



*The Smart Cricket Ball: Design, Innovation
and Advanced Performance Analysis.*

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The current state of the 'art' in designing and commercialising smart wearables and equipment technology is 1) early market entry of 2) mostly un-validated products [1], that 3) measure known performance parameters at a low level [2,3] (compared to high-end devices that are not wearable nor fit on/into equipment), without 4) recognising opportunities for innovation, specifically lateral innovation (achieving at least the same outcome but with different rather than traditional technology, i.e. disruptive technology). The Smart Cricket Ball was designed and developed for measuring and calculating newly discovered performance parameters of bowling, such as precession speed of the spin axis, normalised precession, efficiency, precession torque, and power. The ball also measures traditional parameters such as spin rate and stability of the seam, as well as the centre of pressure (COP, where the torque is imparted onto the ball). Yet, the COP is rather calculated from gyro data rather than from traditional pressure or force sensors, a typical example of lateral innovation. The ball was validated against a standard motion capture system, and different bowling deliveries were tested, such as fast bowling and 19 different spin bowling deliveries, leading to a new classification system for spin bowling. Some of the results obtained from the ball are that backspin deliveries are less efficient than topspin; wrist spin deliveries are more efficient than finger spin; the middle finger produces most of the torque in spin bowling; low performance of bowlers is mostly due to wasting too much torque for precession. The ball is currently used by several cricket clubs and organisation for testing advanced performance analysis of bowlers.

[1] Dueking et al. 2016. *Frontiers in Physiology* 7(article 71):2-11

[2] Navalta et al. 2016 Validation of Hexoskin biometric shirt to Cosmed k4b2 metabolic unit in adults during trail running, *Sports Technology*, in print

[3] Nevins et al. 2015, *Procedia Engineering*, 112: 175-179