THE EXAMINATION OF UPPER LIMB AMBIDEXTERITY IN WRESTLING SNAP DOWN TECHNIQUE

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The purpose of this study was to bilaterally examine the kinematic motions of the upper extremity in the snap down technique. Six male collegiate wrestlers were recruited and performed a total of ten snaps, five from each side. A standard two-dimensional kinematic analysis was conducted in the upper extremity. The results showed no significant difference between right and left side in the angular displacement, velocity and acceleration. These findings indicated that upper limb ambidexterity was achieved by these college wrestlers in the study. From further video analysis, the study found some wrestlers appeared to use their shoulder and elbow as prime executors of the technique while other wrestlers utilized their hips.Upon this discovery, future studies are warranted to investigate the kinematics of lower extremity motion in the snap down technique.

KEY WORDS: folk style, kinematics.

INTRODUCTION: Wrestling is one of the oldest sports in recorded human history. Folk style is a subdivision of the sport most popular in 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. Within Folk style wrestling, pinning is achieved and points accrued through the technical and controlled 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, typically with 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 advantage 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 them to secure points (Hamel, n.d). If not, the maneuver is repeated to produce the desired result.

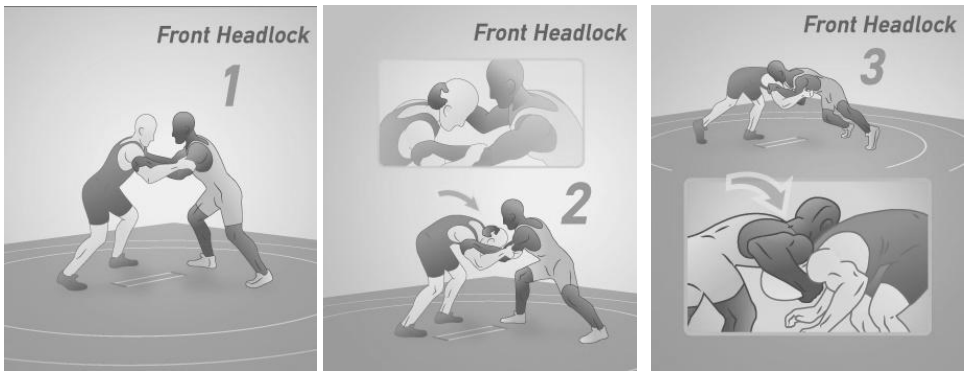

Figure 1: Illustration of Snap Down Technique Progression into Front Headlock
Images retrieved from http://wrestling.isport.com/wrestling-guides/how-to-secure-a-front-headlock

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, possessing the ability to execute that move on the opposite side can surprise the opponent and likely result in a win for the wrestler able to do so. However, the question of how to perform the snap down skill properly is not well understood. There is 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 taken the sport and examined it from a biomechanical perspective.
The study of the snap down technique in wrestling remains to be addressed. It is necessary for every wrestler to develop it properly to be successful. By studying the kinematics of the snap down technique and the differences between execution by dominant and non-dominant limbs, coaches and athletes will be armed with useful information on improving technique effectiveness in matches and reducing the incidence of injury. Finally, due to the lack of literature on ambidexterity, understanding bilateral movements in sport skills will help to 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 during the execution of the snap down technique between the dominant and the non-dominant arms.

METHODS: Six male collegiate level wrestlers were recruited 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, respectively. 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 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 they would normally before practice or competition. On both sides of the body reflective joint markers were placed at the greater trochanter of femur, acromion process of scapula, lateral epicondyle of humerus, and the ulnar styloid process. Regulation headgear, wrestling shoes and mouth guards were used to simulate the movements in a real match and to ensure athlete safety. The participants were instructed to start in a standing neutral position and perform five snap downs with right arm and another five snap down with the left arm against an opponent who was equipped with wresting gear as well. The order of the upper extremity (right vs left) was randomized to reduce the order effect, and the same opponent was used for all six male wrestlers to ensure the consistency of the data. A one minute rest period between each snap down and five minute rest between each arm was afforded. The data used for each parameter was taken from the end-point of motion, when contact was made with the ground. 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™. The digital filter was applied to the data with the cut off frequency of x = 7 and y = 7. A dependent sample *t*-test was conducted at $\alpha = 0.05$ to examine between the kinematics of right and left arms, and all statistical analyses were conducted with SPSS (v. 22).

RESULTS: A paired sample t-test 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 ($p < 0.05$). The results showed no statistical difference between right and left sides in any of the tested parameters.

Table 1
Angular Displacement between Right and Left Side Snap Down

Body kinematic variables	Right vs Left Mean (SD)°	*p*
Shoulder	38.8 (17.6) vs 44.9 (26.5)	.55
Elbow	113.2 (32.1) vs 123.2 (30.6)	.09

**Statistical significant at p < 0.05*

Table 2
Angular Velocity between Right and Left Side Snap Down

Body kinematic variables	Right vs Left Mean (SD)°/s	*p*
Shoulder	36.4 (70.1) vs 180.4 (231.8)	.16
Elbow	178.6 (203.4) vs 312.5 (432.8)	.51

**Statistical significant at p < 0.05*

Table 3
Angular Acceleration between Right and Left Side Snap Down

Body kinematic variables	Right vs Left Mean (SD)°/s^2	*P*
Shoulder	915 (1020.5) vs 269.8 (2514.9)	.58
Elbow	951.3 (2377.6) vs 927.5 (4188.8)	.99

**Statistical significant at p < 0.05*

DISCUSSION: The purpose of this study was to examine the kinematics of upper extremity in the snap down technique between right (dominant) and left (non-dominant) sides. The results of the study revealed that there was no statistical significant difference in the shoulder and elbow joints in the angular displacement, velocity and acceleration. No research study has evaluated the mechanics of Folk style wrestling. In other similar sports, Čular, Miletić and Miletić (2010) examined the influence of limb dominance on performance of specific motor abilities on Taekwondo front and roundhouse kicks between male and female athletes. 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. The results revealed a statistical significant difference in the hip angular displacement (103.2 ± 13.4º and 88.4 ± 12.4º (p = 0.00) for the double collar tie and double underhook, respectively). It also showed a difference in angular acceleration at the knee (5083 ± 4422 º/s^2 and 1981 ± 2707 º/s^2 (p = 0.03)) and ankle (631 ± 1371 º/s^2 and 2581 ± 2191 º/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, it implies the importance of the 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. 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, provides 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.

CONCLUSION: This study used six college wrestlers to examine the ambidexterity of the snap down technique. This study provides 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 concludes 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 in the snap down technique.

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