

# COMPARISON OF ELBOW ANGLES IN GYMNASTS WITH AND WITHOUT CHRONIC ELBOW PAIN IN HORSE VAULT ROUTINE

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**KEY WORDS:** horse vault, elbow, chronic strain, video analysis

**INTRODUCTION:** Chronic elbow strain is an injury involving inflammation or fracture which is caused by repeated bending, stretching or rotating of the elbow over along period of time, or by squeezing from external force. When the athlete performs a vault dismount, the external force passes through his/her hands to the elbows, causing variations in elbow position. Therefore, the action of the elbow is crucial to vault routine. When the incorrect or irregular movement of elbows repeated again and again, it might cause chronic elbow strain. The purpose of this study was to identify the relationship between elbow angle and elbow strain when performing two major movements in vault.

**METHODS:** Twenty male and twenty female athletes from national gymnastic team participated in this study and 11 of them were world champions. Their age, body height, body weight and training history were recorded. All subjects were right hand dominant. Subjects were examined by their team doctor to determine whether they suffered from chronic elbow strain. Among all subjects, 16 (5 male and 11 female) of them suffered from chronic elbow strain. Two video cameras of 50 Hz frequency were used to record the hand movements during the National Gymnastics Championships. One of them was placed in the front of the horse and the other one was positioned at the lateral side of the horse. The distance of each camera to the horse was 15 meters. The camera lenses were 20 cm above the horizontal level of the horse. After movement recording, a cubic calibration frame was placed on the horse's position for 3-D data production from the 2-D data of each camera. The recorded video materials were digitized on motion analysis system (Ai-Jie, Beijing). Subjects were divided into two groups: handspring forward and cartwheel groups. Each group consisting of 20 subjects, 10 male and 10 female. According to their elbow condition, each gender group in each group was further divided into subjects without elbow strain and those with elbow strain. Thus, a total of 8 groups were obtained. The statistical significance was set at .05.

**RESULTS AND DISCUSSION:** Comparing the male and female subjects without elbow strain, subjects in performing handspring forward, there was a significant difference in right elbow angles ( $p < 0.01$ ) but not in the left elbow angles. Comparing the male and female subjects in performing cartwheel spring, significant difference was found with the left elbow angles ( $p < 0.01$ ) but it was not the case for the right elbow angles ( $p > 0.05$ ). On the other hand, a significant difference was found in right elbow angles ( $p < 0.05$ ) but not in the left elbow angles between the male and female subjects with elbow strain in performing handspring forward. Finally, for the female subjects, the longitudinal rotation angle was found with the right arms ( $p < .05$ ) but not with the left arms when performing handspring forward. This angle, however, was found significantly different with both arms between those with elbow strain and male subjects with out elbow strain. When an athlete performs handspring forward, the joint angle of left elbow in the range of  $164.80 \pm 7.12$  degrees may be related to the right elbow strain. Performing handspring forward is more likely to induce elbow strain than performing cartwheel.

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