Comparison of Physical and Physiological Characteristics of Elite Under-16 and Under-18 Rugby League Players

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Introduction

Assessing the physical capabilities of youth athletes is imperative to prescribing training recommendations and in talent identification practices, especially within the high performance environment (Pearson, Naughton & Torode, 2006).

Due to the physically demanding nature of rugby league, highly developed levels of muscular strength endurance, power, speed, and aerobic capacities are increasingly sought after at all levels of the game (Gabbett, 2012). Though these physical characteristics have been largely covered abroad (King, Hume, Milburn & Guttenbeil, 2009), similar investigations on rugby league youth players are currently non-existent within New Zealand.

Purpose

The purpose of this study was to investigate the athletic capacities of New Zealand elite youth rugby league players, and compare the under-16 (U16) and under-18 (U18) age groups. Performing these measures will potentially aid in future training recommendations and provide an insight into the current physical and physiological capacities of elite, youth New Zealand rugby league players.

Methods

78 elite youth rugby league players (U16 *n* = 39, U18 *n* = 39) completed a range of standardised tests as part of the New Zealand Rugby League annual High Performance Camp. Test protocols comprised:

Anthropometry: Standing height, seated height and body mass

Lower Limb Power: Counter Movement Jump

Muscular Endurance: Cadence press up test

Linear Speed: 10m, 20m and 40m sprint

Change of Direction Speed: 5-0-5 test

Aerobic Capacity: 1.2km shuttle run test (1.2_{SRT})

Table 1: Mean values (SD) of U16 and U18 age, mass, height and seated height measurements.

Variable	U16 (n = 39)	U18 (n = 39)
Age (years)	15.2 (0.6)	16.7 (0.5)
Mass (kg)	90.9 (12.2)	91.8 (12.3)
Height (cm)	179.1 (6.4)	179.9 (6.2)
Seated Height (cm)	95.2 (2.9)	95.7 (3.3)

1.2km Shuttle Run Test

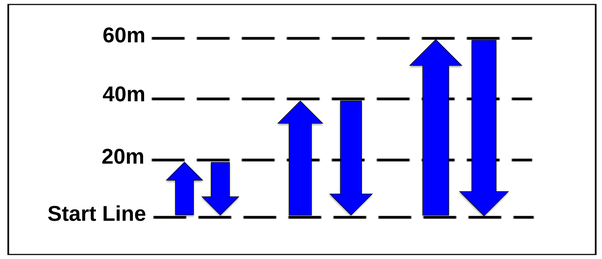

Figure 1: 1.2_{SRT} schematic

Disc cones were placed at 0m, 20m, 40m, and 60m. Athletes were required to run forward to the 20m line then return to the start line, progress on to the 40m line and return, then finally run out to the 60m line before returning to the start line. Athletes were required to repeat this process a total of five times continuously with no breaks, at maximal intensity for time.

Results

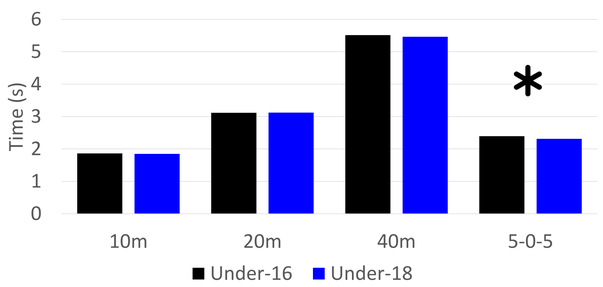

Figure 2: differences between age groups for linear and change of direction speed. ✱ = Statistical significance between age groups.

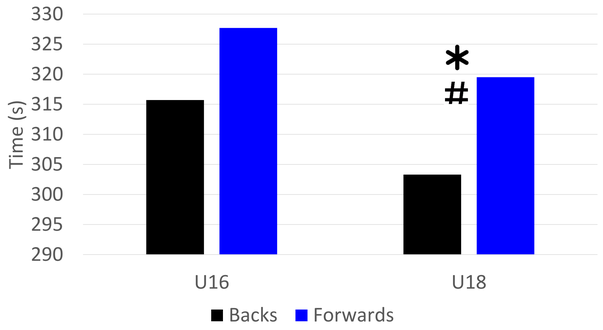

Figure 3: Differences in 1.2_{SRT} times between positional backs and forwards for U16 and U18 cohorts. ✱= Statistical significance between age groups; # = Statistical significance between positional groups.

Results

Table 2: Pearson's correlation coefficient values and categories for linear speed, change of direction speed, and aerobic capacity against body mass for U16 and U18 athletes.

Variable	U16 Mass (r)	Qualitative Inference of Magnitude	U18 Mass (r)	Qualitative Inference of Magnitude
10m Speed	0.28	Minor	0.16	Minor
20m Speed	0.23	Minor	0.16	Minor
40m Speed	0.34*	Moderate	0.15	Minor
5-0-5	0.36**	Moderate	0.25	Minor
1.2_{SRT}	0.36*	Moderate	0.49**	Moderate

* = Statistical significance at the 0.05 level; ** = Statistical significance at the 0.01 level; r = Pearson's correlation coefficient.

- Significantly small and moderate differences between age groups were observed for 5-0-5 and 1.2_{SRT} test procedures, with the U18's performing 3.4% and 3.1% faster than U16's respectively.
- However, all other testing variables returned no significant differences.
- Notably significant correlations of lighter U16 athletes performing better in the 5-0-5 than heavier athletes of the same age.
- Lighter athletes performed aerobic testing significantly faster than heavier athletes for U16 and U18 cohorts, with greater correlations overall returned for the U18 group.

Discussion

Trivial differences in mass, height, and seated height measures were elicited between age groups, with U18 athletes taller and heavier than the U16 athletes. These findings are consistent with established patterns showing increases in anthropometric variables as athletes get older (Till, Scantlebury & Jones, 2017).

Lower limb power outputs and upper body muscle endurance efforts were greater in U18 athletes, outjumping and outperforming the U16 athletes by 2.6% (1.6cm), and 15.6% (5 press up repetitions) respectively. 5-0-5 test performance of the U18s was significantly faster (3.4%, p = 0.001) than the U16s. 1.2_{srt} performance was also significantly faster, illustrating greater aerobic capacities of the U18s compared with the U16s.

Overall, due to a large degree of similarity between test variables, it seems that greater training loads, higher intensities, and superior playing levels in addition to the natural biological progressions through pubescent changes enhance physical performance as athletes get older (Gabbett, 2009). This is suggested to produce greater neuromuscular control and both application and production of force, in addition to an enhanced ability to control their own mass during training and competition (Till et., 2017).

Practical Applications

•Practitioners and athletes should note that gains in body mass should come by way of lean muscle to increase performances.

•Lighter and older athletes typically perform the change of direction speed better and have greater aerobic capacities.

•Overall, there is minimal variation between physical capacities of the two age groups, however the older athletes seemingly develop greater aerobic and change of direction abilities.

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