



Strength and lower body power in international rugby sevens players: Seasonal variations and the effects of travel

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Abstract

Maintaining strength and power during a rugby sevens tournament, and across an international season, is deemed important, yet the time course of changes in these characteristics is unclear in forwards and backs. During an international season, players undertake high intensity physical training to prepare for the demands of travel and competition. The aim of this research is to quantify changes in strength and power across an international rugby sevens season, and the effects of long-haul travel on neuromuscular function and tournament running demands. Two experimental studies were conducted to address these issues.

Body composition, upper body strength, lower body strength and power were measured to quantify changes over an international rugby sevens season at three time points: initial, early season and late season. Subjects were 14 international male players – seven forwards, seven backs (age 21.4 ± 2.2 y; mean \pm SD). Forwards were taller (185 ± 4 cm), heavier (95 ± 6 kg) and possessed a greater lean body mass (55.5 ± 4.0 M·S^{-0.14}; M is body mass (kg), S is sum of skinfolds (mm)) than backs (181 ± 8 cm, 88.5 ± 5.5 kg, 51.9 ± 3.4 M·S^{-0.14}). Over the full season, small ($\sim 5\% \pm 5\%$; mean \pm 90% confidence limits) positive changes occurred in body composition with players having increased muscle mass with decreased fat mass. Lower body strength gained during the pre-season decayed in-season ($\sim 4\% \pm 3\%$ below initial levels), whereas upper body strength increased moderately ($\sim 10\% \pm 3\%$) across the season. Forwards showed a small decrease in lower body peak power (relative and absolute). There was a moderate decrease in mean power over the season for the forwards ($\sim 6\% \pm 6\%$), but conversely a moderate increase for the backs ($\sim 8\% \pm 6\%$). In-season difficulties in maintaining and improving power qualities indicates prescription of training loads could be position-specific to optimise strength and power.

Lower body power and tournament running demands were monitored over 17 tournaments to assess between-subject changes following long-haul (>5 h) travel in international rugby sevens players (22 male international players - age 21.7 ± 2.7 y, mass 89.0 ± 6.7 kg, stature 180.5 ± 6.2 cm; mean \pm SD). A countermovement jump was used to assess lower body power over repeated three week travel and competition periods (pre-travel, post-travel, and post-tournament). Small decreases in peak power were evident post-travel ($-4.0\%, \pm 3.2\%$; mean, \pm 90% confidence limits) for combined short and long-haul travel, with further reductions in peak ($-4.5\%, \pm 2.3\%$) and mean power post-tournament (3.8% ,

$\pm 1.5\%$) culminating in a moderate decrease in peak power overall ($-7.4\%, \pm 4.0\%$). In a within-subject analysis completed on a sub-set of 12 players who competed in a minimum of 8 tournaments, long-haul travel elicited a large decrease in both lower body peak ($-9.4\%, \pm 3.5\%$) and mean power ($-5.6\%, \pm 2.9\%$) over the monitoring period, with a small decrease ($-4.3\%, \pm 3.0\%$ and $-2.2\%, \pm 1.7\%$) post-travel and moderate decrease ($-5.4\%, \pm 2.5\%$ and $-3.5\%, \pm 1.9\%$) post-tournament respectively. In long-haul tournaments the 12 players covered $\sim 13\%, \pm 13\%$ greater total distance (m) and $\sim 11\%, \pm 10\%$ distance above $5 \text{ m}\cdot\text{s}^{-1}$ distance above $5 \text{ m}\cdot\text{s}^{-1}$ (via global positioning system) than short haul tournaments. Effective pre- and post-travel management strategies are indicated to reduce neuromuscular fatigue and running load demands following long-haul travel.

There are unique physical demands for players competing in international rugby sevens. During a competitive season, forwards may struggle to maintain lower body strength and power likely due to specific positional demands. Long-haul travel can increase neuromuscular fatigue and tournament running demands. Practitioners should develop training plans to develop and maintain strength and power across the season, and maximise post-travel/tournament recovery.

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Publications by the Candidate Relevant to the Thesis

Mitchell JA, Pumpa KL, Williams KJ, and Pyne DB. Variable changes in body composition, strength and lower body power during an international rugby sevens season. *J Strength Cond Res* 2016 30(4): 1127-36.

Mitchell JA, Pumpa KL, and Pyne DB. Responses of lower body power and match running demands following long haul travel in international rugby sevens players. *J Strength Cond Res* (In Print), 2016.

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Conference Presentations by the Candidate Relevant to the Thesis

Mitchell JA, Challenging the Strength and Power Paradigm. ASCA International Strength and Conditioning Conference, November 8, 2014, Melbourne, Australia.

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