Goal(s):

- Compare acceleration, load & other Catapult[1] metrics of warmup routines of men/women soccer & lacrosse athletes on grass & turf
- What is the ideal surface (turf or grass) for warming up? We want to know what surface type brings out the highest (max) acceleration values for soccer and lacrosse players.
- How do deceleration[2] values/slopes compare on turf vs grass surfaces?

Design: The participating athletes shall have identical final parts of their warmup where they exert maximal intensity acceleration/deceleration movements. Each athlete will wear a Catapult GPS device/bib, sampling at 100Hz[2] to track various metrics for future analysis. Athletes will perform the following movements **4 times (2 each side)**, starting at the same point each time (P1). The proposed course outline is shown in Figure 1.

1. Starting at P1, 10m[3] straight sprint to P2.
2. After decelerating to cut & change direction 90° at P2, 5m sprint to pre-determined P3 location.
    a. *Athletes will know ahead of time which direction they are going (i.e. direction a or b) and all athletes will follow the same sequence/order depending on trial # (P3a, P3a, P3b, P3b)*
3. After decelerating to cut & change direction 45° at P3, 3m sprint to P4.
4. After decelerating to cut & change direction 45° at P4, 3m sprint to P5.
    a. *Note that Steps 3 & 4 differ at a & b spots by switching the back foot used to push off*
5. Upon reaching P5, athletes will stand at the finish line for 5 seconds[2] to standardize the end of movements. Athletes will rest for 1 minute before repeating the above steps.

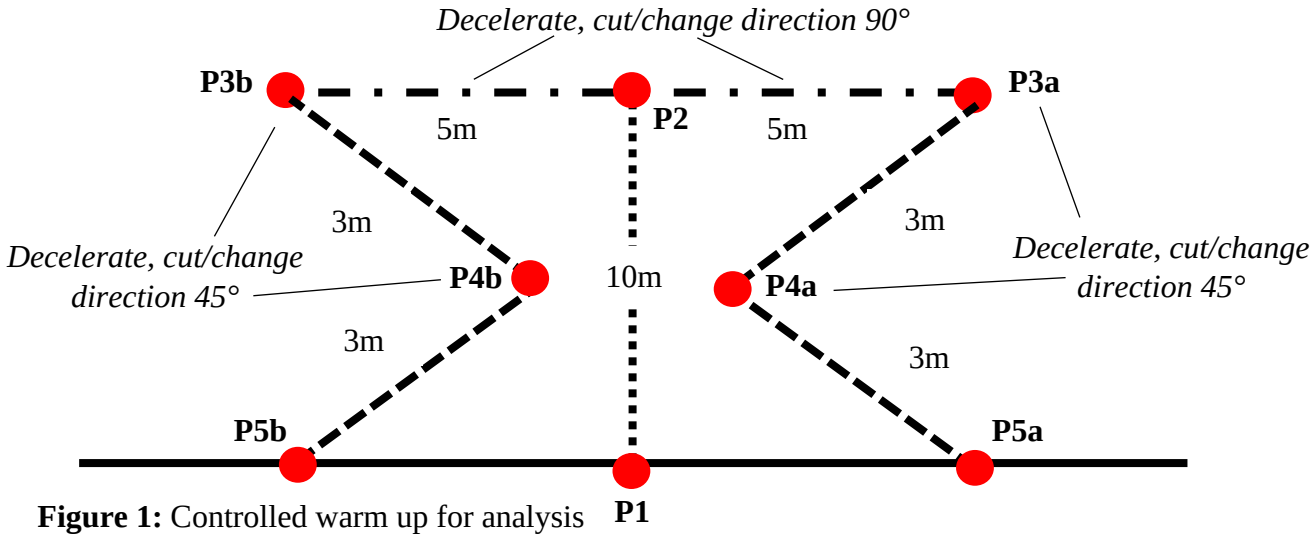

Figure 1: Controlled warm up for analysis

[1] Akenhead R, et al. The acceleration dependent validity and reliability of 10 Hz GPS. J Sci Med Sport (2013), http://dx.doi.org/10.1016/j.jsams.2013.08.005
[2] Matthew C. Varley, Ian H. Fairweather & Robert J. Aughey (2011): Validity and reliability of GPS for measuring instantaneous velocity during acceleration, deceleration, and constant motion, Journal of Sports Sciences, DOI:10.1080/02640414.2011.627941
[3] Stevens, T. G. A., de Ruiter, C. J., van Niel, C., van de Rhee, R., Beek, P. J., & Savelsbergh, G. J. P. (2014). Measuring acceleration and deceleration in soccer-specific movements using a Local Position Measurement (LPM) system. International Journal of Sports Physiology and Performance, 9(3), 446-456. https://doi.org/10.1123/IJSPP.2013-0340