Using Technology to Monitor Elite Athletes – Vital Signs

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Vitals signs are classified as objective measures of the body's essential physiological functions, used to evaluate general health status, identify potential medical problems, and track recovery. These include the four traditional *core* measurements of body temperature, pulse (heart) rate, blood pressure, and respiratory rate, with some additional supplementary vital signs including oxygen saturation, level of consciousness and pain. However, whilst the measurement of oxygen saturation has become a routine component of clinical assessment because of its proven value in detecting hypoxemia, both level of consciousness and pain are far less common given the subjective nature of their rating. In medical settings, vital signs are recorded on admission, before procedures, during routine check–ups, and continuously in critical care. Abnormal values in these measures often signal underlying illness or deterioration before other symptoms become apparent. Clinicians use them to establish baselines, detect acute illness, monitor treatment response, and guide decisions such as medication dosing or escalation of care. Many hospitals use early warning scores (such as the National Early Warning Score 2 [NEWS2] in the UK), which combine multiple readings into a single score to flag patients at risk of deterioration.

Vital signs also have high practical utility within the domains of the of sport and exercise sciences, which can now be easily assessed using wearables such as chest straps and smartwatches to allow continuous monitoring. Heart rate is often used as a measure of internal workload during exercise, with resting values indicating cardiac efficiency, fatigue, illness or suboptimal recovery. Blood pressure can indicate a range of clinical outcomes (e.g. hypotension), with respiratory rate and oxygen saturation being useful for monitoring exercise–induced asthma, altitude training, and recovery from respiratory illness. Finally, assessing body temperature is critical for identifying heat illnesses, such as heat exhaustion and heatstroke, which are major risks in endurance and outdoor based sports. From a sports nutrition context, vital signs can act as a practical, non–invasive feedback on whether an athlete's fuelling, hydration, and recovery strategies are optimal. Changes in heart rate during both rest and exercise can be indicative of inadequate fuelling or dehydration. Elevated core temperature during exercise, particularly in the heat, potentially highlights suboptimal hydration and changes in blood pressure may indicate fluid deficits, elevated sodium intakes and is proposed as a potential indicator of low energy availability on the Relative Energy Deficiency in Sport (REDs) CAT 2 tool.

To contextualise the use of vital signs in sport and exercise nutrition, this presentation will highlight their practical application for monitoring hydration status, screening for REDs, periodising carbohydrate, fluid, and electrolyte strategies during training and competition and evaluating the impact of ergogenic aids such as caffeine. Finally, the presentation will highlight the use of vital sign assessment in the recent (S)auna induced (W)eight–loss (E)ffects on cognitive, physical and physiological (A)bilities in jockeys (T)rial (SWEAT) study, to examine both the physiological responses of hypohydration and monitor athlete safety.