Game-play characteristics differ between the European Super League and National Rugby League: Implications for coaching and talent recruitment

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Original Article

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Abstract

Objectives: To compare the game-play characteristics between the European Super League (ESL) and the National Rugby League (NRL) competitions.

Methods: Eleven team performance indicators were extracted from each match played by every ESL and NRL team over their respective 2016 season. Data was averaged, classified according to competition (Two levels: ESL and NRL), and modelled using univariate and multivariate techniques. Specifically, effect size statistics enabled between group comparisons, while non-metric multidimensional scaling enabled multivariate insights into competition dissimilarity.

Results: Seven of the 11 performance indicators showed 'large' to 'very large' effects. Notably, NRL game-play generated fewer 'line breaks', 'errors', 'tackles' and 'dummy half runs' relative to ESL game-play (d >1.2). Despite the NRL generating fewer 'all runs' (d = 1.27 [0.57-1.95]), game-play in this competition generated greater 'all run distances' relative to the ESL (d = 1.78 [1.02-2.51]). Non-metric multidimensional scaling revealed clear multivariate competition dissimilarity, with ESL and NRL teams orienting distinctive positions on the ordination surface. Further, there was a greater spread in the relative positioning of NRL teams compared to ESL teams, indicating greater team dissimilarity within the NRL.

Conclusions: Our observations may be explained by differing competition rule interpretations, in addition to differing game strategies and player skill capabilities. Both coaches and talent recruitment managers associated with these competitions may consider our data to assist with the identification and recruitment of suitable players from these respective competitions.

Key words: Performance analysis, non-metric multidimensional scaling, team behaviour, data visualisation, team sport

Introduction

Rugby league (RL) is an international team invasion sport played in over 14 countries. Game-play consists of two 40 minute halves, during which players execute a range of physical (e.g., anaerobic and aerobic power), technical (e.g., passing and kicking) and perceptual (e.g., decision-making and pattern recall) skills [1, 2]. The sport is contested between two teams who field 13 players per side, with the rectangular pitch dimensions ranging between 112-122 x 58-68 m. The fundamental premise of game-play is to score a 'try' (resulting in four points) by placing the ball on or across the opposition try line. The scoring team is then afforded with the opportunity to score an additional 'try conversion' (resulting in two points) by kicking the ball over a cross bar positioned between two goal posts at either end of the pitch. Thus, the winning team is the one who accrues the highest number of points at the end of the 80-minute game.

Although being played across four continents, the two most prominent elite senior RL competitions are the Australasian National Rugby League (NRL) and the European Super League (ESL). The NRL, founded in 1998, consists of 16 teams (15 from Australia and one from New Zealand) who compete within a 26-week 'Premiership' season. The premise of this season is to rank teams on a ladder based on the number of wins they accrue, with the highest ranked eight teams at its conclusion then competing within a four-week finals series in an attempt to win the NRL Premiership [3, 4]. The ESL, founded in 1996, consists of 12 teams (11 from England and one from France) who compete within a 23-week 'home and away' season. Following this, the eight highest ranked teams on the ladder compete within a 'super eight' stage, where each team plays one another [5]. The four highest ranked teams following this stage then compete within a 'play-off' series to determine who competes in the ESL Grand Final [5].

Despite the fundamental requisites of game-play being similar, there are distinctive ruling differences between the NRL and ESL. Most prominently, the ESL has a relegation process, which was implemented in the 2015 season. This ruling sees the bottom four ranked ESL teams compete against the top four Championship league teams (league below the ESL) for four places in the ESL in the subsequent season. Contrastingly, there is no such relegation ruling within the NRL. It is possible that

this relegation ruling generates a more equalised competition, as poorer performing teams are replaced with higher performing teams from a sub-competition. Accordingly, the multivariate profiles between teams in the ESL may be more similar when contrasted to those in the NRL, which does not possess a relegation ruling.

It is common practice for teams within both the NRL and ESL to recruit players from the opposing competition. However, in an attempt to standardise this international recruitment behaviour, the ESL introduced a 'home grown player' ruling in 2007, which currently dictates that no more than five international players are eligible to be contracted to an ESL team. Contrastingly, the NRL do not have such a ruling, meaning that an NRL team is free to recruit as many international players as they see fit (pending salary cap restrictions). Building from this, the NRL have a higher player salary cap relative to the ESL, with NRL teams in the 2017 season being eligible to spend up to $7 million on player salaries [6], compared to the $2.5 million ESL clubs are eligible to spend [7]. It could therefore be postulated that NRL teams more eagerly recruit higher profile players from other international competitions, such as the ESL, as they are not limited by an international recruitment policy and can place greater financial incentives on player contracts.

Although prior work has demonstrated that the physical activity profiles of players in the ESL and NRL differ [8], it is unknown whether the technical game-play characteristics (e.g. the number of ball carries and carry distance) differ between these international RL competitions. Examining these technical differences would likely benefit recruitment managers associated with teams in both competitions by objectively informing the types of game-based performance characteristics that may be most suited to their respective competition, enabling more targeted talent recruitment. The aim of this study was to compare the performance indicator characteristics between the NRL and ESL competitions. Given the differences in relegation and international player rulings, coupled with prior work [8], it was hypothesised that the multivariate characteristics would be distinctly dissimilar between competitions.

2. Methods

Performance indicators from each team participating in the 2016 NRL and ESL seasons were extracted from publically available sources (http://www.nrl.com/stats; http://www.rugby-league.com/superleague/stats) (Table 1). The indicators were chosen given their utility in the explanation of match outcome in RL [4], and availability within both competitions at the time of analysis. Seasonal averages of each performance indicator were used to account for the different lengths of each respective season. The relevant Human Ethics Committee provided ethical approval prior to data acquisition.

******INSERT TABLE ONE ABOUT HERE******

The following analyses were performed in the computing environment *R*, version 3.2.5 [9]. Data was sorted according to competition (Two levels: NRL and ESL), with descriptive statistics (mean ± standard deviation) being calculated for each team's performance indicator relative to competition. To gain insights into the univariate differences between competitions, effect sizes and subsequent 90% confidence intervals (90% CIs) were calculated relative to competition using Cohen's *d* statistic [10] in the 'MBESS' package [11]. Corresponding effect size interpretations were in accordance with prior recommendations [12].

To reveal multivariate competition dissimilarity, non-metric multidimensional (nMDS) was used, which is the preferred ordination technique when no assumptions are made about the underlying distribution of the data [13]. This indirect gradient analysis produces a two- or three-dimensional ordination based on a dissimilarity matrix [13]. To resolve this matrix, isotopic regression is used, which is a form of non-parametric regression that iteratively (referred to as 'runs') searches for a least squares fit [13]. Prior to performing this analysis, teams from both competitions were sorted according to ladder position at the end of their respective home and away seasons, enabling a visualisation of the multivariate profiles of higher and lower ranked teams. Using the Bray-Curtis method in the 'vegan' package, the team performance indicators were used to build the dissimilarity matrix via the *metaMDS* function [14]. The matrix was then plotted in two-dimensions using generalised additive models that employed an isotopic smoother via thin-plate regression splines [13]. Using the 'ggplot2' package [15],

teams were colour coded and labelled on the ordination surface using the *geom_label* function, while their subsequent ladder position was denoted using the size of their 'point' using the *geom_point* function.

3. Results

The descriptive statistics and competition effects are presented in Table 2. Three of the 11 team performance indicators displayed very large effects. On average, NRL game-play generated fewer 'line breaks', 'errors' and 'dummy half runs' compared to the ESL (d >2.0; Table 2). Despite producing fewer 'all runs', game-play in the NRL generated a greater 'all run distance' relative to the ESL (d >1.2; Table 2). Furthermore, NRL game-play generated fewer 'try assists', 'tackles', and 'tries' relative to the ESL (d >1.0; Table 2), while the count of 'offloads', 'missed tackles' and 'tackle breaks' each presented trivial to small effects (Table 2).

******INSERT TABLE TWO ABOUT HERE******

The dissimilarity matrix solution was reached after 20 runs (stress = 0.130, root mean squared error = 7.1×10^{-4}, maximum residual = 3.1×10^{-3}). The ordination plot revealed clear multivariate competition dissimilarity (Figure 1). Each ESL team was oriented to the right of MDS1, while the majority of NRL teams (with the exception of the New Zealand Warriors, Canberra Raiders and North Queensland Cowboys) were oriented to the left panelling of MDS1. There was a greater spread in the positioning of NRL teams on the ordination surface relative to the ESL teams. This indicates greater competition dissimilarity in the profiles of NRL teams relative to that within ESL teams. There was a data signature in the NRL regarding the positioning of each team relative to their ladder ranking (Figure 1). Teams ranked closer to one (higher performing teams) generally clustered along the bottom panelling of MDS2, while team ranked closer to 16 (lower performing teams) generally clustered along the top of MDS2. This signature was not as apparent within the ESL, with Hull (ranked one on their respective ladder) possessing a dissimilar position relative to the Wolves (ranked second) and Wigan Warriors (ranked third) (Figure 1).

******INSERT FIGURE ONE ABOUT HERE******

4. Discussion

This study compared the team performance indicator characteristics between the NRL and ESL competitions during the 2016 season. The differences in relegation, international player recruitment and salary cap rulings, coupled with prior work [8], led to the hypothesis that differences would be evident. Results supported this hypothesis, with large to very large differences being noted for seven of the 11 team performance indicators. Given these univariate differences, multivariate competition dissimilarity was expected. Despite being speculative, it is possible that this dissimilarity stems from competition ruling differences (e.g. relegation and international player recruitment), coaching strategic differences and/or the functional skill capacities of players within both competitions. Talent managers may wish to consider these results when determining the objective suitability of prospective recruits from either competition.

The univariate differences between the competitions were of considerable note. Specifically, the ESL generated more 'line breaks', 'tackles', 'errors' and 'all runs' relative to the NRL. However, despite the greater number of 'all runs', the NRL generated a greater all run distance relative to the ESL, with this observation likely being explained by differing rule interpretations surrounding the ruck speed. Notably, from the 2015 season, the NRL imposed strict temporal constraints on the ruck speed, meaning that defending players engaged in the ruck had to release the tackled player faster, limiting the time defenders had to retreat along their defensive line to fill holes in the line. This is likely to have afforded the attacking team with the opportunity to execute a faster play-the-ball, exposing holes in a defensive line [3]. Contrastingly, the ESL have not imposed a temporally strict interpretation on the ruck speed, meaning that tackling players are free to peel off a tackled player in succession, with this allowing the defensive team to fill holes along their line. Ultimately, this could enable the defensive line to engage in greater collective behaviour, resulting in greater difficulty for the attacking team when attempting to run the ball. Further, the NRL dictates that players must reside a minimum of 10m from the scrum if they are not actively involved, while the ESL imposed only a 5m distance in the 2016 season (interestingly, this was changed to 10m in the 2017 season). The greater distance in the NRL may afford the team in possession with more time and space, potentially augmenting their capability to pass along

the attacking line in search for defensive holes. Conversely, the relatively constrained space following a scrum in the ESL may reduce an attacking player's stimulus identification and/or response selection time and subsequently incur a technical error [16-18].

It was interesting to note that on average, the ESL generated nearly one more 'try' per game relative to the NRL. On initial thought, this appeared counterintuitive, as ESL players would seem to have less time and space to devise an attacking sequence and score. However, the greater average count in 'line breaks' and 'dummy half runs' within the ESL indicates that teams (or players) may be equipped to manage the seemingly greater relative tackle pressure imposed during game-play by engaging the dummy half in more runs than is observed within the NRL. Thus, the dummy half within the ESL may more actively search for opportunities to run the ball following a tackle relative to their counterpart within the NRL. It would be of value to contrast this suggestion with the total number of 'kicks' and 'passes' performed during game-play. However due to data availability (namely, differences in the types of notations recorded and reported by commercial providers across competitions), this was not possible here. Additionally, the greater count of 'line breaks' in the ESL suggests that NRL players may possess greater tackling skill, a speculation somewhat supported by the lower number of missed tackles reported in the NRL. Given this, it would be of interest for future work to compare the tackling capabilities of players from both competitions.

As shown on Figure 1, each ESL team oriented on the right panelling of MDS1, while the majority (13/16) of NRL teams oriented on the left panelling of MDS1 (Figure 1). Coupled with the ruck and scrum rulings discussed above, it is possible that these multivariate differences are a reflection of differing game strategies and/or physical capacities of players within their respective competitions. Supportive of the aforementioned, Twist et al. [8] reported that NRL players engaged in greater high-speed running distances relative to ESL players, concluding that NRL game-play was performed with greater fluidity, while players in the NRL were likely to be more physiologically equipped to maintain greater high-speed running capabilities throughout game-play. However, despite the general competition dissimilarity observed, it should be noted that certain NRL and ESL teams generated more similar profiles than others. The Roosters, Warriors, and Raiders were the most similar NRL teams to

the Wigan Warriors, Saints and Hull KR (ESL teams). Recruitment managers from these respective teams may wish to consider this relative similarity when engaging in competition recruitment, as it may enable a smoother transition in contrast to highly dissimilar teams (such as the Knights and Rhinos).

With the exception of the Rhinos, the positioning of each ESL team on the ordination surface relative to one another showed greater similarity than the positioning of each NRL team. This suggests greater homogeneity in the multivariate team profiles of ESL teams in contrast to their NRL counterparts. This homogeneity may stem, in part, from the relegation differences between competitions, as it could minimise performance gaps between lower and higher ranked teams, partly equalising competition standards. This was evident when contrasting the ordination positions of higher and lower ranked NRL and ESL teams. Notably, there was clustering of higher and lower ranked NRL teams, while this seemed less apparent in the ESL (Figure 1). This indicates that higher performing teams within the NRL generated considerably dissimilar multivariate profiles relative to their lower performing counterparts, an observation reported by others [3]. In addition to the relegation ruling, the differences in international player recruitment and salary cap may have implicated the relative homogeneity noted in the ESL. Given that the NRL does not enforce international player recruitment limitations and has a greater salary cap, it is possible that certain NRL teams recruited highly dissimilar international players who possess unique skill qualities, contributing to a dissimilar team profile. To test this speculation, it would be of value for future work to examine whether NRL teams with a greater relative distribution of international players on their roster cluster dissimilarly to teams who do not.

Despite the novel findings, this study is not without limitations. Most apparent, the observational design of this work generates speculative limitations when discussing the mechanisms behind the findings. Future work may wish to provide greater clarity as to the mechanisms surrounding the game-play differences observed here, such as explicitly focusing on the quantification of game-style and coaching strategy beyond the discrete performance outcome measures modelled here.

5. Conclusion

This study demonstrates game-play differences exist between NRL and ESL teams. Specifically, game-play in the NRL generated fewer 'line breaks', 'errors', 'tackles' and 'dummy half runs' relative to ESL game-play. Despite the NRL generating fewer 'all runs', game-play in this competition generated greater 'all run distances' relative to the ESL. The multivariate profiles of teams generated distinct dissimilarity, with NRL and ESL teams clustering relative to their respective competitions. Further, the ESL teams appeared to cluster with greater similarity relative to the NRL teams, suggesting greater competition homogeneity. Although discussed relative to logical speculation, future work should empirically investigate the mechanisms underpinning these observations.

6. Practical Applications

- Talent recruitment managers from the NRL and ESL may consider these results when determining the 'types' of players that may be suited to their respective competition dynamics.
- Data suggests that ESL game-play incurs greater temporal and spatial constraints, with players engaging in different behaviours (e.g., dummy half runs) to manage these constraints relative to NRL game-play. Players within both competitions may subsequently possess dissimilar technical skill qualities.
- Sport scientists should consider the use of multivariate data visualisation (such as nMDS) when examining competition, team or player differences given their interpretative capabilities.

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Figure 1. The ordination plot using nMDS of a dissimilarity matrix calculated from team performance indicators of each NRL and ESL team in the 2016 season