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Original research

Using anthropometric and performance characteristics to predict selection in junior UK Rugby League players

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Abstract

Research examining the factors influencing selection within talented junior Rugby League players is limited. The aims of this study were firstly to determine whether differences existed for anthropometric and performance characteristics between regional and national selection in high performance UK junior Rugby League players, and secondly to identify variables that discriminated between these selection levels. Regional representative ($n = 1172$) selected junior players (aged 13–16 years) undertook an anthropometric and fitness testing battery with players split according to selection level (i.e., national, regional). MANCOVA analyses, with age and maturation controlled, identified national players as having lower sum of 4 skinfolds scores compared to regional players, and also performed significantly better on all physical tests. Stepwise discriminant analysis identified that estimated maximum oxygen uptake ($\dot{V}O_{2\,max}$), chronological age, body mass, 20 m sprint, height, sum of 4 skinfolds and sitting height discriminated between selection levels, accounting for 28.7% of the variance. This discriminant analysis corresponded to an overall predictive accuracy of 63.3% for all players. These results indicate that performance characteristics differed between selection levels in junior Rugby League players. However, the small magnitude of difference between selection levels suggests that physical qualities only partially explain higher representative selection. The monitoring and evaluation of such variables, alongside game related performance characteristics, provides greater knowledge and understanding about the processes and consequences of selection, training and performance in youth sport.

Key words: Talent; Maturation; Identification; Homogenous

1. Introduction

Rugby League is a collision sport played at junior and senior levels around the world with game popularity most established in Great Britain, France, Australia and New Zealand.[1,2] The game involves frequent periods of high-intensity activities (e.g., tackling, ball carrying) separated by bouts of low intensity activity (e.g., jogging[3,4]). Due to the physically demanding nature of the game, players are required to have highly developed physiological capacities of muscular strength, power, speed, agility and aerobic power.[2,5,6]

In the UK, the Rugby Football League (RFL) used a player performance pathway for the selection of high performance junior players (see Till et al.[7] for a more detailed description of the pathway). The major purpose of the pathway was to assist in the development of the most talented junior players with regional and national representative selection key components of this development model. Regional selection (i.e., County standard – Yorkshire, North–West, Cumbria in the UK) resulted in 100 players being selected at under 13, 14 and 15 annual-age categories each year in which players attended a week long training camp to undertake specialised coaching and training. Following performances at regional level, players were then selected for national level ($n = 40$ at under 13s; $n = 24$ at under 14 and 15 each year) where they received further support and development from the RFL. Therefore,

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the RFL identified 100 talented players at each annual-age group each year to regional level with the best of this group of players selected to respective national squads.

Previous research in junior Rugby League players[3,8,9] has shown that anthropometric and physiological characteristics increase and develop across annual-age groups and playing level. For instance, Gabbett[8] showed improved capacities as age increased from under 13 to senior aged players, while further studies[10,11] found body mass, vertical jump, speed, agility and estimated aerobic power to differentiate between elite (Australian National Rugby League club development program) and sub-elite (club standard) juniors. Recent research in other youth sports contexts, such as field hockey[12] and volleyball[13] has begun to assess whether anthropometric, physiological and skill data also discriminate between junior players within a similar age and stage of development. For example, in volleyball,[13] no differences in anthropometric and physiological characteristics were found between selected ($n = 19$) and non-selected ($n = 9$) players to a Queensland Academy of Sport Talent Search Program. Instead results found that passing accuracy, passing technique and spiking technique were the discriminating factors. However, in junior handball players,[14] findings identified that body mass, arm length, standing long jump, vertical jump and shuttle speed were able to distinguish between elite and non-elite players.

Unlike heterogeneous samples (i.e., different ages, stages of development and skill levels) where anthropometric and physiological differences may be more striking, it is difficult based on research to date, to consistently assume which variables are able to discriminate between more homogenous (i.e., similar age and skill levels) samples in a given sport context. Although studies have compared characteristics across age-categories and skill levels in youth sport, no study has directly examined how anthropometric and performance characteristics contribute to regional or national selection within a developmental and representative group of junior Rugby League players. Thus using a large sample with data collected over a number of years from the RFL player performance pathway, the initial purpose of this study was to determine if differences existed for anthropometric and performance characteristics between regional and nationally selected players, whilst controlling for chronological age and maturation. The secondary purpose was to identify potential variables which discriminated between the selection levels and were able predict the likelihood of being a national compared to regional representative junior player.

2. Methods

Participants: A total of 1172 regional representative selected junior rugby league players participated in the study. The data were separated by selection level (regional $n = 870$; national $n = 302$) and by annual-age category (under 13 regional $n = 255$, national $n = 130$; under 14 regional $n = 309$, national $n = 86$; under 15 regional $n = 306$, national $n = 86$). All players undertook an anthropometric and fitness assessment, in which all protocols received institutional ethics approval with parental and/or guardian consent provided.

Procedures: Fitness testing results from the 2005 to 2008 RFL's Regional representative squads were collected in July each year. All assessments were carried out by Leeds Metropolitan Sport Science Support Team, however all tests were decided by the RFL. Standard anthropometry (height, sitting height, body mass, sum of 4 skinfolds), maturation (age at peak height velocity; PHV) and performance characteristics (lower and upper body power, speed, agility, estimated maximum oxygen uptake) were collected for each participant during the regional camp.

Anthropometry: Height and sitting height were measured using a Seca Alpha stand, to the nearest 0.1 cm. Body mass, was measured using calibrated Seca alpha (model 770) scales, to the nearest 0.1 kg. The sum of four skinfold thickness was determined using calibrated Harpenden skinfold callipers (British Indicators, UK) with procedures in accordance with Hawes and Martin.[15] Intraclass correlation coefficients and typical error measurements for reliability of skinfold measurements were $r = 0.954$ ($p < 0.001$) and 3.2%, respectively, indicating acceptable reliability based on established criteria (i.e., >.80[16]).

Maturation (age at PHV): To measure maturity status, an age at PHV prediction equation was used.[17] The 95% confidence interval associated with this equation for boys is $\pm$ 1.18 years.[17] Years from PHV was calculated by subtracting age at PHV from chronological age.

Performance characteristics: To assess lower body power a vertical jump was measured using a Takei vertical jump metre (Takei Scientific Instruments Co. Ltd., Japan). A countermovement jump with hands positioned on hips was used, with jump height measured to the nearest cm. The vertical jump score was the highest value recorded during three trials.[18] The intraclass correlation coefficient and typical error measurement for the vertical jump was $r = 0.903$ ($p < 0.001$) and 2.9%, respectively.

The 2 kg medicine ball (Max Grip, China) chest throw was used to measure upper body power.[19] Participants were seated with their backs against a wall and were instructed to throw the ball horizontally as far as possible. Distance was measured to the nearest 0.1 cm from the wall to where the ball landed with the furthest of three trials used as the score. The intraclass correlation coefficient and typical error measurement for the medicine ball chest throw was $r = 0.965$ ($p < 0.001$) and 0.6%, respectively.

Running speed was assessed over 10 m, 20 m, 30 m and 60 m using timing gates (Brower Timing Systems, IR Emit, USA). Times were recorded to the nearest 0.01 s, with the shortest time recorded during 3 trials used for the sprint measurement. Intraclass correlation coefficients and typical error measurements of the 10 m, 20 m, 30 m and 60 m sprints were $r = 0.788$ ($p < 0.001$), $r = 0.852$ ($p < 0.001$), $r = 0.899$