HONG KONG SPORTS INSTITUTE
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RESEARCH HIGHLIGHTS

Blood Lactate Responses of Male and Female Players Throughout an International Rugby Sevens Tournament

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Introduction

Rugby Sevens players undertake numerous repeated, maximal intensity locomotor efforts, however few studies have investigated the within- and between-game blood lactate ([La-]) responses during tournaments [1, 2], and only in male players. Such short-duration, maximal intensity activities are unlikely to be fully sustained by aerobic energy provision, with the associated physiological stress not accurately quantifiable via ubiquitous internal (i.e. heart rate monitoring, RPE [1, 2]) or external (i.e. GPS, accelerometry) athlete monitoring methodologies. Therefore, this study investigated [La-] responses across an international rugby sevens tournament (5 matches over 2 days), in both male and female teams.

Methodology

A cross-sectional observational study of an international tournament was performed, with 25 players from the men's and women's Hong Kong Rugby Sevens teams. Earlobe [La-] was sampled before (n = 119), immediately (< 90 s) after leaving the pitch (n = 105), and 30-min post-match (n = 51). Linear mixed models were fitted on pre-, post- and 30-min post-match [La-] data. Models investigated changes across matches, sexes and playing positions, as well as pre- versus 30-min post-match [La-].

Results

Match 5 post-match [La-] was lower (-1.9 [-3.2 – -0.6] mmol•L^{-1}) compared to Match 1 (Figure 1, p = 0.005). Higher 30-min post-match [La-] was found compared to pre-match [La-] (+1.7 [1.4 – 2.0] mmol•L^{-1}; p < 0.001; Figure 2). From 51 samples, nine remained above onset of blood lactate accumulation ('OBLA'; 4 mmol•L^{-1}) 30-min later. No differences were observed in [La-] clearance (i.e. post-match [La-] vs 30-min post [La-]) across the tournament. Pre-match [La-] was elevated before Match 2 (+0.8 [0.6 – 1.1] mmol•L^{-1}), Match 3 (+0.8 [0.5 – 1.1] mmol•L^{-1}) and Match 5 (+0.6 [0.4 – 0.9] mmol•L^{-1}), compared to Match 1 (all p < 0.001). Higher post-match [La-] (+1.6 [0.1 – 3.2] mmol•L^{-1}) was observed in males versus females (p = 0.042). No changes were observed between sexes for [La-] clearance or pre-match [La-], nor between positions for any comparisons.

Discussion

Extremely high [La-] responses were found immediately after matches (Figure 1), with ~20% of values remaining >4 mmol•L-1 30-min later (Figure 2). Approximately half of all observations exceeded 10 mmol•L^{-1}, with two observations exceeding 19 mmol•L^{-1}. These peak values appear novel within sevens literature and represent benchmarks for replicating anaerobic match demands during specific training practices. We observed greater post-match [La-] in males, however no other [La-] measures differed between sexes. Differences in post-match [La-] likely arise through males possessing and utilizing a greater muscle mass, which supports the higher running activity we observed in males. There was considerable inter-individual variation in post-match [La-] responses (males 2.9 - 20.2 mmol•L^{-1}, females 3.4 - 14.6 mmol•L^{-1}). Despite this variability, and unlike in fifteens [3], no positional differences were identified between forwards or backs. This implicates an individual's physiological profile as a likely determinant of match [La-] response.

We identified cumulative metabolic stress across the tournament, with meaningful changes in resting [La-] between matches. Whilst [La-] itself is a fuel source for various tissues [4], it remains a surrogate indicator of acidosis in active muscles, and prompt clearance is associated with enhanced training status and aerobic fitness [5]. Therefore, a well-developed aerobic capacity appears highly desirable for sevens players, to optimise recovery within and between matches. Similarly, supplementation and training strategies that enhance muscle buffering capacity have relevance for sevens players. Finally, 'active' recovery strategies at specific, individualized intensities may be used to accelerate [La-] clearance [6], as can reduced body temperature [7].

In summary, improving athletes' metabolic recovery capacity through training, nutrition, and recovery interventions, may enhance physical readiness for subsequent matches within a day, where incomplete lactate clearance was observed, with these responses similar in both males and females.

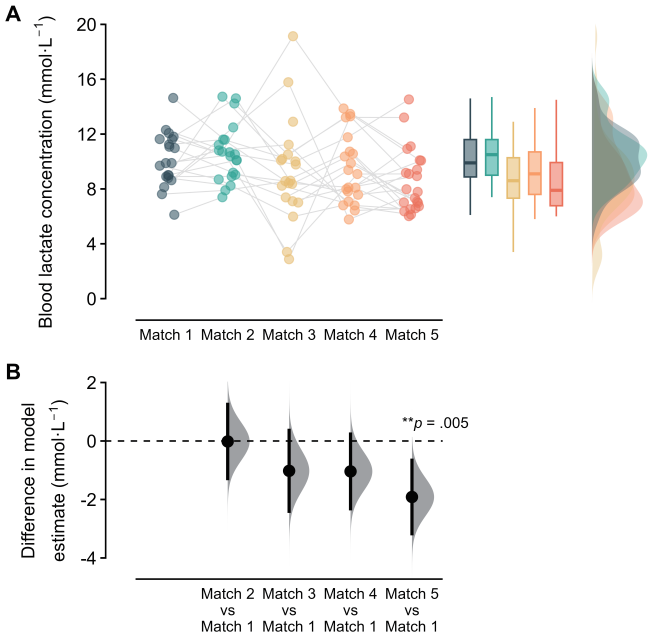

Figure 1: Differences in post-match [La-] across matches, versus Match 1. Raw data are plotted on Panel A, with corresponding box and density plots. On Panel B, differences in model coefficients are plotted as point estimates (black dots) with a 95% confidence interval (vertical black line) and corresponding t distribution (grey shaded area).

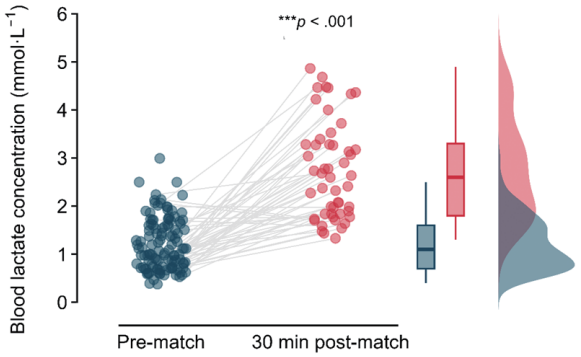

Figure 2: Comparison of pre-match [La-] with measures taken 30 minutes post-match.

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