

A PILOT STUDY

Explosive Capacities in Swedish Elite Female Players

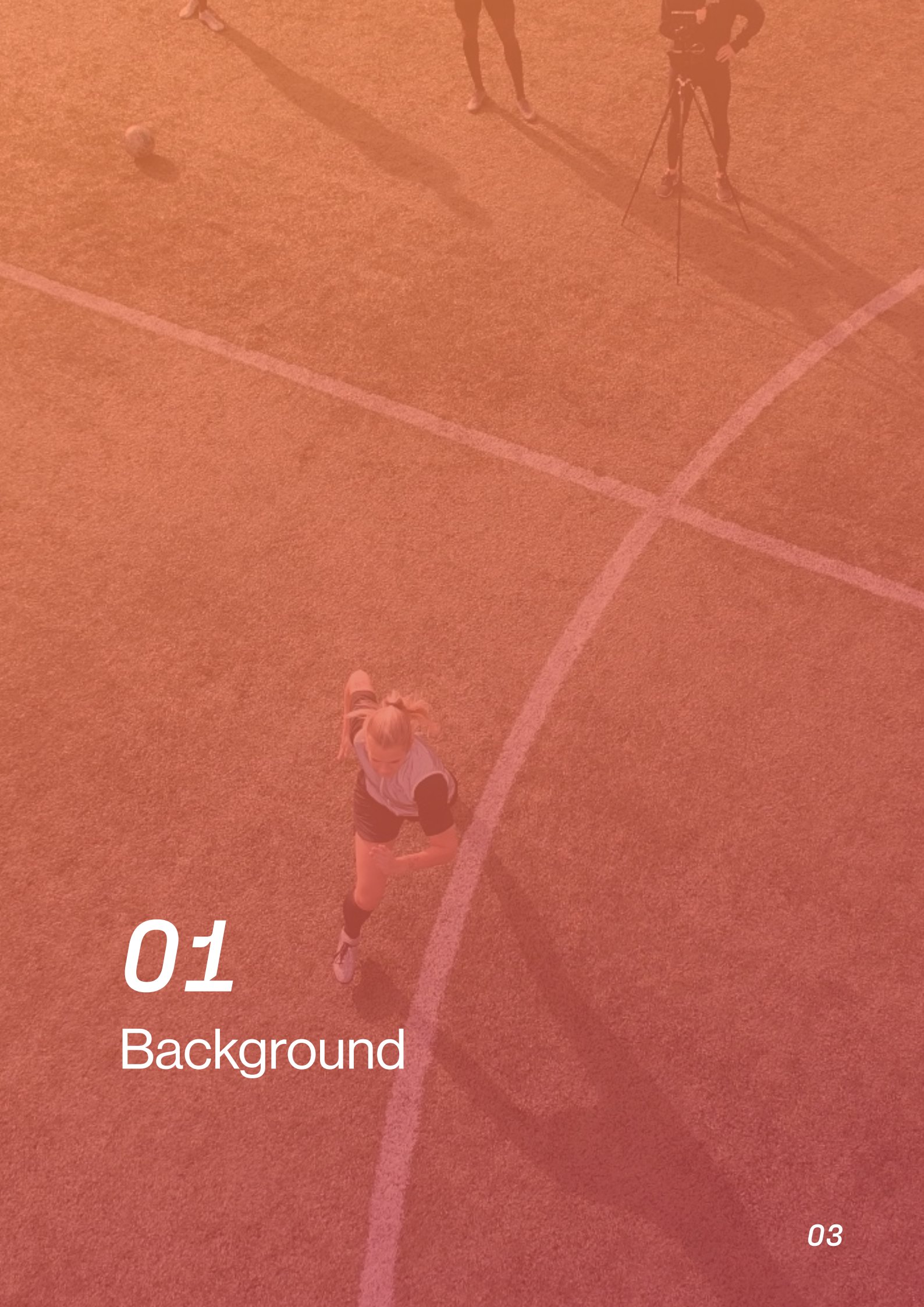


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01

Background

BACKGROUND

Rapid Development of Women's Football

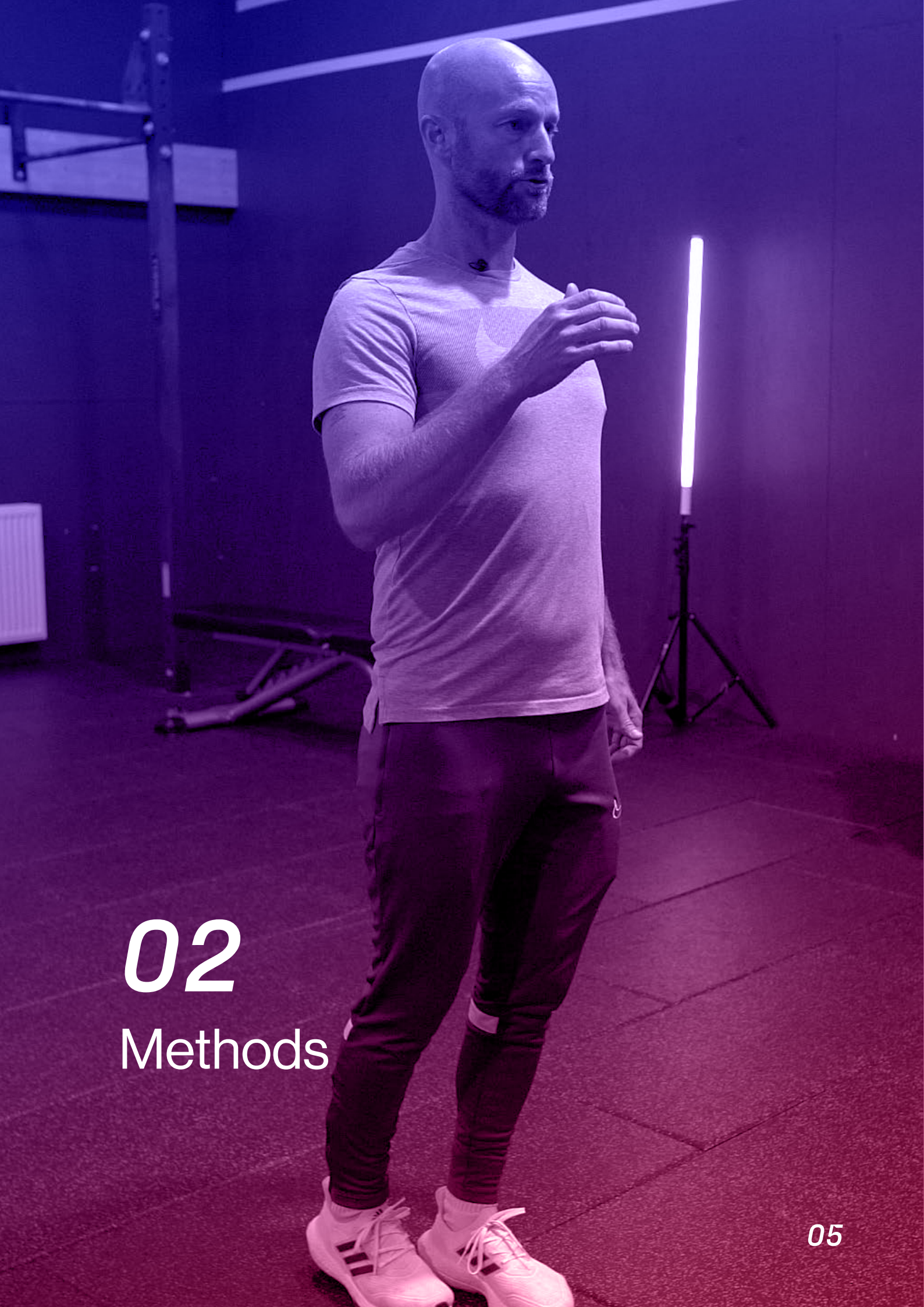
Women's football match-play has developed rapidly in the last two decades and the number of players has increased to 13.4 million active players worldwide. On the elite level the physical match- demands have expanded from 8,5 km to 10-11 km in total distance and of those 10-11 km around 2.0 km are covered in high speed ¹.

In the high speed running distances, several sprints, forceful accelerations and decelerations are performed throughout the games. This shows the importance of developing explosive capacities for players. Moreover, it has been shown that well-developed explosive capacities can minimize the risk of injury, in male football ⁴.

The Importance of This Study

Thus it seems that explosive actions are occurring in elite female football matches and preparing players for the physical match demands is important to reduce the risk of injuries and potentially increase physical performance.

In 2021, a project with the long-term aim to develop female elite football players' explosive capacities in Sweden started. The initiative makers are the Swedish elite football organization (EFD), Photon Sport and are partly financed by Folksam, Sparbanken Skåne och Infrastructure Logistics.



02

Methods



METHODS

Data Collection and Validation of the 3D Camera Technology

The system has been validated in collaboration with Bosön (the Swedish National Sports Confederation's development center) and Umeå University.

Sprint validation has been performed using SmartSpeed by Vald, WittyGate by MicroGate, wirebased systems such as 1080 Sprint and Dynaspeed. Good agreements were found between these systems and Photon Sports.

For jump validation the Oqus 300+ (Qualisys AB®, Gothenburg, Sweden) and Qualisys Track Manager software was used with high correlation between Qualisys and Photon Sports.

Validation reports are available ("Validation Report - Countermovement Jump" and "Validation Report - 30 metres sprint") on demand.

Tests included in the pilot study were 5 m sprint, 30 m sprint, and countermovement jump (CMJ). The tests were prioritized based on proven game demands and a recent article made on English female players⁵.

All tests were performed after a warm-up at least 72 hours after the last match. The test period was the season from January-November in 2022 and includes data from the pre-season and competitive season.



Standing Sprint, 10 m, Standing start

Hanna Johnson

Start test

Total time (s)	Max speed (km/h)	Split time 2.5 m (s)
2.50 Today	19.4	0.98

Participants	#	Best today
Michael Almebäck	4	2.36 s
Adam Stighall	0	
Hanna Johnson	4	2.50 s PB
Erik Svensson	0	
James Brydle	0	

Edit list of players

View & compare results

03 Results

Countermovement jumps

The results of a total of 821 jumps by 124 players
(mean ~ 7 jumps per player).

TABLE 1

	Mean	SD
Jump Height	39.33 cm	± 5.00 cm
Max Power	47.18 W	± 5.82 W
Average Power	21.56 W	± 3.36 W

Standing sprints

The results from standing sprints (5-30 m) of a total of 172 sprints by
66 players (mean ~ 2,5 sprints per player).

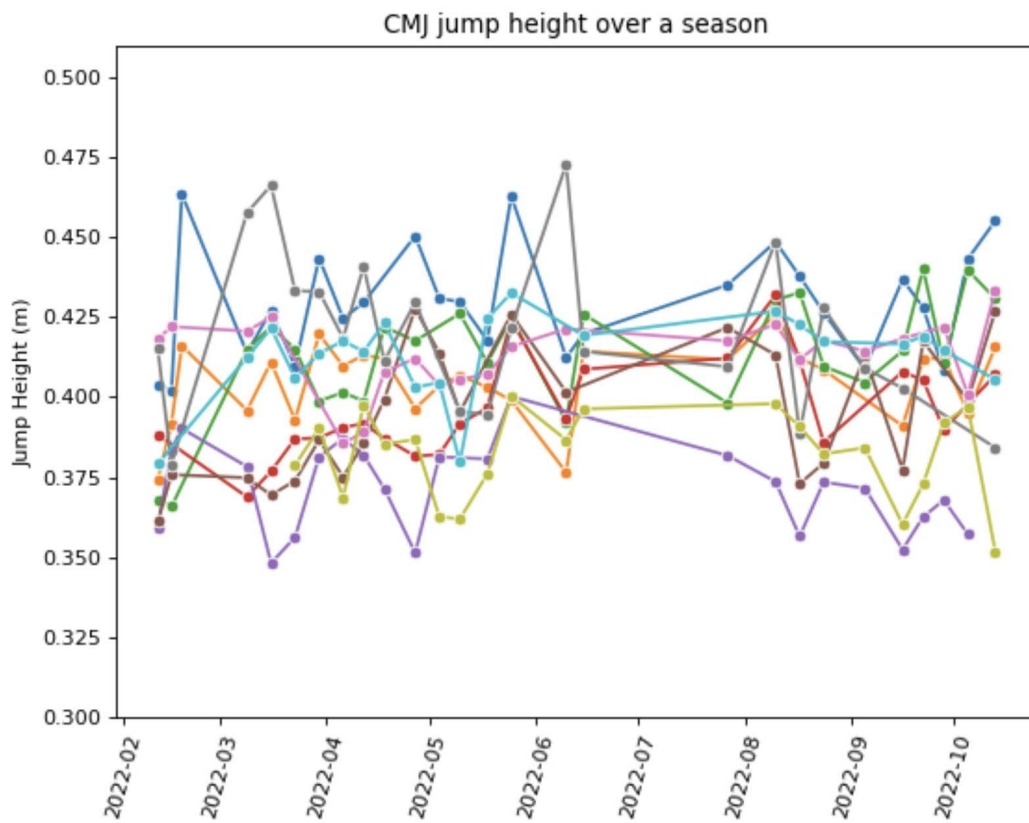
TABLE 3

	Mean	SD
Max Speed	7.92 m/s	± 1.29 m/s
Split time 2.5 m	0.90 s	± 0.14 s
Split time 5 m	1.37 s	± 0.17 s
Split time 10 m	2.22 s	± 0.20 s
Split time 20 m	3.59 s	± 0.34 s
Split time 30 m	5.05 s	± 0.56 s

CMJ over a season

Variations of countermovement jump height over a season in 232 tests by 20 players.

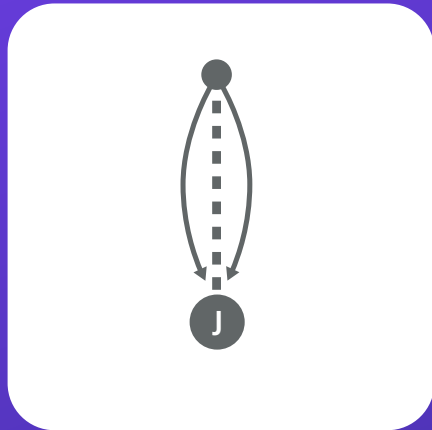
FIGURE 1



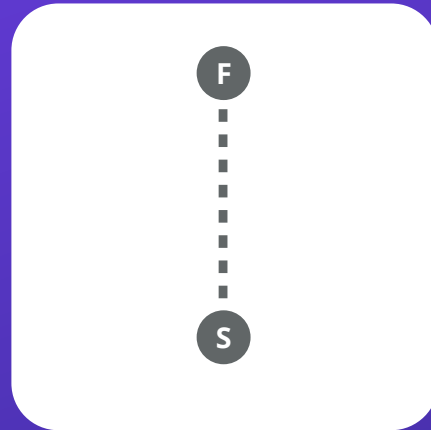


04

Correlations



COUNTER MOVEMENT JUMP



STANDING SPRINT

CORRELATIONS

The correlation between jump height in CMJ and the maximum speed was 0.90 which can be defined as an extremely strong correlation.



05

Discussions

DISCUSSIONS

Comparison with earlier results and studies

The mean jump height for the Swedish elite players was 39,33 cm, similar to English elite female players⁵. The power conducted during CMJ has been related to 10-meter acceleration performance in elite athletes in previous studies⁶. In the present investigation, there was no significant correlation between CMJ maximum power and 30 m sprint split times (2.5, 5, 10, 15, 20, and 30 m) ($r = 0.02-0.18$) nor CMJ maximum jump height and 30 m sprint split times ($r = 0.03-0.22$). However, an extremely large correlation ($r = 0.9$) was found between CMJ height and maximum speed during the 30 m sprint test. These results indicate that CMJ height performance may be an important marker for top-speed performance in football-specific sprints, in elite women's football.

DISCUSSIONS

Relationship between CMJ Markers and Neuromuscular/Metabolic Fatigue

Explosive performance based on CMJ markers has been seen to be associated with both neuromuscular and metabolic fatigue in a trained population⁷. In the present pilot study, the variation in CMJ performance was on average $0.2 \pm 5.4\%$ over a season. This is a very small fluctuation, however, the individual results fluctuated from -14.4% to 18.9% . The variation may be a change in explosive capacity but it may also indicate neuromuscular or metabolic fatigue. As all CMJ tests were performed on matchday + 3 the variation could be an indicator of insufficient post-match recovery as previous studies have found that neuromuscular recovery may be decreased for more than 72 hours after a female elite football match⁸. Monitoring CMJ as a marker for neuromuscular performance and fatigue in elite football will give valuable information for coaches to plan training and recovery strategies on an individual level.



06

Future Directions



FUTURE DIRECTIONS

Need for More Studies in Women's Football

In general, the number of studies investigating women's football has increased the last decade, but more knowledge is warranted ⁹.

Moreover, the physiology of the male and female population in training studies and their training response has been shown to differ ¹⁰.

Therefore, a deeper understanding of women's physical and physiological response to football-specific training methodology is necessary to get a deeper understanding and for practitioners to plan and conduct training, specific for female players.

Investigating Neuromuscular Performance in Different Player Positions

In the present project, we aim to investigate if neuromuscular performance can distinguish between player positions and if there may be a difference between elite players and top-class players in the Swedish first league. Moreover, we aim at designing a training study on how to improve football-specific neuromuscular capacity in elite female players as we know from previous male studies that it is important from a performance perspective ³ and to lower the risk of injuries ⁴.

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