study by Ball (2011) evaluated the skill of drop punt in seventeen professional male rugby players between the dominant/preferred and non-dominant/non-preferred legs. The researchers collected kinematic data of the kicking leg and pelvis from the time of toe off until ball contact. The authors found that hip range of motion, angular velocities of the knee, shank and foot were higher in the dominant leg, while hip and thigh angular velocity of the non-dominant leg were greater at the point of contact with the ball. The conclusion was that when using the dominant leg the participants utilized the knee, shank and foot to a greater degree, whereas with the non-dominant leg the hip and thigh

had greater emphasis.

The study of the snap down technique in wrestling remains to be addressed. It is necessary for every wrestler to develop and master it properly to be successful and victorious. By studying the kinematics of the snap down technique, as well as the differences between execution by dominant and non-dominant limbs, coaches and athletes will gather very useful information. The information will result in improved technique effectiveness in matches and a reduction of the incidences of injury. By educating athletes in the implications proper joint angle, velocity, and acceleration have on human body structures, one can better instruct them on how to correct form through the use of visual aids. Finally, due to the lack of literature on ambidexterity, understanding bilateral movements in sport skills will advance the body of knowledge in the field of sports biomechanics. Therefore, the purpose of this study was to examine the kinematic motion of the shoulder and elbow joints, between the dominant and the non-dominant arms, during the execution of the snap down technique. The researcher hypothesized that the results would reveal a significant difference from one side to the other, particularly

with the motions of the shoulder joint.

Methods

Six male collegiate level wrestlers were recruited from two different universities, to participate in this study. The mean age, height and weight were 20 ± 2 yrs., 1.8 ± 0.1 m, 68.2 ± 13.6 kg. All participants were free of injury or illness, and they used their right arm/leg as their dominant side and left arm/leg as their non-dominant side. Both approval from the institutional review board and informed written consent were obtained prior to the beginning of the study. Testing was conducted in the university wrestling room. Each participant was instructed to warm up as he would normally before practice or competition. Reflective joint markers were placed on both sides of the body at the base of the 5th metatarsal, lateral malleolus, lateral aspect of the knee joint, greater trochanter, acromion process, lateral epicondyle, and the ulnar styloid process. Regulation headgear, wrestling shoes and mouth guards were used to simulate the movements in real match and to ensure athlete safety. Participants were instructed to begin in neutral position (standing) and perform a total of ten snap downs. Five snap downs were conducted with the dominant (right) arm in the controlling position (posterior neck), and another five snap downs with the non-dominant (left) arm in the controlling position. The order of execution (right vs. left) was randomized to reduce the order effect. To ensure the consistency of the data the same opponent was used for all six male wrestlers. A one-minute rest period was afforded between each snap down and a five-minute rest between each arm. A standard two-dimensional kinematics analysis was conducted with a camera set up to capture the sagittal view of the snap down motion. Trials were recorded using a JVC video camera (Model: GR-D371V) captured at 60 Hz in conjunction with a 650W artificial spot light. Kinematic motion of the shoulder and elbow joints was analyzed with the Ariel Performance Analysis System (APAS). The digital filter was applied to the data with the cut off frequency of $x = 7$ and $y = 7$. A twin sample t-test was conducted at $\alpha = 0.05$ to examine the kinematic variances between the right and left arms, and all statistical analyses were conducted with SPSS (v. 18)

Results

A paired sample t-test ($n = 6$) was conducted between the right side and left side snap down execution. The angular displacement, velocity, and acceleration of the elbow and shoulder, were analyzed using a dependent sample t-test ($p < 0.05$).

Table 1: Angular Displacement Between Right and Left Side Snap Down

Body Kinematic Variables	Right vs Left Mean (SD) ^o	p
Shoulder	38.8 (17.6) vs 44.9 (26.5)	.55
Elbow	113.2 (32.1) vs 123.2 (30.06)	.09

Table 2: Angular Velocity between Right and Left Side Snap Down

Body Kinematic Variables	Right vs Left Mean (SD) ^o /s	p
Shoulder	36.4 (70.1) vs 180.4 (231.8)	.16
Elbow	178.6 (203.4) vs 312.5 (432.8)	.51

Table 3: Angular Acceleration Between Right and Left Side Snap Down

Body Kinematic Variables	Right vs Left Mean (SD) ^o /s ²	p
Shoulder	915 (1020.5) vs 269.8 (2514.9)	.58
Elbow	951.3 (2377.6) vs 927.5 (4188.8)	.99

The results showed no statistical difference between right and left sides in any of the tested parameters.

Discussion

Folk Style Wrestling is a sport that has received very little attention from the research community. The purpose of this study was to examine the snap down technique, specifically the joint angular displacement, velocity and acceleration of the shoulder and elbow as the wrestler executed the technique using the right (dominant) and left (non-dominant) sides. Data collection was initiated at the moment that the participant began his technique and concluded when they had reached the lowest position, or “end” point, in the technique. Each trial was approximately one second in duration with slight deviations. Elbow joint angle was measured using the wrist and shoulder reflective markers; shoulder joint angle was measured using the elbow and hip reflective markers. The results of the study revealed that there was no statistical significant difference in any

of the three parameters when compared bilaterally. Despite an exhaustive search of multiple research databases, no research studies of a similar nature and purpose were discovered. Therefore, the researchers expanded their search to include studies involving a wider diversity of sports but with similar objectives regarding ambidexterity and bilateral limb analysis.

Čular, Miletić and Miletić (2010) examined the influence of limb dominance on the performance of specific motor abilities of Taekwondo skills. Thirty-nine male and eighteen female participants, with a mean age of 10 ± 2 years were tested on two separate occasions to evaluate their ambidexterity when executing the front kick and roundhouse kick. The results revealed a significant difference in motor ability when assessing frequency of alternate leg movements in both genders, while assessment of flexibility, strength and explosive power in the leg did not show any significant difference between genders. A higher ambidexterity in the male population was noted but did not represent a significant difference between the populations. For male athletes, the researchers indicated that motor abilities and technique performance had a strongly defined linear correlation (.75 to .81) on both the left and right side. In female athletes, no such significant correlation was made.

Trial & Wu (2013) conducted a study examining the differences in the joint angular displacement, velocity and acceleration of the hip, knee, ankle joints between the double-collar tie and double underhook positions in Thai Boxing. Participants executed six continuous knee strikes with the dominant leg (right) in each of the two clinching positions for a total of twelve knee strikes. Data was collected from the athlete's starting position until strike contact. The results revealed a statistical significant difference in the hip angular displacement ($103.2 \pm 13.4^\circ$ and $88.4 \pm 12.4^\circ$ ($p = 0.00$) for the double collar tie and double underhook, respectively). It also showed a difference in angular acceleration at the knee ($5083 \pm 4422 \text{ }^\circ/\text{s}^2$ and $1981 \pm 2707 \text{ }^\circ/\text{s}^2$ ($p = 0.03$)) and ankle ($631 \pm 1371 \text{ }^\circ/\text{s}^2$ and $2581 \pm 2191 \text{ }^\circ/\text{s}^2$ ($p = 0.02$)). The researchers concluded that the hip flexion angle was more acute in the double collar clinching position technique, making it preferable when striking a target lower than the striker's knee. It also revealed that the angular accelerations for the knee and ankle were similar in both positions but differed at the hip. From Trial & Wu (2013)'s study implies the importance of lower body mechanics in martial arts skills.

Further examination of the video analysis in this study revealed that some wrestlers performed the skill using their shoulder and elbow as "prime executors" of the technique, while other wrestlers utilized their hips as the point of technique execution and incorporated the shoulder and elbow joints as stabilizers

of the opponent. Put simply, during the study, the bulk of the work snapping opponents down to the mat was coming directly, rather than indirectly, from the shoulder and elbow. Wrestlers who began the motion with their hips turned their body into a whip, starting in the lower half and carrying through to their arms. With this discovery it is logical that future studies are warranted to investigate the kinematics of lower extremity motion in the snap down technique. Some limitations in this study should be considered. The sample size, six wrestlers, provided a preliminary understanding in this research study. With a greater sample size, the power of the statistical analysis will increase, which might allow us to detect any significant difference in the upper extremity. In addition, the experience level of participants had a greater than expected variation, ranging from 3 to 10 years. With a more controlled experience level, the variability of the results between subjects should be reduced. Another rather difficult variable to account for was body size. While the research study called for a weight range of approximately 50 pounds (wrestlers were between 125 and 175 pounds), participant height and body composition was an uncontrollable factor. A future study may be designed that would provide a more complete understanding of the snap down technique.

Conclusion

This study used six college wrestlers to examine the ambidexterity of the snap down technique. This study provided a basic understanding on the kinematic mechanics of the snap down technique in Folk Style wrestling when performed on the dominant and non-dominant sides of the upper body. The results showed no significant statistical difference at the shoulder or elbow joints regarding angular displacement, velocity, or acceleration when compared bilaterally. Therefore, this study concluded that collegiate level athletes are capable of executing the snap down technique with near ambidexterity in the upper extremity. Future studies are warranted to examine the lower body mechanics and with different experience levels and weight classes.

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About the Author



Nicholas DeCastro is a senior Athletic Training major. His research project was completed in the summer of 2014 under the mentorship of Dr. Tom Wu (Movement Arts, Health Promotion & Leisure Studies) and

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