

# **A NOVEL FEMALE SNATCH PERFORMANCE INDEX BY UTILIZING OPEN AI SKELETON FOR WOMAN 55KG AND 59KG CATEGORY**

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## **Introduction:**

A novel female snatch performance index is proposed and verified in this paper. Many successful snatch measure indexes such as horizontal displacement and vertical displacement have been observed, however, these indexes need experts utilizing kinematic analysis software to gather. Hence, in this study, an open AI skeleton is considered to obtain the skeleton information automatically and further compose the 2D skeleton information to our proposed snatch performance index.

## **Methods:**

Intel OpenVino with Microsoft CoCo skeleton model is considered in this paper. We gather woman 55Kg and 59Kg categories snatch competition videos from 2019 IWF weightlifting world championship and 2021 Tokyo Olympic games. These videos are separated into elite and general groups. Skeleton model is utilized to obtain the lifter's joint coordinate from the videos. We refer to the snatch phases (Ikeda, et al, 2012; Musser, Garhammer, Rozenek, Crussemeyer, & Vargas, 2014) and further consider the joint passing time in each phase as our novel female snatch performance index. Finally, independent sample *t* test verifies our proposed index.

## **Results:**

From independent sample *t* test, the passing time of snatch phase III and phase IV are significant difference. Elite lifters consume less time in phase I and phase II than general lifters. Furthermore, the most-high level of the barbell of the elite lifters is lower than general lifters.

## **Discussion & Conclusion:**

In this paper, we proposed a novel female snatch performance index to indicate the female weightlifting lifters' performance. From the results, we can obtain that our proposed index indicates that elite lifters consume less time in phase III and phase IV and utilize less most-high level of the barbell. These observation shows that our proposed female snatch performance index can efficiently and precisely indicate lifters' performance.

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# Female Snatch Technical Index Utilizing AI Skeleton Model and Barbell Trajectory on Lightweight Category

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## Introduction

In this paper, we create a novel snatch technical index considering the relation between the lifter's body and barbell trajectory from a competition video. Snatch processes lifter's coordination skills in continuous movement, hence we observe the relation between body information and barbell kinematic parameters. We utilize our novel technical index to indicate the lifter's performance of elite and ordinary athletes, respectively, and further verify the precision of our snatch technical index by independent sample t-test..

## Methods

The novel snatch technical index is established with the body information and barbell trajectory from the video, which reflects the real situations in the snatch movement. We capture these competition videos from the 2019 and 2020 National Intercollegiate Athletic Games (Taiwan) women weightlifting lightweight categories (45-59kg). The lifter's body information is obtained by Intel OpenVINO with the Microsoft COCO model. Barbell trajectory is gathered by our previous barbell tracking algorithm (Hsu, C. T., Ho, W. H., & Chen, J. S., 2018). Then we calculate the area between the lifters' upper extremity and the barbell from each frame and further gather the mean of these areas of the snatch movement. Finally, an independent sample t-test verifies the lifter's performance of two groups (elite and ordinary).

## Results

We gather the snatch technical index of elite and ordinary lifters, respectively. The elites' mean area is less than the ordinary ( $912.945 \text{ cm}^2 < 1176.164 \text{ cm}^2$ ) and there are significant differences from the independent sample t-test ( $p=0.003^*$ ).

## Discussion& Conclusion

The proposed female snatch technical index indicates the weighting lifter's sports performance both considering the mean area of the lifter's body and barbell trajectory. According to the results, the mean area of the elite group is significantly less than the ordinary group. This observation shows that our snatch technical index can efficiently estimate a lifter's sports performance.

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