

## Last preparations of Swedish and Norwegian elite athletes for the European Championships

Performed by Analyz3d by Dr. Tobias Hein; powered by Qualisys AB

In July, more than 20 track & field athletes from Sweden and Norway have been analyzed in Växjö, Sweden, to prepare for the final stage of their season. Within the four throwing disciplines, Shot Put, Diskus, Javelin and Hammer throwing, the athletes' throwing technique has been recorded with 14 3D-cameras and two high-speed cameras to enable the evaluation of discipline-specific parameters in relation to the throwing distance. The 3D-movement analyses have been carried out the second consecutive year in Växjö by Dr. Tobias Hein, a former scientist from Göteborg Universitet, now working for "Analyze3d by Dr. Tobias Hein", in Basel, Switzerland. In total, eight of the tested athletes participated at the 24<sup>th</sup> European Athletics Championships one month later; five of them even proceeding to the final. With one silver medal from Daniel Ståhl and a spectacular 4<sup>th</sup> place from Simon Pettersson in the male Diskus competition, the overall performances were very successful.

In Växjö, four measurement days have been organized by the head coach of Swedish throwing, Anders Axlid, each day focusing on one specific discipline. During Day 1 and 2, the camera system has been set up in indoor facilities (Telekonsult Arena and Tippshallen) to analyze male and female shot putters and diskus throwers. Equipped with more than 20 markers on their body and one on the shot/diskus, the throwing procedure was recorded in 3D. Especially, timing variables, hip-shoulder-separation and their influence on release angle and velocity of the shot can be analyzed with regard to the quality and result of the throw. This is a unique approach leading to individual information about performance variables and their connection to the final result. With throws of more than 65m indoors, Daniel Stahl showed world-class throws during the 3D analyses offering exceptional insights into the biomechanics and kinematics of Diskus throwing.

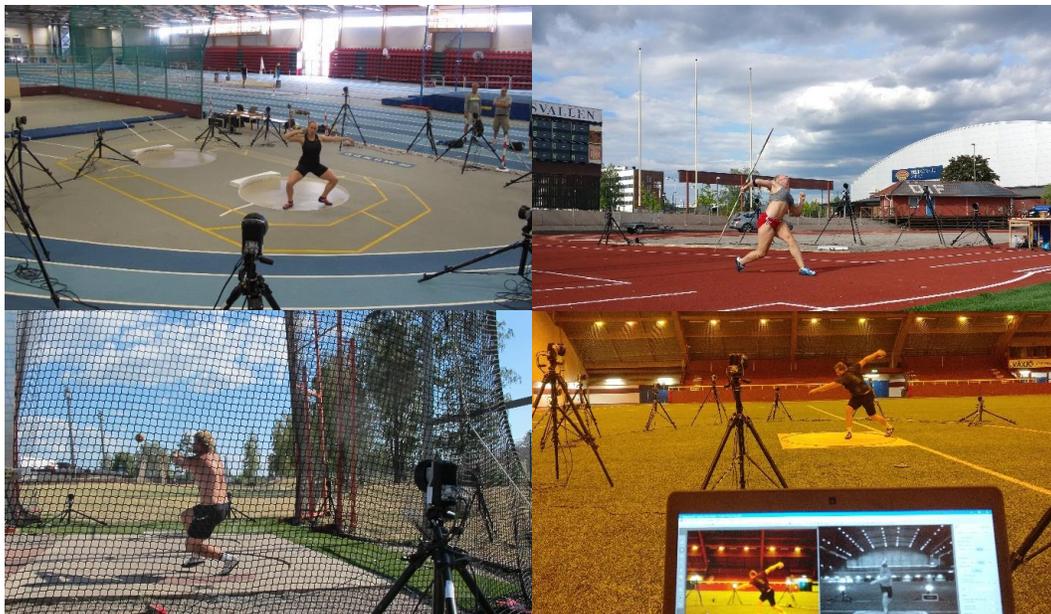


Figure 1: Frida Åkerström (Shot Put), Sofi Flink (Javelin), Oscar Vestlund (Hammer), Daniel Ståhl (Diskus)

During Day 3 and 4, the camera system has been set up outdoors (Värendsvallen) for analyzing Javelin and Hammer throwing. With sunlight and the big measurements volumes which needed to be covered, two challenges have been faced. But with the Qualisys cameras and the software, carrying out these kind of measurements have been possible. For Javelin throwing, different parameters, as angle of release, angle of attack, step lengths and many more have been implemented in the analyses helping the throwers and their coaches to improve the technique.

The goal of this project is be to establish a direct link between the different kinematic variables and the most important parameters "speed of release" and "angle of release". Further, two questions are intended to be answered "What is the best throwing technique for this individual thrower?" and "How can the technique be improved?" in order to perform better.

Athletes participating in the analyses and European Athletics Championships 2018

- Daniel Ståhl, Diskus, silver medalist and World Lead Throw 2018, 69,72m
- Simon Pettersson, Diskus, 4<sup>th</sup> place
- Sofi Flink, Javelin, 10<sup>th</sup> place
- Fanny Roos, Shot Put, 11<sup>th</sup> place
- Ola Stunes Isene, Diskus, 11<sup>th</sup> place
- Vanessa Kamga, Diskus
- Frida Åkerström, Shot Put
- Axel Härstedt, Diskus,

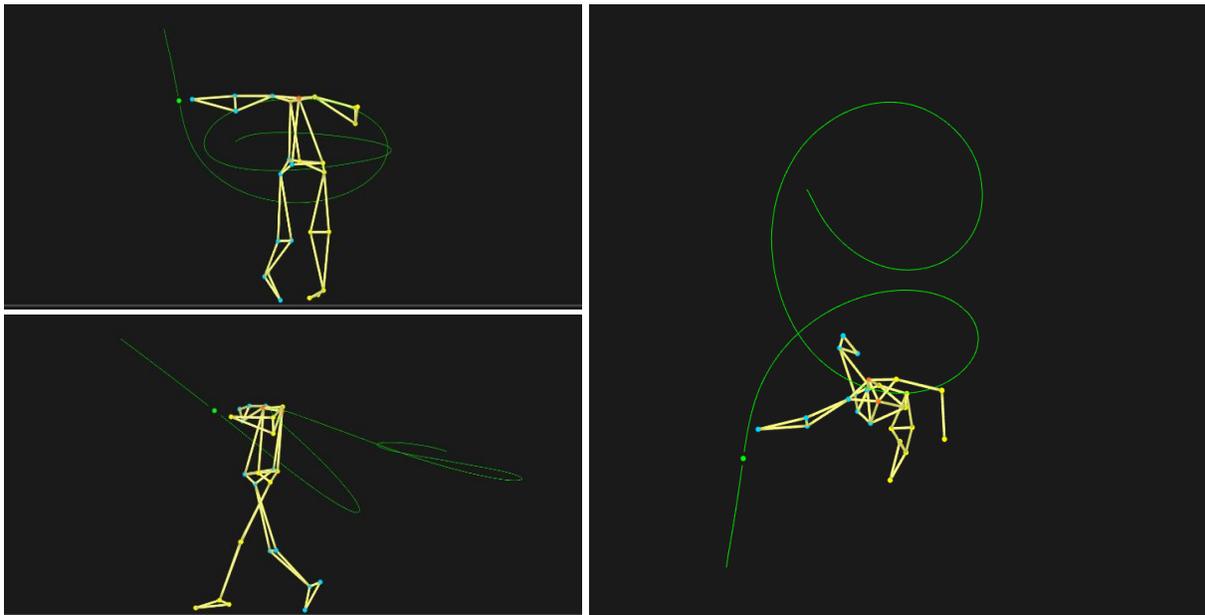


Figure 2: Diskus throw in 3d with Diskus trajectory (frontal view, side view and top view. ©Analyze3d by Dr. Tobias Hein).

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