Assessment 2 – Project

**GPS as a data collection tool:**

Global Positioning Systems use a radio signal received by at least 4 satellites to triangulate the position of the GPS unit at ground level. In a sporting context, they are used to track various statistics involving the position and speed of an athlete during outdoor games or training. Tracking athletes using GPS has some questions regarding validity and reliability. GPS units can have limitations when it comes to validity in tracking lateral movements as well as speed and velocity measures. Higher sample rates generally increase the level of validity in GPS units, 10hz units seem to be the most effective compared to 1hz and 5hz when it comes to short high intensity running (Scott et al., 2016). All studies referenced in the section below mention overcoming inter-unit reliability issues by having players wear the same unit throughout each game or session. This approach lowers the chance of errors when comparing across sessions. However, considering an acceptable level of error, GPS tracking allows for a more efficient collection of data than traditional time motion/video-based analysis (Aughey, 2011).

**How GPS Data is analysed in field sport:**

GPS tracking is used across various field sports to track player movement throughout a game.  
It can be used to track players’ movement and exertion, allowing them to be compared across positions. In the AFL data has been analysed to calculate statistics for distance covered, average velocity as well as acceleration and sprinting. These can also be used to calculate an exertion index which is based on the sum of a weighted instantaneous speed, a weighted accumulated speed over 10 s, and a weighted accumulated speed over 60 s. Players typically cover ~12km during a game with midfield players covering 3.4% more total distance, having 23% more instances of running at >18km-hr (than forwards and defenders), this leads to midfielders playing 4.8% less game time as substitutions are used to maximise their output. Midfielders also recorded a 17% higher exertion index per minute. (Wisbey et al., 2010).

In the NRL similar statistics can be produced to those in the AFL using GPS. These stats can also be used to provide further context to energetic and physical demand by factoring in the cost of repeated acceleration and deceleration, with accelerations from low velocity having power output equal to or higher than that required to sustain higher velocities. The highest average distances covered during an NRL match are by outside backs (centres and wingers) who cover ~6.8km. Outside backs covered fewer metres per minute at 98.6 m/min compared to the two groups of forwards (hitup = 90.5m/min, wide-running = 90.4 m/min) with adjustables (hookers, halves and fullbacks) averaging the highest with 98.6 m/min. Adjustables also had the highest number of very high-intensity accelerations with 11.7 per minute. Energetic analysis can also be performed to give measures of mean power output and total energy expenditure. Adjustables attained the highest measure of mean power while outside backs recorded the highest energy expenditure (Cummins et al., 2016).

GPS tracking is also used to analyse the running demands during a game and how players’ performance changes throughout. In the AFL, decreases can be seen in total distance covered (3463±403 to 3058±433) from quarter one to four as well as in high-intensity running distance (1090±212 to 844298) (Coutts et al., 2010).

In Rugby league, the first 10-minute periods of each half show the highest distances of high-speed running and highest metabolic power output. While the first 5-minutes of the match had the highest level of high-speed running compared to the final 5 and average for all other periods (Kempton et al., 2014).

GPS tracking can also be used to map where each player is on an AFL field to provide more information about team tactics on offence and defence. It was shown that field position had a stronger effect on where the central point of a team was during play than whether they were attacking defending or in a contestable phase of play, whereas the match phase had a greater effect on the width, length, and surface area of a team. (Alexander et al., 2019).

**Data analysis plan:**

With the GPS data provided, I will tidy and sort the data using RStudio. Having recently learned to program in this software the packages available make it an efficient and effective tool for wrangling data. I haven’t worked with GPS data previously so I will find this a new challenge to wrangle correctly and effectively as opposed to other counted statistics. Initially, I have not come up with an analysis question, but once I wrangle the data I will be able to read it easier than I can currently in its Excel format. I will initially need to calculate summary statistics to give myself an idea of the non-GPS data within the dataset, which I will then plot onto a density or box plot to visualise the distribution. There are timestamps within the data showing the use of a line plot will be an effective visualisation tool. I will utilise Rmarkdown for my visualisations, hopefully in a slide-based format as I know this can be done in Rstudio, but I haven’t used this format to date.

References:

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