

## **Threshold Justification Flag System**

### **1. Jump Height Threshold (< 0.30 m)**

Jump height is one of the most widely used indicators of neuromuscular performance and lower-body power. Multiple studies have demonstrated that reductions in jump height reflect fatigue, training stress, or a decrease in force-velocity performance capacity. Research examining collegiate female athletes reports average countermovement jump heights ranging from 0.32-0.36 m, depending on sport, season phase, and testing protocol.

According to published normative tables (TopendSports, 2024), jump heights below ~0.30 m fall into the below-average or poor category for trained female populations. This threshold aligns with two key insights: performance readiness and risk indicator. When the performance readiness is lower than expected, it indicates impaired cycle function and reduced lower-limb power, often associated with neuromuscular fatigue or insufficient recovery. Studies show that athletes with consistently reduced jump height demonstrate biomechanical compensations and are more likely to exhibit increased ground-contact times and lower propulsive outputs, factors associated with elevated injury risk.

Thus, setting a threshold at < 0.30 m allows the system to flag athletes whose explosive capacity is meaningfully below normative expectations and may indicate fatigue, detraining, or inadequate recovery.

### **2. Peak Propulsive Force Threshold (< 1200 N)**

Peak propulsive force measures an athlete's ability to generate force during the upward phase of a countermovement jump. It is a strong reflection of relative strength, neuromuscular drive, and readiness.

Force-plate literature examining NCAA Division I female athletes typically reports peak propulsive forces in the range of 1300-1600 N, with values below ~1200 N representing a meaningful decline in performance capacity (Reiser et al. 2000). Lower propulsive forces reflect a reduced force production. This can be possibly due to accumulated fatigue, decreased strength levels, or disrupted training. It is also important to note that athletes with low propulsive forces produce lower jump heights and have difficulty generating sufficient impulse.

Selecting 1200 N as a threshold captures athletes operating significantly below the expected force production range for collegiate female athletes, providing a reliable marker of impaired neuromuscular performance.

## **Conclusion**

The chosen thresholds: Jump Height < 0.30 m and Peak Propulsive Force < 1200 N, are grounded in normative data and supported by evidence linking these metrics to readiness, fatigue, and performance quality. These thresholds allow the flagging system to identify athletes who may be experiencing performance decline, increased fatigue, or insufficient recovery, enabling coaches and sports performance staff to intervene proactively.