Speed and countermovement jump characteristics of elite female soccer players 1995-2010

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Introduction
According to FIFA, more than 4 million female players are registered in football associations. While physical characteristics of male soccer players have been well described, fewer studies are available involving female players. The aim of this study was to use a database of women’s soccer athlete sprint and CMJ tests collected under the same highly standardized conditions over 15 years to quantify possible differences in sprinting velocity and jump height as a function of: 1) athlete performance level, 2) field position, and 3) age. Additionally, we evaluated the evolution of sprinting velocity and CMJ height in the Norwegian national squad over a 15 year period.

Methods
Data from 194 female soccer players, 15-35 years old (22±4.1 yr), body mass 63±5.6 kg, representing a broad range of performance levels, were tested between 1995 and 2010. In total, 355 sprint tests and 250 CMJ tests formed the basis for this investigation. All tests were performed at the Norwegian Olympic training center in Oslo.

Results
National team players were 2% faster than 1st division players (p=0.027, d=0.5) and 5% faster than 2nd division players (p<0.001, d=1.3) over 20-m. 1st division players were 3% faster than 2nd division players (p=0.006, d=0.8). Junior elite players were 3% faster than 2nd division players (p=0.003, d=0.8). Overall, 95% CIs for sprinting velocity trended predictably across performance level. Moreover, national team players jumped 8-9% higher than 1st division players (p=0.001, d=0.6) and junior elite players (p=0.023, d=0.5). Forwards were 3-4% faster than midfielders (p=0.001, d=0.8) and goalkeepers (p=0.003, d=0.9). Defenders were 2% faster than midfielders (p=0.019, d=0.5).

No differences in sprint or CMJ performance were observed across the age groups. Players from time epoch 2006-2010 were 2% faster over 0-20m than players from time epoch 1995-1999 (p=0.046, d=0.6). Overall, the 95% CIs demonstrate a slight trend towards faster national team players over time. No differences in CMJ ability were observed across time epochs.

Discussion
In the present study, data from large sample of athletes tested under identical conditions demonstrates moderate to large differences in sprinting velocity as a function of soccer performance level and playing position. We also observed a moderate positive development in 0-20m sprinting velocity among elite performers over a 15 year period of testing, but no significant changes in 20-40m velocity or CMJ ability. Soccer players have lots of qualities to develop, and coaches should take sprinting velocity into account within the larger skill set of soccer. Selection of players, testing, and physical conditioning of the athletes should be reflected by the importance of speed. Future research should focus more on the relationship between physical demands of the game, capacity profiles among players, and consequences for long term planning of individual fitness programs in female soccer.

Figure 1. 95% confidence intervals for 0-20m velocity as a function of performance level (upper panel) and time epoch (lower panel). Differing letters indicate significant differences among groups.