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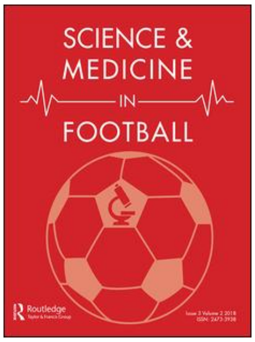

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The positional technical and running performance of sub-elite Gaelic football

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ABSTRACT

Introduction: The current research examines the positional technical and running performance of sub-elite Gaelic football match-play and compares technical and running performance between Division 1 and Division 2 teams.

Methods: Sixty eight sub-elite Gaelic football players from two teams were monitored via global positioning system (GPS) microtechnology (GPEXE LT 18 Hz, Exelio, Udine, Italy) and a video camera across 30 competitive matches (n = 336). Comparisons between teams and playing positions were examined for selected technical and running performance variables.

Results: Playing position had large effects on several variables including number of possessions (ES = 0.18), number of shots (ES = 0.45), total m per minute (ES = 0.403), average speed (ES = 0.40), number of power events (ES = 0.3) and recovery time between power events (ES = 0.31). Playing standard had trivial to small effects on all technical performance variables (ES ≤ 0.47) and trivial to small effects (ES ≤ 0.48) on all running performance variables.

Conclusion: The current study demonstrates that there are distinct positional demands in sub-elite Gaelic football. The findings of this research also demonstrate that there is little difference in the technical and running performance of Division 1 and Division 2 sub-elite teams.

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KEYWORDS
GAA; GPS; performance analysis; activity profile; amateur sport

Introduction

Gaelic football is a team-based invasion sport native to Ireland and governed by the Gaelic Athletic Association (GAA) since its codification in 1884. The game is played by two teams of fifteen players on a grass pitch measuring 145 m long and 90 m wide. The aim of the game is to accumulate more points than the opposition by kicking the ball over the crossbar and between the posts (1 point) and under the crossbar and between the posts (3 points). Gaelic football is played at both the sub-elite (club) and elite (inter-county) level. The duration of games are 60 min at the sub-elite level and 70 min at the elite level, with additional time for stoppages added on at the referee's discretion. Every player who wishes to play Gaelic football competitively must first be registered to a sub-elite GAA team. Inter-county teams select the best players who are registered to a sub-elite GAA team in the respective county or players who were born in that county.

At both the elite and sub-elite levels, teams compete in a championship, a league and in various cup competitions. The championship competitions are viewed as the most prestigious competition at both the elite and sub-elite levels (Mangan and Collins 2016). Players chosen to represent their county team are released to play with their sub-elite teams at certain stages of the season. Elite teams maintain an amateur status despite following a professional routine, generally completing three pitch sessions and two gym sessions each week and attending squad meetings in addition to attempting to balance a family and working life (Beasley 2015; Shovlin et al. 2018). Sub-elite Gaelic football has a reduced level of preparatory practice with players less likely to receive the same conditioning and preparation than their elite counterparts (Wilson et al. 2007). Few contemporary studies have compared elite and sub-elite Gaelic football players with most investigations undertaken when the game structure and level of preparatory practice was of its times (Keane et al. 1997; Reeves and Collins 2003). Keane et al. (1997) observed that elite Gaelic footballers had a higher estimated VO_{2max} than their sub-elite counterparts (54 ± 3 ml·kg^{-1}·min^{-1} vs 51 ± 6 ml·kg^{-1}·min^{-1}). Meanwhile, Reeves and Collins (2003) reported that elite Gaelic football players were taller (182 ± 4 vs 181 ± 3 cm), heavier (83 ± 3 vs 81 ± 4 kg) and had a lower percentage adiposity (11 ± 1 vs 18 ± 3%) than sub-elite Gaelic football players.

The match-play running performance of elite Gaelic footballers has been extensively reviewed (Malone et al. 2016a, 2017d; Mangan et al. 2017a, 2019; McGahan et al. 2018). Elite players have been observed to run 8160–9222 m during a 70-min match with approximately 20% of this distance completed at a high-intensity relative to Gaelic football (>17 km·h^{-1}) (Collins et al. 2013; Malone et al. 2016a; Malone et al. 2016b; McGahan et al. 2018). To date, no research has examined the running performance of sub-elite Gaelic football players. A recent study has examined sub-elite hurling players (Young et al. 2018). Hurling is a sport played on the same size pitch to Gaelic football with the same goalposts and playing numbers however it is played with a stick and a ball much smaller than a Gaelic football. The authors observed that elite players covered greater relative total distance compared to sub-elite players (118 ± 9 m min^{-1} vs 93 ± 16 m min^{-1}) but sub-elite players covered more relative high-speed running (> 19.8 km·h^{-1}) than their elite

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counterparts (3.3 ± 0.4 m min^{-1} vs 2.9 ± 1.1 m min^{-1}). The differences between elite and sub-elite running performance in a sport similar to Gaelic football suggests that there is a valid reason to investigate the demands of sub-elite Gaelic football. The information would be critical for coaches and practitioners involved with the development and transitioning of players from sub-elite to the elite level.

Technical performance in Gaelic football, like running performance, has primarily been focused on elite players. Mangan et al. (2017b) investigated the relationship between technical performance indicators and running performance in elite Gaelic football, Carroll (2013) examined team performance indicators in elite Gaelic football, Bradley and O'Donoghue (2011) investigated counter attacks in elite Gaelic football and McGahan et al. (2018) examined match-play running demands and technical performance in elite Gaelic footballers. Each of the aforementioned studies only focused on elite players while only one study examining technical performance indicators in sub-elite Gaelic football (McGuigan et al. 2018). The authors examined three teams (n = 48) across the three grades of championship competition (senior, intermediate, junior) to assess which technical performance indicators were key to success. Although no comparisons were made between the grades of competition or between player positions, the authors identified several variables that distinguished between winning and losing teams including possession: scores ratio; turnover rate and scores per possession.

Traditionally there are 6 playing positions in Gaelic football with a formational setup of 1 goalkeeper, 3 full backs, 3 half backs, 2 midfielders, 3 half forwards and 3 full forwards. Midfielders, half backs and half forwards have been observed to cover significantly greater distances than full backs and full forwards, reflecting their roles in attacking and defensive transitions (Malone et al. 2016a; Mangan et al. 2017b). The role of full forwards is to score and link play in the attacking third, they will generally play close to the attacking goal and are marked by full backs who act as a last line of defence before the goalkeeper (Malone et al. 2016a). Technical performance in Gaelic football has yet to be examined on a positional level and given the differences between positions for running performance, it is likely differences will also exist between positions for technical performance. The differing tactical roles mean it is important to consider playing position when analysing match-play performance (Malone et al. 2017c).

There are over 370,000 registered GAA players on the island of Ireland (Mangan and Collins 2016). Of this figure, only about 0.3% will represent an inter-county team. Despite a very small minority of GAA players who play at the elite level, the majority of research to date has focused on players at this level (McGuigan et al. 2018). Aside from a form of competitive sport, sub-elite Gaelic football represents a social outlet for players and also serves as a source of physical activity (Keeler and Wright 2013). The identification of the running demands of sub-elite Gaelic football may help promote the health benefits of participating in the sport. Additionally, the identification of match-play running performance and technical performance would provide coaches with objective figures which they could use to create more effective training strategies.

There is a distinct lack of research relating to the running performance and technical performance in sub-elite Gaelic football. The present study aims to examine the positional technical and running performance of sub-elite Gaelic football match-play. The research will also assess whether the competition grade effects technical and running performance. It is hypothesised that positional differences will exist for technical and running performance and that there will be a distinct difference between competition grades for technical and running performance.

Methods

Participants

Thirty-seven adult male Gaelic football players (years: 23.9 ± 4.4; height: 182.9 ± 5.6 cm; mass: 84.0 ± 7.9 kg) from one Division 1/Senior Championship sub-elite team and 31 adult male Gaelic football players from one Division 2/Intermediate Championship sub-elite team (years: 24.2 ± 5.2; height: 179.8 ± 4.9 cm; mass: 80.0 ± 10.1 kg) participated in the current study. Both teams reached at least the semi-finals in both their respective league and championship competitions in the season when data were collected. The training routines of both teams were very similar. A typical week would consist of the completion of two pitch training sessions, 1–2 gym sessions and one match. Both the league and championship operate on a promotion/relegation basis. For example, winning Division 2 would lead to promotion to Division 1 for the following season and the winner of the Intermediate Championship would progress to the Senior Championship the following season (McGuigan et al. 2018). The study received ethical approval from the host institute's ethics committee. Prior to commencement, participants were provided with information regarding the study and were required to complete a participant consent form.

Experimental procedures

Global positioning system (GPS) microtechnology (GPEXE LT 18 Hz, Exelio, Udine, Italy) was used to collect match data across the 2018 sub-elite season (February – October). The microtechnology are found to be valid and reliable for determining movement patterns in team sports (Hoppe et al. 2018). Specifically the microtechnology showed good validity and reliability for the entire distance covered on the testing circuit (−1.6 ± 0.3, Bias % ±90% CI; −1.6 ± 0.3, typical error of estimate between units (TEE) ±90% CI), sprinting over 25.1 m with change of directions (−9.2 ± 0.3, Bias % ±90% CI; 0.5 ± 0.1, TEE ±90% CI) and sprinting over 30 m (−6.7 ± 0.6, Bias % ±90% CI; 1.0 ± 0.1, TEE ±90% CI). Gaelic football involves frequent changes of direction and high-speed actions (Malone et al. 2017c) so the selected microtechnology were deemed appropriate for assessing the match-play running performance in the current study given their reliability for measuring high speeds in straight lines and with changes of direction. Although the study by Hoppe et al. (2018) found a 20 Hz Local Positioning System to be superior in terms of reliability to the 18 Hz GPS microtechnology, the significantly lower cost and the mobility of the 18 Hz microtechnology made it a more practical option for an amateur Gaelic football team. A total of 167 full match data sets were collected during 15 Division 1/Senior championship matches and 169 full match data sets were collected during 15 Division 2/Intermediate championship matches. Players were grouped by the position they played in each game (full back, half back, midfield, half forward, full forward). Match day temperatures measured between 6°C and 16°C. The duration of matches were 60 min plus any additional time that the referee added on (66 ± 3 min). Relative measures for distances were calculated by dividing the distance covered by each player by the number of minutes played by each player (Young et al. 2018).

The GPS microtechnology were turned on one hour prior to each match in order to prevent disruption to the players' preparations close to the match start-time. Each participant wore a GPS enclosed in a tight-fitting compression vest to reduce uncontrolled device movements (Malone et al. 2017a). A single GPS was positioned centrally between the scapula in contrast to the reliability and validity study of the selected GPS (Hoppe et al. 2018) where two devices were placed between the scapula of individuals, 7 cm apart. Participants wore the devices during a standardised warm up prior to the game to ensure that the devices established a stable satellite connection and also to ensure their match preparation was not interrupted. Start and end times for each half were noted along with the timing of substitutions. Post-match, data were uploaded from a computer to the GPEXE Web App using the GPEXE Bridge software. The files were trimmed to ensure that only data recorded during match-play were included. All matches were video recorded from an elevated position with a HD camcorder (Canon Vixia, Canon Inc., Tokyo, Japan). The optical zoom feature was utilised to ensure that individual players were easily identified while in proximity of the ball. Following each game, the video was transferred using an SD card to a password-encrypted computer.

Running performance

GPS were used to monitor match-play running performance. Only the data for outfield players who started and completed the full game were included in the final analysis. Data collected included total distance (m), distance in each speed zone, average speed (km·h^{-1}), maximal velocity (km·h^{-1}), maximal acceleration (m/s^2), maximal deceleration (-m/s^2), number of acceleration events above 3 m/s^2 (Malone et al. 2016b), number of deceleration events above −3 m/s^2 (Malone et al. 2016b), number of Power Events, recovery time between Power Events (s) and average duration of Power Events (s). Power Events are an estimation of the number of events in a session which are dependent on anaerobic processes (Osgnach and Di Prampero 2018; Sannicandro and Cofano 2018). Distance covered was divided into 5 speed zones; Speed Zone 1 – Standing and Walking (0–6.9 km·h^{-1}), Speed Zone 2 – Jogging (7–11.9 km·h^{-1}), Speed Zone 3 – Cruising/Striding (12–16.9 km·h^{-1}), Speed Zone 4 – High-Speed Running (17–21.9 km·h^{-1}) & Speed Zone 5 – Sprinting (> 22 km·h^{-1}). These speed zones have been used previously to describe Gaelic football running performance (Malone et al. 2017b; Malone et al. 2016a; Mangan et al. 2017a; McGahan et al. 2018).

Technical performance

Post-match technical analysis was carried out using a customised coding template in SportsCode (Sports Code Elite V9.8.6, Hudl, NSW, Australia). The match was firstly viewed in its entirety to code the times each player had an interaction with the ball or the person in possession of the ball. Following this, each players' interactions were viewed individually and labelled using the technical coding template designed. Only the data of players who played the entire match were selected for analysis. Technical performance indicators included were number of possessions, fouls and their location on the pitch (inside 45 m line/outside 45 m line), pass type (handpass/kickpass), pass outcome (successful/unsuccessful), tackles, turnovers, kickouts (won/lost/breaking/clean), shots and scoring efficiency. Definitions and outcomes for each of the technical performance variables can be seen in Table 1. Two of the matches were chosen at random for a reliability re-test. Each game was coded once and then coded a second time 7 days later. Intraclass Correlation Coefficients (ICC) were calculated to examine the agreement between the initial data and the retest data for the individual technical performance variables. ICC estimates and their 95% confident intervals (CI) were calculated using statistical software (Statistical Package for the Social Sciences data analysis software V24.0, SPSS Inc., Chicago, Illinois, USA)

Table 1. Operational definitions for technical performance.

Performance variable	Definition
POSSESSION	When a player has clear control of the ball with either their hands or feet
HANDPASS	A clear striking action made with the hand in an attempt to pass the ball to a teammate
KICKPASS	A striking action made with the foot in an attempt to kick the ball to a teammate
SUCCESSFUL PASS	When a teammate gains possession of an attempted pass
UNSUCCESSFUL PASS	When the attempted pass by an attacking player fails to reach a teammate
CONTACT TACKLE	If the defending player makes physical contact with the player in possession or contact with the ball to win the ball or disrupt the player in possession or as they attempt to strike the ball
MISSED TACKLE	When the defending player makes an attempt to tackle the opposing player in possession but fails to make meaningful contact or any contact at all on the player or on the ball
TURNOVER WON	When possession of the ball is won from a player on the opposing team
TURNOVER LOST	When possession of the ball is lost to the opposing team
FREE CONCEDED INSIDE 45	When the referee blows the whistle for what they deem to be an act of misconduct or a violation of the rules in the area of pitch between the defensive end line and the defensive 45 m line
FREE CONCEDED OUTSIDE 45	When the referee blows the whistle for what they deem to be an act of misconduct or a violation of the rules in the area of pitch between the defensive 45 m line and the opposition's end line
FREE WON	When the referee awards a free to the person in possession of the ball
KICKOUT WON CLEAN	When the kickout is caught by a player on the attacking team directly from the goalkeeper's kick without the ball having been touched by another player
KICKOUT WON BREAKING	When the kickout is caught by a player on the attacking team indirectly from the goalkeeper's kick after the ball has been touched by another player
SHOT	A striking action made with the hand or foot in an attempt to score

based on an absolute-agreement, 2-way mixed-effects model (Koo and Li 2016). In the event of ICC = 1, the determinant of the covariance matrix was zero and statistics based on its inverse matrix such as 95% CI and the level of significance could not be calculated. An excellent level of reliability was observed for each of the variables ((frees won (ICC = .960, $p \leq 0.001$, 95% CI = .907-.985); frees conceded (ICC = 0.987, $p \leq 0.001$, 95% CI = .968-.995); tackle attempts (ICC = .996, $p \leq 0.001$, 95% CI = .990-.998); possessions (ICC = .999, $p \leq 0.001$, 95% CI = .999–1.00); turnovers lost (ICC = .984, $p \leq 0.00$, 95% CI = .961-.993); turnovers won (ICC = .993, $p \leq 0.001$, 95% CI = .983-.997); total shots (ICC = .997, $p \leq 0.001$, 95% CI = .993-.999); total scores (ICC = 1); total passes (ICC = .986, $p \leq 0.001$, 95% CI = .965-.994) and kickouts contested (ICC = .996, $p \leq 0.001$, 95% CI = .991-.998)

Statistical analysis

Positional statistics are reported as mean ± SD with 95% confidence intervals and coefficient of variation percentage (CV%). Statistical analysis was completed using SPSS for Mac (Statistical Package for the Social Sciences V24.0, SPSS Inc., Chicago, Illinois, USA). Prior to the commencement of statistical analysis, the distribution of the data was assessed for normality using the Shapiro–Wilk test. The data were deemed to be normally distributed for all variables. Levene's Test of Equality of Error Variances was failed by a number of technical and running performance variables. The failure can be explained by positional differences in Gaelic football so further analysis was carried out (Mangan et al. 2017a). Independent-Sample T-Tests were conducted to compare the Division 1 and Division 2 teams for all technical and running performance variables. Statistical significance was accepted at $\alpha \leq 0.05$. Standardised effect sizes (ES) were calculated to describe the magnitude of difference between the two teams (0–0.19 trivial; 0.2–0.59, small; 0.6–1.19, moderate and 1.2–2.0, large) (Will G Hopkins 2002). Furthermore, magnitude-based inferences (MBI) were calculated using a spreadsheet from the website http://www.sportsci.org/ (Batterham and Hopkins 2006; William G. Hopkins 2006; Welsh and Knight 2015). A seven-category scale was used to describe the MBI based on the qualitative probabilities consisting of '"most unlikely,"' '"very unlikely,"' '"unlikely,"' '"possibly,"' '"likely,"' '"very likely,"' and ' 'most likely" (Welsh and Knight 2015). Since only trivial and small differences existed between the two teams, inter-positional differences for technical and running performance indicators were examined, independent of team, using a series of One Way ANOVAs. Simple main effects were calculated using a Bonferroni correction. The partial eta-squared value ($\eta p2$) was reported as a measure of effect size (ES) (Cohen 1988). Effect size benchmarks specific to partial eta-squared (Cohen 1988) were used to divide effects into null (<0.01), small (<0.06), moderate (<0.14) and large (>0.14) (Richardson 2011).

Results

Although some significant differences were observed between both teams, playing standard had trivial to small effects on all technical performance variables (ES ≤ 0.47) and trivial to small effects (ES ≤ 0.48) on all running performance variables suggesting the magnitude of difference between the two teams was small (Table 2). The aforementioned observation provided justification to pool both teams' data together and analyse on a positional basis.

Positional comparisons

Position had a large effect on total distance covered in a match (ES = 0.36). Half backs, half forwards and midfielders covered significantly more distance than full backs and full forwards ($p \leq 0.05$). A comparison of time spent in each speed zone by position can be seen in Table. Position had a significant effect on all running performance variables examined with the exception of maximum deceleration ($p = 0.08$) and maximal velocity ($p = 0.09$). Position had a large effect on the m per minute in speed zone 2 (ES = 0.29), with midfielders covering the most distance in the speed zone and full forwards the least. Similarly, a large effect was observed for speed zone 3 (ES = 0.32) and speed zone 4 (ES = 0.32) with half forwards covering the most distance in each speed zone and full backs the least. Position had moderate effects on the distance per minute in speed zone 1 (ES = 0.06) and speed zone 5 (ES = 0.12) (Table 3). Large effects were also observed for total m per minute (ES = 0.40), average speed (ES = 0.40), number of power events (ES = 0.29) and recovery time between power events (ES = 0.31) (Table 3).

Defensively, playing position had a large effect on the number of frees conceded outside the 45 m line (ES = 0.14), with midfielders giving away significantly more than full backs and half backs ($p \leq 0.05$) while the number of turnovers won (ES = 0.21) was also largely effected by position with full backs winning possession significantly more times than midfielders, half forwards and full forwards ($p \leq 0.05$) (Table 4). In competing for possession from kickouts, playing position had large effects on the number of opposition kickouts won through breaking ball (ES = 0.188) and also the number of opposition kickouts lost through breaking ball (ES = 0.139) (Table 4) with midfield players involved in the most breaking ball contests.

Position had a large effect on the number of possessions (ES = 0.18) (Table 4). Full backs had significantly fewer possession than all other positions ($p \leq 0.05$). While in possession, there was large differences between positions, with full forwards taking significantly more shots than any other position ($p \leq 0.05$, ES = 0.45) and scoring significantly more goals ($p \leq 0.05$, ES = 0.19), and points ($p \leq 0.05$, ES = 0.35).

Discussion

The current investigation is the first to examine the effects of position on the technical and running performance in sub-elite Gaelic football match-play. Positional differences have been identified for running performance in elite Gaelic football so it was important to establish whether there are distinct positional profiles in sub-elite Gaelic football for technical and running performance. Two sub-elite teams from two different divisions were analysed to give a better representation of sub-elite Gaelic football performance rather than just focusing on a single team from one division. Between position differences were observed for several technical and running performance

Table 2. Playing standard comparisons for running and technical performance.

Performance Variable	Div. 1 mean ± SD	Div. 2 mean ± SD	*P*	ES	Qualitative Inferences for effect magnitude (mean difference; ± 95% CL)	Performance Variable	Div. 1 mean ± SD	Div. 2 mean ± SD	*P*	ES	Qualitative Inferences for effect magnitude (mean difference; ± 95% CL)
Zone 1 ($m{\cdot}min^{-1}$)	42.3 ± 3.5	41.5 ± 4.1	0.005	0.22	*very likely small* (0.83; 0.1)	**Own Kickout Lost Breaking**	0.3 ± 0.6	0.3 ± 0.7	0.972	0	*possibly trivial* (−0.00; 0.9)
Zone 2 ($m{\cdot}min^{-1}$)	23.1 ± 5.0	22.8 ± 6.3	0.002	0.06	*very likely trivial* (0.37; 0.0)	**Own Kickout Lost Clean**	0.1 ± 0.3	0.1 ± 0.3	0.457	0.07	*likely trivial* (0.03; 0.3)
Zone 3 ($m{\cdot}min^{-1}$)	24.6 ± 8.8	22.9 ± 6.9	0.065	0.21	*very likely trivial* (1.66; 0.5)	**Own Kickout Won Breaking**	0.2 ± 0.5	0.3 ± 0.6	0.176	−0.15	*possibly trivial* (−0.09; 0.3)
Zone 4 ($m{\cdot}min^{-1}$)	14.9 ± 5.5	13.5 ± 4.4	0.007	0.27	*very likely small* (1.37; 0.2)	**Own Kickout Won Clean**	0.7 ± 1.0	0.7 ± 1.0	0.886	−0.02	*possibly trivial* (−0.02; 1.1)
Zone 5 ($m{\cdot}min^{-1}$)	6.7 ± 2.7	6.0 ± 2.6	0.565	0.27	*possibly small* (0.72; 11.2)	**Opp. Kickout Lost Breaking**	0.4 ± 0.7	0.6 ± 0.9	0.020	−0.26	*very likely small* (−0.21; 0.1)
Total $m{\cdot}min^{-1}$	111.6 ± 17.7	106.7 ± 16.1	0.009	0.29	*very likely small* (4.86; 0.9)	**Opp. Kickout Lost Clean**	0.3 ± 0.5	0.3 ± 0.6	0.740	−0.04	*possibly small* (−0.02; 0.6)
Total Distance (m)	7270 ± 1216	7021 ± 1124	0.052	0.21	*possibly small* (249; 259)	**Opp. Kickout Won Breaking**	0.4 ± 0.7	0.8 ± 1.0	0.000	−0.44	*most likely small* (−0.39; 0.0)
Max Acceleration (m/s^2)	4.3 ± 0.4	4.1 ± 0.4	0.009	0.48	*most likely small* (0.19; 0.0)	**Opp. Kickout Won Clean**	0.2 ± 0.4	0.3 ± 0.6	0.005	−0.32	*most likely small* (−0.16; 0.0)
Max Deceleration (m/s^2)	−5.8 ± 0.7	−5.7 ± 0.7	0.000	−0.06	*possibly trivial* (−0.04; 0.7)	**Free Conceded Outside 45**	0.8 ± 1.0	1.2 ± 1.3	0.000	−0.39	*most likely small* (−0.44; 0.0)
Average Speed ($km{\cdot}h^{-1}$)	6.7 ± 1.1	6.4 ± 1.0	0.007	0.29	*very likely small* (0.29; 0.0)	**Free Conceded Inside 45**	0.4 ± 0.7	0.5 ± 0.8	0.110	−0.17	*likely small* (−0.14; 0.3)
Maximal Velocity ($km{\cdot}h^{-1}$)	29.4 ± 1.4	28.8 ± 1.6	0.000	0.39	*most likely small* (0.58; 0.0)	**Turnover Won**	1.7 ± 1.6	2.0 ± 1.6	0.156	−0.16	*likely small* (−0.25; 0.8)
Acceleration Events (n)	5.5 ± 3.4	4.4 ± 3.6	0.007	0.3	*most likely trivial* (1.04; 0.0)	**Contact Tackle**	2.7 ± 2.1	2.3 ± 1.9	0.078	0.19	*very likely small* (0.39; 0.6)
Deceleration Events (n)	13.3 ± 4.8	11.8 ± 4.8	0.005	0.31	*very likely small* (1.49; 0.1)	**Missed Tackle**	0.8 ± 1.1	0.8 ± 1.0	0.770	−0.03	*possibly small* (−0.03; 1.1)
Power Events (n)	96.2 ± 21.6	90.2 ± 22.2	0.013	0.27	*very likely small* (5.99; 0.6)	**Possessions**	16.9 ± 6.6	14.8 ± 6.3	0.002	0.33	*most likely small* (2.15; 0.1)
Recovery Time between power events (s)	33.7 ± 10.5	37.4 ± 12.0	0.003	−0.33	*most likely small* (−3.73; 0.2)	**Total Pass Attempts**	15.2 ± 6.4	12.8 ± 5.8	0.001	0.38	*most likely small* (2.35; 0.0)
Power Events Avg. Time (s)	8.2 ± 1.0	8.1 ± 0.9	0.394	0.1	*likely trivial* (0.09; 0.8)	**Successful Hand pass**	11.3 ± 5.1	9.0 ± 4.6	0.000	0.47	*most likely small* (2.29; 0.0)
Turnover Lost	1.1 ± 1.1	1.4 ± 1.5	0.007	−0.3	*most likely small* (−0.39; 0.1)	**Successful Kick pass**	3.1 ± 2.6	2.7 ± 2.0	0.180	0.15	*likely small* (0.34; 1.2)
Total Shots	2.0 ± 2.6	1.9 ± 2.5	0.641	0.05	*possibly trivial* (0.130; 2.6)	**Unsuccessful Hand pass**	0.4 ± 0.7	0.4 ± 0.7	0.425	−0.09	*possibly small* (−0.06; 0.6)
Points	1.1 ± 1.8	0.9 ± 1.5	0.352	0.09	*likely small* (0.15; 1.4)	**Unsuccessful Kick pass**	0.4 ± 0.7	0.6 ± 1.0	0.016	−0.26	*very likely small* (−0.23; 0.1)
Goals	0.1 ± 0.4	0.1 ± 0.3	0.352	0.08	*likely small* (0.04; 0.3)	**Pass Success %**	95.0 ± 6.0	91.0 ± 11.0	0.000	0.45	*most likely* (0.03; 0.0)
Scoring Efficiency	0.5 ± 0.4	0.5 ± 0.4	0.481	0.1	*possibly small* (0.04; 0.5)	**Free Won**	0.9 ± 0.9	1.0 ± 1.1	0.300	−0.12	*possibly small* (−0.11; 0.7)

Table 3. Running performance profiles.

Performance Indicator	Full Back mean ± SD (95% CI, CV%)	Half Back mean ± SD (95% CI, CV%)	Midfield mean ± SD (95% CI, CV%)	Half Forward mean ± SD (95% CI, CV%)	Full Forward mean ± SD (95% CI, CV%)	All Positions mean ± SD (95% CI, CV%)
Zone 2 (m·min^{-1})	19.8 ± 5.2 (18.7–20.9, 27.3%)	24.6 ± 4.7 (23.5–25.7, 19.9%) **ae**	26.2 ± 4.7 (24.8–27.5, 18.8%) **ae**	25.4 ± 5.0 (24.3–26.4, 20.4%) **ae**	18.2 ± 4.5 (16.9–19.5, 24.3%)	22.9 ± 5.7 (22.3–23.6, 25.6%)
Zone 3 (m·min^{-1})	18.2 ± 6.1 (16.7–19.7, 34.0%)	24.9 ± 5.8 (23.4–26.3, 23.5%) **ae**	26.8 ± 5.5 (25.0–28.6, 21.1%) **ae**	29.4 ± 8.8 (27.9–30.8, 30.2%) **abe**	18.6 ± 5.0 (16.8–20.4, 27.5%)	23.7 ± 7.9 (22.9–24.6, 33.6%)
Zone 4 (m·min^{-1})	10.8 ± 3.8 (9.9–11.8, 35.3%)	14.9 ± 3.8 (13.9–15.8, 24.9%) **ae**	15.2 ± 4.1 (14.0–16.3, 27.8%) **ae**	18.2 ± 5.4 (17.2–19.1, 29.9%) **abce**	11.1 ± 3.1 (9.9–12.2,28.6%)	14.2 ± 5.0 (13.7–14.7, 35.5%)
Zone 5 (m·min^{-1})	5.2 ± 1.8 (4.6–5.8, 33.7%)	6.9 ± 2.3 (6.3–7.4, 33.4%) **ae**	6.4 ± 3.1 (5.7–7.1, 48.0%)	7.6 ± 2.8 (7.0–8.1, 38.0%) **ae**	5.5 ± 2.6 (4.8–6.1, 48.2%)	6.4 ± 2.7 (6.1–6.7, 41.8%)
Total m·min^{-1}	95.1 ± 14.5 (92.1–98.1, 15.2%)	112.8 ± 12.1 (109.9–115.8, 10.7%) **ae**	116.8 ± 10.7 (113.1–120.6, 9.1%) **ae**	121.8 ± 15.0 (118.9–124.7, 12.3%) **abe**	97.3 ± 12.4 (93.6–100.9, 12.8%)	109.1 ± 17.1 (107.3–111.0, 15.6%)
Total Distance (m)	6230 ± 1005 (6018–6441, 16.1%)	7442 ± 857 (7233–7651, 11.5%) **ae**	7674 ± 776 (7409–7939, 10.1%) **ae**	7928 ± 1087 (7720–8135, 13.7%) **abe**	6330 ± 876 (6070–6589, 13.8%)	7145 ± 1175 (7019–7271, 16.4%)
Max Acceleration (m/s^2)	4.3 ± 0.4 (4.2–4.3, 9.7%)	4.3 ± 0.3 (4.2–4.3, 7.5%)	4.1 ± 0.5 (4.0–4.2, 11.9%)	4.1 ± 0.4 (4.0–4.2, 10.1%)	4.2 ± 0.4 (4.1–4.3, 10.4%)	4.2 ± 0.4 (4.1–4.2, 9.9%)
Max Deceleration (m/s^2)	−5.7 ± 0.7 (−5.9- −5.5, 9.7%)	−5.7 ± 0.7 (−5.8- −5.5, 9.7%)	−5.6 ± 0.8 (−5.8- −5.4, 10.2%)	−5.9 ± 0.7 (−6.0- −5.7, 10.1%)	−6.0 ± 0.7 (−6.2- −5.8, 11.1%)	−5.8 ± 0.7 (−5.8- −5.7, 9.7%)
Average Speed (km·h^{-1})	5.7 ± 0.9 (5.5–5.9, 15.2%)	6.8 ± 0.7 (6.6–6.9, 12.8%) **ae**	7.0 ± 0.6 (6.8–7.2, 9.1%) **ae**	7.3 ± 0.9 (7.1–7.6, 12.3%) **abe**	5.8 ± 0.8 (5.6–6.1, 12.8%)	6.6 ± 1.0 (6.4–6.5, 15.6%)
Maximal Velocity (km·h^{-1})	29.1 ± 1.4 (28.7–29.4, 4.9%)	29.3 ± 1.4 (29.1–29.8, 4.7%)	28.8 ± 1.7 (28.3–29.2, 6.0%)	29.1 ± 1.6 (28.8–29.4, 5.4%)	28.8 ± 1.5 (28.8–29.4, 5.0%)	29.1 ± 1.5 (28.9–29.2, 5.2%)
Acceleration Events (n)	6.0 ± 4.1 (5.2–6.8, 67.7%) **cd**	5.5 ± 3.0 (3.7–5.6, 54.3%)	3.9 ± 3.9 (2.9–4.9, 101.5%)	4.3 ± 3.0 (3.5–5.0, 71.4%)	4.7 ± 3.5 (3.7–5.6, 74.8%)	5.0 ± 3.6 (4.6–6.3, 71.9%)
Deceleration Events (n)	11.2 ± 4.2 (10.2–12.3, 37.4%)	13.9 ± 5.1 (12.9–15.0, 36.7%) **ac**	10.5 ± 5.2 (9.1–11.8, 49.7%)	13.1 ± 4.3 (12.0–14.1, 32.9%) **c**	13.4 ± 4.7 (12.1–14.7, 35.3%) **c**	12.5 ± 4.8 (12.0–13.0, 38.6%)
Power Events (n)	79.0 ± 18.9 (74.8–83.2, 23.9%)	103.0 ± 18.4 (98.9–107.1, 17.8%) **ae**	106.5 ± 18.3(101.2–111.7, 17.2%) **ae**	99.4 ± 20.6 (95.3–103.5, 20.7%) **ae**	77.0 ± 15.7 (71.9–82.2, 20.4%)	93.2 ± 22.1 (90.9–95.6, 23.7%)
Recovery Time between power events (s)	43.4 ± 12.0 (41.3–45.5, 27.5%)	30.6 ± 7.2 (28.5–32.7, 23.4%) **ae**	28.9 ± 6.9 (26.2–31.6, 23.9%) **ae**	31.9 ± 9.8 (29.7–34.0, 30.8%) **ae**	43.6 ± 10.5 (41.0–46.2, 24.1%)	35.6 ± 11.4 (34.3–36.8, 32.1%)
Power Events Avg Time (s)	7.8 ± 0.7 (7.6–8.0, 9.4%)	8.2 ± 0.8 (8.0–8.4, 10.2%)	8.4 ± 1.1 (8.2–8.7, 12.4%) **ae**	8.4 ± 1.0 (8.2–8.6, 11.9%) **ae**	7.9 ± 1.0 (7.7–8.1, 12.2%)	8.1 ± 0.9 (8.0–8.2, 11.5%)

Table 4. Technical performance profiles.

Performance Indicator	Full Back mean ± SD (95% CI, CV%)	Half Back mean ± SD (95% CI, CV%)	Midfield mean ± SD (95% CI, CV%)	Half Forward mean ± SD (95% CI, CV%)	Full Forward mean ± SD (95% CI, CV%)	All Positions mean ± SD (95% CI, CV%)
Own Kickout Lost Breaking	0.0 ± 0.2 (−0.1–0.2, 235.2%)	0.2 ± 0.6 (0.1–0.4, 271.7%)	0.7 ± 1.1 (0.5–0.9, 148.5%) **abde**	0.4 ± 0.6 (0.2–0.5, 166.4%) **a**	0.2 ± 0.6 (0.0–0.4, 314.6%)	0.3 ± 0.7 (0.2–0.34, 235.2%)
Own Kickout Lost Clean	0.0 ± 0.0 (−0.1–0.1, 500.0%)	0.1 ± 0.3 (0.0–0.2, 299.8%)	0.2 ± 0.5 (0.1–0.3, 223.2%) **a**	0.1 ± 0.4 (0.1–0.2, 295.1%)	0.0 ± 0.2 (0.1–0.2, 499.9%)	0.1 ± 0.3 (0.1–0.1)
Own Kickout Won Breaking	0.1 ± 0.2 (−0.1–0.2, 430.0%)	0.3 ± 0.5 (0.2–0.5, 159.3%) **a**	0.6 ± 0.9 (0.5–0.8, 148.4%) **ae**	0.3 ± 0.6 (0.2–0.5, 182.2%) **a**	0.1 ± 0.4 (0.0–0.3, 324.7%)	0.3 ± 0.6 (0.2–0.3, 210.1%)
Own Kickout Won Clean	0.6 ± 0.9 (0.3–0.8, 168.1%)	0.9 ± 1.1 (0.7–1.2, 113.8%) **e**	0.8 ± 1.0 (0.5–1.0, 129.7%) **e**	0.8 ± 1.1 (0.6–1.1, 128.1%) **e**	0.2 ± 0.6 (−0.1–0.5, 288.9%)	0.7 ± 1.0 (0.6–0.8, 144.1%)
Opp. Kickout Lost Breaking	0.3 ± 0.7 (0.1–0.5, 233.1%)	0.5 ± 0.8 (0.3–0.7, 172.5%)	1.2 ± 1.0 (0.9–1.4, 86.6%) **abde**	0.4 ± 0.8 (0.2–0.5, 218.5%)	0.2 ± 0.5 (0.0–0.4, 293.5%)	0.5 ± 0.8 (0.4–0.6, 179.8%)
Opp. Kickout Lost Clean	0.1 ± 0.2 (−0.1–0.2, 430.0%)	0.3 ± 0.5 (0.2–0.4, 169.6%) **a**	0.6 ± 0.9 (0.5–0.8, 140.7%) **abe**	0.4 ± 0.6 (0.3–0.5, 138.9%) **ae**	0.1 ± 0.3 (0.0–0.3, 276.6%)	0.3 ± 0.6 (0.2–0.4, 192.3%)
Opp. Kickout Won Breaking	0.3 ± 0.5 (0.1–0.4, 209.5%)	0.7 ± 0.9 (0.5–0.9, 128.8%) **ae**	1.5 ± 1.3 (1.2–1.7, 89.2%) **abde**	0.5 ± 0.8 (0.3–0.7, 145.3%)	0.3 ± 0.6 (0.0–0.5, 219.7%)	0.6 ± 0.9 (0.5–0.7, 152.8%)
Opp. Kickout Won Clean	0.1 ± 0.3 (0.0–0.2, 346.3%)	0.4 ± 0.6 (0.2–0.5, 175.2%) **a**	0.5 ± 0.7 (0.3–0.6, 151.0%) **ae**	0.2 ± 0.5 (0.1–0.3, 234.3%)	0.1 ± 0.4 (0.0–0.3, 324.7%)	0.2 ± 0.5 (0.2–0.3, 221.6%)
Free Conceded Outside 45	0.5 ± 0.8 (0.2–0.7, 159.8%)	1.4 ± 1.3 (0.5–1.0, 112.7%)	1.6 ± 1.2 (1.2–1.9, 79.0%) **ab**	1.2 ± 1.4 (1.0–1.5, 111.7%) **a**	1.4 ± 1.3 (1.1–1.7, 92.1%) **ab**	1.0 ± 1.2 (0.9–1.1, 114.8%)
Free Conceded Inside 45	0.9 ± 1.1 (0.7–1.1, 119.9%) **bcde**	0.5 ± 0.7 (0.4–0.7, 134.2%) **e**	0.5 ± 0.8 (0.2–0.7, 170.5%)	0.2 ± 0.5 (0.1–0.4, 199.7%)	0.1 ± 0.2 (−0.1–0.3, 404.0%)	0.5 ± 0.8 (0.4–0.6, 169.5%)
Turnover Won	2.7 ± 1.7 (2.4–3.1, 62.5%) **cde**	2.3 ± 1.5 (2.0–2.6, 62.5%) **de**	1.8 ± 1.4 (1.4–2.2, 77.6%) **e**	1.3 ± 1.3 (1.0–1.6, 99.6%)	0.6 ± 0.9 (0.2–1.0, 151.1%)	1.9 ± 1.6 (1.7–2.0, 85.8%)
Contact Tackle	2.6 ± 2.0 (2.2–3.1, 76.7%) **e**	2.5 ± 1.9 (2.1–3.0, 74.8%) **e**	2.8 ± 2.0 (2.3–3.4, 69.8%) **e**	3.0 ± 2.3 (2.5–3.4, 78.5%) **e**	1.5 ± 1.4 (1.0–2.1, 90.2%)	2.5 ± 2.0 (2.3–2.8, 79.4%)
Missed Tackle	0.7 ± 0.8 (0.4–0.9, 119.2%)	0.8 ± 1.1 (0.6–1.0, 134.8%)	1.0 ± 1.1 (0.8–1.3, 101.8%)	1.0 ± 1.2 (0.8–1.2, 119.0%)	0.6 ± 0.8 (0.3–0.8, 147.1%)	0.8 ± 1.0 (0.7–0.9, 123.1%)
Possessions	11.1 ± 5.1 (9.8–12.5, 45.5%)	16.4 ± 5.8 (15.1–17.7, 35.2%) **a**	16.8 ± 6.9 (15.2–18.5, 41.2%) **a**	18.7 ± 6.4 (17.4–20.0, 33.9%) **a**	15.9 ± 6.5 (15.1–18.3, 34.9%) **a**	15.9 ± 6.5 (15.2–16.6. 41.1%)
Total Pass Attempts	10.8 ± 5.0 (9.5–12.1, 45.9%)	15.7 ± 5.8 (14.4–17.0, 36.7%) **ae**	15.3 ± 6.5 (13.7–17.0, 42.5%) **ae**	16.0 ± 6.7 (14.7–17.2, 41.8%) **ae**	11.7 ± 5.2 (10.1–13.3, 44.3%)	14.0 ± 6.2 (13.3–14.7, 44.6%)
Successful Hand pass	8.1 ± 4.3 (7.0–9.2, 53.1%)	11.2 ± 4.4 (10.1–12.3, 39.0%) **ae**	10.8 ± 5.7 (9.5–12.2, 51.4%) **ae**	11.6 ± 5.4 (10.6–12.7, 46.5%) **ae**	8.9 ± 4.4 (7.6–10.2, 48.9%)	10.2 ± 5.0 (9.7–10.7, 48.9%)
Successful Kick pass	2.3 ± 1.2 (1.7–2.7, 88.8%)	3.6 ± 2.8 (3.1–4.1, 78.1%) **ae**	3.1 ± 2.1 (2.5–3.8, 65.9%)	3.3 ± 2.1 (2.8–3.7, 64.1%) **e**	1.9 ± 2.0 (1.3–2.5, 101.9%)	2.9 ± 2.3 (2.6–3.1, 80.1%)
Unsuccessful Hand pass	0.2 ± 0.4 (0.0–0.3, 243.1%)	0.4 ± 0.8 (0.2–0.5, 197.5%)	0.6 ± 0.7 (0.4–0.8, 128.8%) **a**	0.5 ± 0.7 (0.3–0.6, 157.7%)	0.5 ± 0.8 (0.3–0.7, 160.0%)	0.4 ± 0.7 (0.3–0.5, 175.9%)
Unsuccessful Kick pass	0.3 ± 0.5 (0.1–0.5, 172.3%)	0.6 ± 0.8 (0.4–0.8, 142.5%) **ae**	0.8 ± 1.2 (0.6–1.0, 153.8%) **ae**	0.6 ± 0.9 (0.5–0.8, 139.5%) **ae**	0.4 ± 0.8 (0.2–0.6, 195.4%)	0.5 ± 0.9 (0.4–0.6, 161.4%)
Pass Success %	95.4 ± 6.4 (93.4–97.3, 6.7%) **c**	93.8 ± 7.4 (91.8–95.7, 7.8%)	90.8 ± 9.8 (88.3–93.2, 10.7%)	92.4 ± 9.4 (90.5–94.3, 10.2%)	92.2 ± 11.1 (89.8–94.6, 12.1%)	93.1 ± 8.8 (91.7–94.2, 9.4%)
Free Won	0.7 ± 0.9 (0.5–0.9, 123.1%)	0.8 ± 0.8 (0.6–1.0, 107.7%)	0.9 ± 0.9 (0.6–1.2, 96.5%)	1.4 ± 1.2 (1.1–1.6, 86.7%) **ab**	1.1 ± 1.1 (0.8–1.4, 100.2%)	1.0 ± 1.0 (0.9–1.2, 104.3%)
Turnover Lost	0.6 ± 0.7 (0.3–0.9, 119.2%)	1.3 ± 1.4 (1.0–1.6, 105.2%) **a**	1.6 ± 1.5 (1.2–1.9, 92.4%) **a**	1.4 ± 1.4 (1.1–1.7, 96.6%) **a**	1.5 ± 1.4 (1.2–1.9, 93.1%) **a**	1.2 ± 1.3 (1.1–1.4, 105.9%)
Total Shots	0.4 ± 0.6 (−0.1–0.8, 177.8%)	0.7 ± 0.8 (0.2–1.1, 124.1%)	1.4 ± 1.7 (0.9–2.0, 121.2%) **a**	3.1 ± 2.6 (2.6–3.5, 84.8%) **abc**	5.2 ± 3.0 (4.7–5.7, 58.5%) **abcd**	2.0 ± 2.6 (2.8–3.5, 130.8%)
Points	0.10 ± 0.30 (−0.2–0.4, 364.9%)	0.3 ± 0.6 (0.00–0.6, 191.7%)	0.5 ± 0.9 (0.2–0.9, 172.5%)	1.6 ± 1.9 (1.3–1.9, 119.6%) **abc**	2.9 ± 2.2 (2.5–3.3, 76.8%) **abcd**	1.0 ± 1.7 (1.3–1.8, 169.2%)
Goals	0.0 ± 0.0 (−0.1–0.1, 500.0%)	0.0 ± 0.0 ((−0.1–0.1, 500.0%)	0.1 ± 0.3 (0.0–0.2, 338.9%)	0.2 ± 4.2 (0.1–0.3, 226.0%) **ab**	0.5 ± 0.6 (0.4–0.5, 135.3%) **abcd**	0.1 ± 0.4 (0.1–0.3, 292.4%)
Scoring Efficiency	24.7 ± 42.9 (9.1–40.2, 174.1%)	45.5 ± 46.3 (33.3–57.7, 101.7%)	45.8 ± 42.5 (32.2–59.3, 92.9%)	51.9 ± 35.4 (43.1–60.8, 68.2%) **a**	61.1 ± 26.6 (50.5–71.7, 43.5%) **a**	49.1 ± 38.8 (43.8–54.3, 79.0%)

a = significantly greater than Full Back (p ≤ 0.05), b = significantly greater than Half Back (p ≤ 0.05), c = significantly greater than Midfield (p ≤ 0.05), d = significantly greater than Half Forward (p ≤ 0.05), e = significantly greater than Full Forward (p ≤ 0.05).

variables, agreeing with our first hypothesis. Our findings show playing standard at the sub-elite level has trivial or small effects (Table 2) on technical and running performance when players are analysed on a team level, rejecting our second hypothesis. Half forwards covered the most distance, had the highest average speed and also had most possessions of the ball. Our findings demonstrate that sub-elite Gaelic football players distance will cover 7145 m in a 60-min match. The high level of physical activity coupled with the social benefits of participating in the sport (Harkin 2018) should encourage recreational athletes to participate in Gaelic games.

As with previous research in elite Gaelic football (Malone et al. 2016a, 2016b; Mangan et al. 2017a; McGahan et al. 2018), half backs, midfielders and half forwards were found to cover significantly greater distances in sub-elite Gaelic football matches when compared to full backs and full forwards. Due to the differences in game length between sub-elite and elite Gaelic football (60 vs. 70 minutes), comparisons are best made using relative figures (Young et al. 2018). Only one research paper in elite Gaelic football has reported distance as a relative measure (Malone et al. 2016b). In comparing the results of the current research to elite Gaelic football, all positions covered lower relative distances than elite Gaelic football players (full back, 95 vs. 112 $m{\cdot}min^{-1}$; half back 113 vs. 137 $m{\cdot}min^{-1}$; midfield, 117 vs. 151 $m{\cdot}min^{-1}$; half forward, 122 vs. 144 $m{\cdot}min^{-1}$; full forward, 92 vs. 112 $m{\cdot}min^{-1}$) (Malone et al. 2016b). Caution most be exercised however in comparing these results due to the differences in GPS systems used across studies, but also because of the methods used for calculating relative distance. The current study divided the total distance run by the number of minutes played, including additional time added on by the referee (average game length = 66 min). The study by (Malone et al. 2016b) however, divided total distance by an arbitrary 70 min (length of elite Gaelic football match minus additional time), which likely results in an overestimation of true relative distance. The relative figures outlined in the current research such as the upper limits for total distance (137 $m{\cdot}min^{-1}$) and high-speed distance (26 $m{\cdot}min^{-1}$) can be very useful for coaches in terms of planning training drills and games. Coaches can use these figures as 100% of match demands and manipulate training games and drills to match or exceed it if they want to prepare for match-intensity or train at a lower percentage if the session aim is recovery.

The national guidelines for physical activity (Department of Health and Children 2009) in Ireland state that running 1600 m in 10 min or less (160 $m{\cdot}min^{-1}$) is considered as vigorous aerobic activity and that adults should complete 75 min of this activity type each week. Although our findings are below this figure, the extra physical cost associated with performing technical skills with a Gaelic football (Hulton et al. 2008) and the physical contact involved in a Gaelic football match would most likely mean that sub-elite Gaelic football comes close to meeting the national guidelines for vigorous aerobic activity. The high levels of physical activity coupled with the social benefits of participating in team sports should encourage adults to play Gaelic football. The identification of the physical demands are also useful for practitioners working in the elite game. Players with one year of experience in elite Gaelic football are more likely to get injured than those with greater experience at that level (Malone et al. 2016a). Now that we have established that the physical demands of sub-elite Gaelic football are lower than elite Gaelic football, practitioners working in the elite game may work on strategies based on the data presented to make the transition from sub-elite to elite Gaelic football more gradual, potentially reducing the risk of injury.

Clear positional differences were observed for technical performance (Table 3). Full backs conceded significantly more frees inside the 45 m line than every other position ($p < 0.001$); given their positioning on the pitch and their role in marking full forwards, this is unsurprising. Midfield players were involved in competing for more kickouts than any other position (Table 4), fitting with the traditional tactical role of midfield players (Kelly and Collins 2018; Shovlin et al. 2018). Half forwards had the most possessions and passes and won the most frees. The half forward position seems to be key in terms of linking attacking play and as such requires a high level of technical skill and decision-making. Full forwards made significantly fewer contact tackles ($p = 0.01$) than every other position; however, they accounted for significantly more shots ($p < 0.001$) and points ($p < 0.001$) than every other position. Our findings indicate that full forwards do not track back to the same extent of their team-mates, saving their energy for attacks. Given the positional differences for technical and running performance, it may be advantageous for coaches to design specific training exercises/games for each positional line to prepare for the specific match demands.

In comparing Division 1 and Division 2 players, there were only trivial to small effects for all technical and running performance variables. No statistical comparisons for playing standard have been made between sub-elite Gaelic football players to date, however, playing standard comparisons have been made in elite Gaelic football (McGahan et al. 2018). Playing standard was found to have a large effect on the amount of high-speed running (>17 $km{\cdot}h^{-1}$) covered by full backs and midfielders in elite Gaelic football and on a team level, there were large differences between the total number of passes, tackles and shots missed from play (McGahan et al. 2018). The elite teams compared were from Division 1 and Division 3, so may explain why there are greater differences between players compared to the current study where there is less observable difference in the playing standard (i.e., Division 1 and Division 2).

A limiting factor of this study is that only two sub-elite teams were examined, albeit over a large volume of games. Between team differences (Mangan et al. 2017b) exist, so it is not plausible to say that this data represents all Division 1 and Division 2 teams, although it does provide comparative values for sub-elite Gaelic football teams that did not previously exist. The CV % was very high for some of the technical performance variables (Table 4) within positions suggesting that individual player roles may not be the same for all players in a given position. In examining the reliability of the technical performance data, total game values for each performance indicator were assessed for the test-retests. A limiting factor of this approach is that it cannot be determined if an event coded in one game matches up with the exact same event in the retest. The absence of this temporal aspect of reliability should be noted by the reader. While the current study analysed the performance of players who played the full game, it excluded players who did not start or who did not complete the full game. The high physical demands placed on Gaelic football players means that the role of substitutions are crucial. Future research should examine the role and effectiveness of substitutions in Gaelic football in line with research in soccer that has shown substitutes completing more high-speed running than other players and subsequent performance being affected by situational variables (Bradley and Noakes 2013; Bradley et al. 2014). Specifically, information regarding the timing of substitutions and the m per minute covered by replacements would be particularly useful for coaches for strategic planning. With the match-play demands of sub-elite Gaelic football now known, further research may be warranted to assess the most effective training methodologies to prepare for these demands. By overexposing players to the technical and physical demands of match-play, coaches could prepare players for the worst-case scenarios in games.

Conclusion

The novel findings of the current study provide Gaelic football coaches and practitioners with much needed information regarding the positional technical and running performance demands of sub-elite Gaelic football match-play.

Practical implications

The research provides comparative values of performance for sub-elite Gaelic football teams. The information should provide lower ranked teams with measures of technical and running performance of which they can aspire to, to compete at the highest level of the sub-elite game. The findings are also beneficial to elite Gaelic football teams in terms of transitioning players who have been selected from sub-elite teams to represent their county at the elite level. Sub-elite teams should design training games to exceed the highest average relative running demands of match-play (137 $m.min^{-1}$) to prepare players for competitive performance.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Batterham AM, Hopkins WG. 2006. Making meaningful inferences about magnitudes. Int J Sports Physiol Perform. 1:50–57.
Beasley KJ. 2015. Nutrition and Gaelic football: review, recommendations, and future considerations. Int J Sport Nutr Exerc Metab. 25(1):1–13. doi:10.1123/ijsnem.2013-0214.
Bradley J, O'Donoghue P. 2011. Counterattacks in elite Gaelic football competition. Int J Perform Anal Sport. 11(1):159–170. http://www.ingentaconnect.com/content/uwic/ujpa/2011/00000011/00000001/art00015
Bradley PS, Lago-Peñas C, Rey E. 2014. Evaluation of the match performances of substitution players in elite soccer. Int J Sports Physiol Perform. 9(3):415–424. doi:10.1123/IJSPP.2013-0304.
Bradley PS, Noakes TD. 2013. Match running performance fluctuations in elite soccer: indicative of fatigue, pacing or situational influences? J Sports Sci. 31(15):1627–1638. doi:10.1080/02640414.2013.796062.
Carroll R. 2013. Team performance indicators in Gaelic football and opposition effects. Int J Perform Anal Sport. 13(3):703–715.
Cohen J. 1988. Statistical power analysis for the behavioral sciences. In: Statistical power analysis for the behavioral sciences. 2nd ed. New York: Lawrence Erlbaum Associates; p. 531–535. doi: 10.1234/12345678.
Collins K, Solan B, Doran DA. 2013. A preliminary investigation into high-intensity activity during elite Gaelic football. J Sports Ther. 1:10.
Department of Health and Children, Health Service Exceutive. 2009. The national guidelines on physical activity for Ireland. Dublin.
Harkin F. 2018. Where would we be without the GAA?": gaelic games and Irishness in London. London Ir Stud Rev. 26(1):55–56.
Hopkins WG. 2002. A scale of magnitudes for effect statistics. Sportscience. 5:1–7.
Hopkins WG. 2006. Estimating sample size for magnitude-based inferences. Sportscience. 10: 63-70
Hoppe MW, Baumgart C, Polglaze T, Freiwald J. 2018. Validity and reliability of GPS and LPS for measuring distances covered and sprint mechanical properties in team sports. PLoS One. 13(2):e0192708. doi:10.1371/journal.pone.0192708.
Hulton A, Ford T, Reilly T. 2008. 53 the energy cost of soloing a Gaelic football. In: Reilly T, Korkusuz F, editors. Science and football VI. p. 307–313.
Keane S, Reilly T, Borrie A. 1997. A comparison of fitness characteristics of elite and non-elite Gaelic football players. In: Reilly T, Bangsbo J, editors. Science and Football III. New York: Taylor and Francis; p. 3–6.
Keeler I, Wright DA. 2013. Amateurism in an age of professionalism: an empirical examination of an Irish sporting culture. Int J Bus Soc Res. 3 (4):1–13. Retrieved from: http://thejournalofbusiness.org/index.php/site/article/view/25/24
Kelly RA, Collins K. 2018. The seasonal variations in anthropometric and performance characteristics of elite intercounty Gaelic football players. J Strength Conditioning Res. 32(12):3466–3473. doi:10.1519/JSC.0000000000001861.
Koo TK, Li MY. 2016. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. J Chiropr Med. 15:155–163. doi:10.1016/j.jcm.2016.02.012.
Malone JJ, Lovell R, Varley MC, Coutts AJ. 2017a. Unpacking the black box: applications and considerations for using GPS devices in sport. Int J Sports Physiol Perform. 12(Suppl2):S2-18–S2-26. doi:10.1123/ijspp.2016-0236.
Malone S, Hughes B, Roe M, Collins K, Buchheit M. 2017b. Monitoring player fitness, fatigue status and running performance during an in-season training camp in elite Gaelic football. Sci Med Football. 1(3):229–236. doi:10.1080/24733938.2017.1361040.
Malone S, Roe M, Doran DA, Gabbett TJ, Collins KD. 2016a. Aerobic fitness and playing experience protect against spikes in workload: the role of the acute: chronic workload ratio on injury risk in elite Gaelic football. Int J Sports Physiol Perform. 32:1–25. doi:10.1123/ijspp.2016-0090
Malone S, Solan B, Collins K. 2016b. The influence of pitch size on running performance during Gaelic football small sided games. Int J Perform Anal Sport. 16(1):111–121. doi:10.1080/24748668.2016.11868874.
Malone S, Solan B, Collins K. 2017c. The running performance profile of elite Gaelic football match-play. J Strength Conditioning Res. 31(1):1–25. doi:10.1519/JSC.0000000000001477.
Malone S, Solan B, Collins K, Doran D. 2016a. Positional match running performance of elite Gaelic football. J Strength Conditioning Res. 30 (8):2292–2298. doi:10.1519/JSC.0000000000001309.
Malone S, Solan B, Collins K, Doran D. 2016b. The metabolic power and energetic demands of elite Gaelic football match play. J Sports Med Phys Fitness. 57(March):1–20.
Malone S, Solan B, Hughes B, Collins K. 2017d. Duration specific running performance in elite Gaelic football. J Strength Conditioning Res. 1. doi:10.1519/JSC.0000000000001972.
Mangan S, Collins K. 2016. A rating system for Gaelic football teams: factors that influence success. Int J Comput Sci Sport. 15(2):78–90. doi:10.1515/ijcss-2016-0006.
Mangan S, Malone S, Ryan M, McGahan J, O'Neill C, Burns C, Warne J, Martin D, Collins K. 2017a. The influence of match outcome on running performance in elite Gaelic football. Sci Med Football. 1(3):272–279.

Mangan S, Ryan M, Devenney S, Shovlin A, McGahan J, Malone S, O'Neill C, Burns C, Collins K. 2017b. The relationship between technical performance indicators and running performance in elite Gaelic football. Int J Perform Anal Sport. 17(5):706–720. doi:10.1080/24748668.2017.1387409.

Mangan S, Ryan M, Shovlin A, McGahan J, Malone S, O'Neill C, Collins K. 2019. Seasonal changes in Gaelic football match-play running performance. J Strength Conditioning Res. 33 (6):1685–1691.

McGahan JH, Mangan S, Collins K, Burns C, Gabbett T, Neill CO. 2018. Match-play running demands and technical performance among elite Gaelic footballers. J Strength Conditioning Res. 1. doi:10.1519/JSC.0000000000002450.

McGuigan K, Hughes M, Martin D. 2018. Performance indicators in club level Gaelic football. Int J Perform Anal Sport. 18(5):780–795. doi:10.1080/24748668.2018.1517291.

Osgnach C, Di Prampero P. 2018. Metabolic power in team sports – part 2: aerobic and anaerobic energy yields. Int J Sports Med. 39(8):588–595. doi:10.1055/a-0592-7219.

Reeves S, Collins K. 2003. The nutritional and anthropometric status of Gaelic football players. Int J Sport Nutr Exerc Metab. 13(4):539–548. http://www.ncbi.nlm.nih.gov/pubmed/14967875

Richardson J. 2011. Eta squared and partial eta squared as measures of effect size in educational research. Educ Res Rev. 6(2):135–147.

Sannicandro I, Cofano G. 2018. Small-sided games activities with external wildcard soccer players. MOJ Sports Med. 2(4):128–131. doi:10.15406/mojsm.2018.02.00060.

Shovlin A, Roe M, Malone S, Collins K. 2018. Positional anthropometric and performance profile of elite Gaelic football players. J Strength Conditioning Res. 32(8):2356–2362. doi:10.1519/JSC.0000000000002071.

Welsh AH, Knight EJ. 2015. 'Magnitude-based inference': a statistical review. Med Sci Sports Exerc. 47:874–884. doi:10.1249/MSS.0000000000000451.

Wilson F, Caffrey S, King E, Casey K, Gissane C. 2007. A 6-month prospective study of injury in Gaelic football. Br J Sports Med. 41(5):317–321. doi:10.1136/bjsm.2006.033167.

Young D, Mourot L, Coratella G. 2018. Match-play performance comparisons between elite and sub-elite hurling players. Sport Sci Health. 14 (1):201–208. doi:10.1007/s11332-018-0441-6.