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The Seasonal Variations in Anthropometric and Performance Characteristics of Elite Intercounty Gaelic Football Players

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Abstract

Kelly, RA, and Collins, K. The seasonal variations in anthropometric and performance characteristics of elite inter county gaelic football players. *J Strength Cond Res* 32(12): 3475–3482, 2018–There is limited research assessing the anthropometric and performance variations in elite Gaelic football. The aim of this study was to assess the anthropometric and performance characteristics of an elite intercounty squad within a season. After ethical approval and informed consent, 26 participants were assessed at the start of preseason (November), after early in-season (January), and midseason (March). Measurements included stature, body mass, sum of 8 skinfold sites (ΣSkf8), estimated body fat percentage (bf%), squat jump (SJ) and countermovement jump (CMJ), 5-, 10-, and 20-m sprint times, upper body and lower-body strength (1 repetition maximum), and Yo-Yo intermittent recovery test 2 (Yo-Yo IR2). A multivariate analysis of variance was used to determine seasonal and positional variations. Anthropometric variations were observed with an overall increase in participants' body mass and a concomitant decrease in ΣSkf8 and bf% (−21.5%, $p = 0.002$, $\eta^2 = 0.15$; −1.43%, $p = 0.004$, $\eta^2 = 0.13$). Performance variations showed improvements in sprint time over 5-m ($p = 0.001$, $\eta^2 = 0.19$) and 10-m ($p = 0.008$, $\eta^2 = 0.11$), SJ ($p = 0.013$, $\eta^2 = 0.1$), CMJ ($p = 0.013$, $\eta^2 = 0.1$) height and Yo-Yo IR2 ($p < 0.001$, $\eta^2 = 0.34$) noted from preseason to midseason. Significant anthropometric variations are observed between the preseason and early in-season; meanwhile, significant performance variations are observed between the preseason and midseason. Distinct positional variations are evident for both anthropometric and performance characteristics at all time points. Applied practitioners should consider these findings when implementing a seasonal training plan.

Key Words intermittent sport, kinanthropometry, physiology, field testing

Introduction

Gaelic football is a high-intensity intermittent invasion field sport with an unstable, stochastic nature (27). The sport has experienced a recent increased profile in the literature (7,18,21). Games last 70 minutes and involve bouts of high-speed running, jumping, and tackling interspersed with brief recovery periods (17). Teams are made up of 15 players, with positional groups broken down into defenders (full-back and half-back), midfielders, and forwards (half-forwards and full-forwards) (16). Playing positions place specific workrate demands on players who require the necessary fitness to meet these demands (21,26). Significant differences in global and demarcated distances covered by the central 3 positions are indicative of the unique role they play linking defensive and attacking play (21). Reductions in total distance covered and high-speed running actions are observed after the first quarter of match play, with the middle 3 positions completing higher volumes of running in all quarters of match play (21).

Assessment of body composition, particularly "body fat percentage" (bf%) is often used as a default performance-profiling marker of Gaelic football players (10). Excess body fat is undesirable, as it may compromise performance where body mass must be accelerated or lifted against gravity in aerial contests and running (9,27). In both the research and applied Gaelic games setting, tissue adiposity has been estimated primarily from skinfold thickness (SFT) using equations, such as Durnin and Womersley (11) to equate bf%. Shortall et al. (33) identified that there is a requirement for more contemporary data regarding anthropometric characteristics of elite Gaelic football players, as positional and seasonal variations are evident in Gaelic football. Anthropometric variations have previously been observed in rugby league, where SFT decreased in the early phases of the

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season when training loads were highest, with subsequent increases toward the end of the season, when training loads were lowest and match loads were highest (14).

Successful performance in Gaelic football requires an appreciation of the physiological demands of the game (8). Performance tests are undertaken to assess player characteristics, with retesting undertaken to assess training adaptation (28). Horgan and Collins (16) observed a positional variation in squat jump (SJ) and countermovement jump (CMJ) scores in elite players. Recent evidence highlights the importance of acceleration ability at the elite level of Gaelic football with a positional variation evident, highlighting midfielders undertake the greatest number of accelerations with full-backs and full-forwards undertaking the least (20,21,29). Midfielders, half-backs, and half-forwards also cover greater high-speed distances compared with full-backs and full-forwards, with similar trends observed in sprint distances (22). Krustrup et al. (20) determined the Yo-Yo intermittent recovery test, a reliable and sensitive test of an athlete's ability to perform high-intensity intermittent exercise and can show changes in performance across a season, and across positions. Recent research has shown it is a reliable and valid assessment in Gaelic football (15). Collins and Doran (8) showed significant positional differences ($p < 0.001$) were evident in Yo-Yo intermittent recovery test 2 (Yo-Yo IR2) performance with the middle 3 positional lines covering the greatest distances, whereas the full-backs and full-forwards covered the least.

Seasonal variation refers to changes in players' anthropometric and performance characteristics, or both, throughout a typical competitive year. A competitive year may be divided into "off-season" and "in-season," indicative of a decrease or increase in training load and competitions, respectively (32). The training arrangement could be regarded as "quasi-professional," with players at the elite level required to train 2–3 times on the pitch per week, supplemented by 1–2 gym sessions per week. Performance testing has become widespread from underage teams all the way up to senior level (3). Variations are examined through repeated measurements of the anthropometric and performance characteristics and should incorporate a period before commencement of the competitive season (when there is a reduced training load), during the competitive season (when training load is increased), and at the latter stages of competition (when training load is reduced while game load is increased). Variations have been documented in other field sports, such as rugby league (13) and soccer (5,24); however, studies documenting variations in anthropometric and performance characteristics of Gaelic football players are limited (15,16,33). Although previous studies measuring these characteristics have provided insight into the performance attributes of Gaelic football players, they have been limited to a single measurement, performed at varying periods of the competitive season (15,16,23,24). Therefore, the objective of this study was to examine variations in the anthropometric and performance characteristics of elite Gaelic football players across a competitive season. In addition, this study aimed to determine variations with respect to playing position. Furthermore, this study is the first to provide a full view of the variations that take place across a competitive season in elite Gaelic football with respect to both anthropometric and performance characteristics.

Methods

Experimental Approach to the Problem

Twenty-six elite Gaelic football players underwent measurements of standard anthropometric characteristics including stature, body mass, sum of 8 skinfolds (ΣSkf8), and estimated bf%. Performance characteristics including CMJ, countermovement jump peak power (CMJ_{peak}), SJ, 5-, 10-, and 20-m sprint times, 1 repetition maximum deadlift (1RM DL), 1 repetition maximum bench press (1RM BP), and Yo-Yo IR2 distance were measured. Data collection took place at 3 separate testing sessions across the season: preseason (November), early in-season (January), and midseason (March). Players were categorized according to position (full-back, half-back, midfield, half-forward, and full-forward) to allow for comparisons across positions (22) (Table 1). It was hypothesized that the greatest performance variations exist between the start of preseason and early in-season, with greater variations in anthropometric characteristics observed between preseason and midseason.

Subjects

After ethical approval by the Gaelic Sports Research Center at the Institute of Technology Tallaght and informed consent, 26 ($n = 26$), elite intercounty footballers (mean ± *SD* age 26.6 ± 6 years, height 183.5 ± 7.4 cm, and body mass 85.4 ± 10.2 kg) playing in division 1 of the National Football League participated in the study. When categorized by position, the participants consisted of 5 full-backs, 6 half-backs, 5 midfielders, 5 half-forwards, and 5 full-forwards. Written and informed consent was obtained prior to any testing took place.

Procedures

All tests were conducted in the same venue to remove external interferences, with anthropometric assessments preceding performance assessments. Testing took place at the same time of day to minimize the effects of circadian variations on the variables measured (26). Before testing, participants were provided with nutrition and hydration strategies to optimize performance.

Anthropometry. Anthropometric measurements were taken in accordance with the standards of the International Society for the Advancement of Kinanthropometry. Stature and body mass were measured using a SECA stadiometer and digital weighing scales (SECA Instruments Ltd., Hamburg, Germany). Estimations of bf% were determined by measuring subcutaneous fat tissue in millimeters at 8 sites (biceps,

Table 1. The difference in positional roles within a Gaelic football squad.

Position	Role	Reference
Full-back	Occupy the last line of defense. Defensive duties (man marking, tackling, and contesting possession with opposing forward players).	Reilly and Collins (27)
Half-back	Defensive duties combined with linking play between full-backs and midfield players. Contesting aerial possessions on shorter kick-outs from goalkeepers.	Malone et al. (22)
Midfield	Contesting aerial possession on longer kick-outs from goalkeepers, providing a platform for attack play and assisting in defensive play.	Reilly and Collins (27)
Half-forward	Linking attack play between and midfield players and full-forwards. Contribute to attaining scores.	Malone et al. (22)
Full-forward	Tasked with occupying the furthest forward position on the pitch to create scoring opportunities.	Reilly and Collins (27)

triceps, subscapular, iliac crest, supraspinale, abdomen, front thigh, and medial calf) using Harpenden skinfold calipers (Harpenden Instruments Ltd., West Sussex, UK). The bf% was determined using the Reilly estimation equation (29). A technical error of measurement was taken from all participants and was less than 3%, which is within the acceptable measurement error (1).

Performance. Lower limb power was assessed using the highest value obtained from 3 attempts of an SJ (participants squatted down until thighs were parallel with the floor and paused for 3 seconds, before jumping as high as possible), whereas maximum vertical jump height was determined using the highest value of 3 attempts of a CMJ (4) with assessments performed on a Takei digital jump reader (Takei, Japan). Countermovement jump peak power was determined from the equation of Sayers et al. (30). Participants' sprint times were measured over 20 m, with timing gates (Powertimer, Newtest, Oy, Finland) placed at 5, 10, and 20 m. Participants started from stationary and in their own time sprinted to the end of the outlined track, and the quickest of 3 attempts, with 5-minute rest between attempts, was taken. Upper body and lower-body strength was determined with a 1RM BP and hexagonal bar deadlift (1RM DL) (32). Players' ability to perform high-intensity intermittent exercise was assessed using the Yo-Yo IR2. The Yo-Yo test is a suitable test, as it involves movements similar to those experienced during game play (2,19). Power and speed tests preceded cardiorespiratory fitness tests in the testing order.

Statistical Analyses

Descriptive statistics are presented as means ± *SDs* and were calculated for each data collection session and for all positional categories. A multivariate analysis of variance with position as the fixed factor with a Fisher's least significant difference (LSD) post-hoc test was performed using Statistical Package for Social Sciences software (SPSS Version 22 for Windows 10, Chicago, IL, USA). Significance was set at $p \leq 0.05$. Because of the limited sample size in each position, estimates of effect size (36) were also undertaken using a partial eta-squared (η^2_p) and categorized according to Cohen (6). An η^2_p of 0.2, 0.5, 0.8, or 1.3 was considered small, moderate, large, and very large difference, respectively.

Results

Anthropometric

There was a significant main effect for time of season on ΣSkf8 ($F_{2,63} = 5.5$, $p = 0.006$, $\eta^2 = 0.15$) and bf% ($F_{2,63} = 4.7$, $p = 0.012$, $\eta^2 = 0.13$) (Figure 1).

There was a significant main effect for position on player height ($F_{4,63} = 11.4$, $p < 0.001$, $\eta^2 = 0.42$), body mass ($F_{4,63} = 5.18$, $p = 0.001$, $\eta^2 = 0.25$), ΣSkf8 ($F_{4,63} = 9.11$, $p < 0.001$, $\eta^2 = 0.37$), and bf% ($F_{4,63} = 10.4$, $p < 0.001$, $\eta^2 = 0.4$). Midfield players were significantly taller in comparison with all other positions ($p \leq 0.05$), with significantly greater body mass compared with half-backs ($p = 0.003$) and half-forwards ($p = 0.009$). Full-forwards were

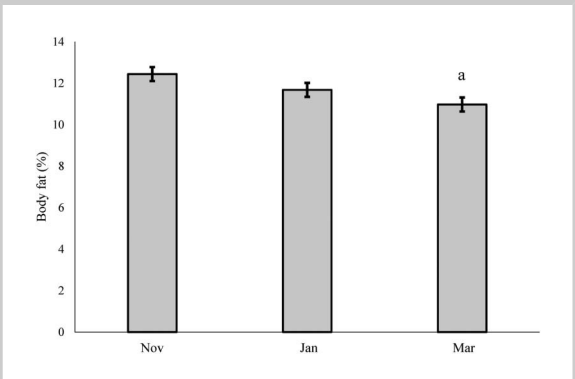

Figure 1. The seasonal variation in estimated body fat percentage (bf%) utilizing the equation from Reilly et al. a = a significant ($p = 0.004$) 1.4% decrease in bf% between November and March. The 95% confidence interval for the difference of the means was from 0.48 to 2.4%.

Table 2. The observed variations in performance characteristics of an elite intercounty Gaelic football squad across the season, categorized by position.*†

	Full-back			Half-back			Midfield		
	November	January	March	November	January	March	November	January	March
5 m (s)	1.18 ± 0.08	1.07 ± 0.08	1.09 ± 0.08‡	1.12 ± 0.08	1.05 ± 0.08	1.05 ± 0.04‡	1.18 ± 0.06§	1.13 ± 0.07	1.10 ± 0.03
10 m (s)	1.83 ± 0.10	1.80 ± 0.12	1.78 ± 0.13	1.82 ± 0.06	1.77 ± 0.05	1.76 ± 0.06	1.87 ± 0.06§	1.83 ± 0.06	1.83 ± 0.10
20 m (s)	3.06 ± 0.16	3.02 ± 0.19	3.04 ± 0.17	3.08 ± 0.09	3.05 ± 0.10	3.04 ± 0.10	3.19 ± 0.08§	3.14 ± 0.06§	3.14 ± 0.08
SJ (cm)	31.6 ± 3.7§	31.9 ± 3.4§	34.4 ± 3.3‡§	35.4 ± 5.6	37.1 ± 5.1	38.5 ± 4.8‡	30.3 ± 3.8§	32.8 ± 3.2§	34.9 ± 3.4‡§
CMJ (cm)	33.2 ± 3.4§	33.1 ± 3.6§	36 ± 3.7§	36.2 ± 5.7	38.5 ± 5.5	40.3 ± 4.3	31.5 ± 4.1§	34.2 ± 3.4§	36.2 ± 3.5§
CMJ_{peak} (w)	3,819 ± 469§	3,833 ± 487§	4,023 ± 481§	4,303 ± 704	4,331 ± 715	4,445 ± 674	3,685 ± 525§	3,869 ± 479§	4,013 ± 364§
1RM DL (kg)	145.8 ± 10	152.8 ± 10.4	160.6 ± 15.6‡	146.0 ± 16.7	153.5 ± 16.7	162.8 ± 17.7‡	132.8 ± 17.9§	142.6 ± 18.8§	152.8 ± 18.2 ‡§
1RM BP (kg)	110 ± 15.4§	111 ± 15.2§	112 ± 15.2§	97.5 ± 22.0§	102.5 ± 18.4§	105.8 ± 19.1§	102 ± 9.8§	105.0 ± 10.8§	108 ± 10.4§
Yo-Yo IR2 distance (m)	1,024 ± 61	1,224 ± 137	1,424 ± 209	1,210 ± 248	1,433 ± 193	1,580 ± 305	1,384 ± 281	1,544 ± 236	1,792 ± 175

	Half-forward			Full-forward		
	November	January	March	November	January	March
5 m (s)	1.14 ± 0.12	1.06 ± 0.12	1.06 ± 0.10	1.3 ± 0.54	1.07 ± 0.06	1.06 ± 0.06‡
10 m (s)	1.82 ± 0.07	1.78 ± 0.10	1.77 ± 0.10	1.86 ± 0.08	1.82 ± 0.11	1.76 ± 0.08‡
20 m (s)	3.08 ± 0.13	3.04 ± 0.17	3.00 ± 0.17	3.07 ± 0.09	3.04 ± 0.10	3.03 ± 0.10‡
SJ (cm)	36.7 ± 4.2	36.3 ± 4.2	38.8 ± 5.3	34 ± 6.0	36.2 ± 6.4	38.4 ± 6.9‡
CMJ (cm)	38.3 ± 4.1	39.6 ± 4.4	40.1 ± 6.0	36.4 ± 5.4	37.4 ± 6.2	39.9 ± 6.9
CMJ_{peak} (w)	3,931 ± 468	4,027 ± 437	4,051 ± 473	3,925 ± 343	4,096 ± 389	4,241 ± 375
1RM DL (kg)	132.8 ± 4.6	147.4 ± 4.2	157.2 ± 6.7‡	139.8 ± 15.1	151.8 ± 12	159.6 ± 13.9‡
1RM BP (kg)	88.0 ± 5.7§	91.5 ± 3.8§	92.5 ± 5.6§	81.0 ± 8.94§	85.0 ± 7.1§	87.5 ± 8.3§
Yo-Yo IR2 distance (m)	1,432 ± 422	1,632 ± 323	1,840 ± 335	816 ± 159§	1,048 ± 147	1,200 ± 202‡§

*1RM BP = 1 repetition maximum bench press; 1RM DL = 1 repetition maximum deadlift; CMJ = countermovement jump; CMJ_{peak} = countermovement jump peak power; SJ = squat jump; Yo-Yo IR2 = Yo-Yo intermittent recovery test 2.
†Data are reported as mean ± *SD*.
‡Significant difference ($p \leq 0.05$) from November.
§Significant difference ($p \leq 0.05$) for position.

significantly heavier than half-backs ($p = 0.001$) and half-forwards ($p = 0.002$) and presented with the highest ΣSkf8, significantly different from half-backs, midfielders, and half-forwards ($p < 0.001$; $p = 0.038$; and $p < 0.001$, respectively) (Table 2). Full-forwards and full-backs had the highest bf%, significantly different compared with half-backs (both $p < 0.001$), midfielders ($p < 0.001$ and $p = 0.006$), and half-forwards ($p < 0.001$ and $p = 0.002$).

Performance

There was a significant main effect for the time of season on SJ and CMJ height ($F_{2,63} = 3.4$, $p = 0.41$, $\eta^2 = 0.1$; $F_{2,63} = 3.2$, $p = 0.0.48$, $\eta^2 = 0.1$; respectively) (Table 2). There was a significant 10.1% increase in SJ height and a 9.8% increase in CMJ height between November and March ($p = 0.013$ and $p = 0.013$, respectively). There was a significant main effect for position on player SJ and CMJ height and CMJ_{peak} ($F_{4,63} = 3.7$, $p = 0.009$, $\eta^2 = 0.19$; $F_{4,63} = 4.1$, $p = 0.005$, $\eta^2 = 0.21$; and $F_{4,63} = 2.6$, $p = 0.047$, $\eta^2 = 0.14$, respectively) (Table 2). Midfielders (32.6 ± 3.8 cm) and full-backs (33.1 ± 3.6 cm) possessed the lowest SJ scores; both were significantly lower than all other positions ($p \leq 0.05$). Half-forwards showed the greatest CMJ height (38.3 ± 4.1 cm), whereas midfielders (33.9 ± 3.9 cm) scored significantly lower compared with full-backs, half-backs, and half-forwards ($p \leq 0.05$). Half-backs displayed the greatest CMJ_{peak} (43,560 ± 658 w), significantly greater compared with midfielders (3,855 ± 449 w; $p = 0.007$).

There was a significant main effect for time of season on 5- and 10-m sprint time ($F_{2,63} = 7.31$, $p = 0.001$, $\eta^2 = 0.19$; $F_{2,63} = 3.8$, $p = 0.028$, $\eta^2 = 0.11$; respectively). Midfield players were significantly slower over 5 m ($p = 0.021$) and 10 m ($p = 0.044$) compared with half-backs who possessed the fastest times over both 5 m (1.07 ± 0.07 seconds) and 10 m (1.78 ± 0.06 seconds). The observed decrease over 20 m between November and March was nonsignificant. A significant main effect for player position on 20-m sprint time ($F_{4,63} = 2.4$, $p = 0.061$, $\eta^2 = 0.13$) was observed, as midfield players were significantly slower than all other positions (all $p \leq 0.05$).

There was a significant main effect for time of season on 1RM DL ($F_{2,63} = 11.7$, $p < 0.001$, $\eta^2 = 0.27$). The 1RM DL increased significantly by 19.7% over the season ($p < 0.001$), with a 13.7% increase between November and January ($p = 0.013$), and a further 6% significant increase from January to March ($p = 0.026$). Half-backs had the greatest 1RM DL (154.1 ± 17.5 kg), significantly greater than midfielders (142.7 ± 18.9 kg; $p = 0.026$). A significant increase in deadlift power:weight ratio (DLPWR) was also observed from November to March (1.65 ± 0.22 vs. 1.87 ± 0.22, $p < 0.001$). Full-forwards had significantly lower compared with full-backs, half-backs, and midfielders (all $p \leq 0.05$). There was a significant main effect for position on player 1RM BP ($F_{4,63} = 9.7$, $p < 0.001$, $\eta^2 = 0.39$). Full-backs (111.0 ± 14.2 kg) had significantly greater 1RM BP compared with half-forwards (90.7 ± 5.1 kg, $p < 0.001$) and full-forwards (84.5 ± 8.0, $p < 0.001$).

There was a significant main effect for time of season on Yo-Yo IR2 performance ($F_{2,63} = 16.5$, $p < 0.001$, $\eta^2 = 0.34$). An overall 34.9% increase in total distance was observed across the season. There was a significant main effect for player position on Yo-Yo IR2 distance covered ($F_{4,63} =$

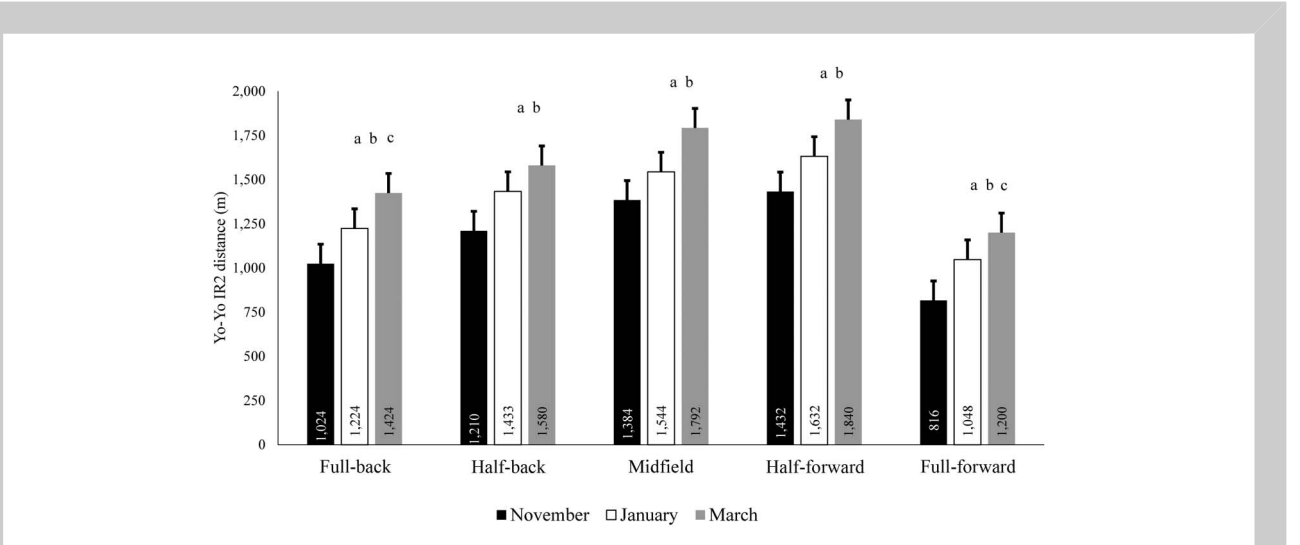

Figure 2. The seasonal variation categorized by position for an elite inter county Gaelic football squad. a = significant difference from November. b = significant difference from January. c = significant difference compared with the half-forward position. The full-forwards covered least distance in the Yo-Yo intermittent recovery test 2 tests. The greatest positional variation was observed between full-forward and half-forward (613 m, $p < 0.001$), followed by midfield (552 m, $p < 0.001$).

15.8, $p < 0.001$, $\eta^2 = 0.5$) (Figure 2). All positions showed an increase in Yo-Yo IR2 performance across the season. Half-forwards covered the greatest distance (1,635 ± 378 m), significantly greater compared with full-backs ($p < 0.001$), half-backs ($p = 0.011$), and full-forwards ($p < 0.001$), who covered the least (1,021 ± 230 m).

Discussion

The aim of this study was to assess the variations in anthropometric and performance characteristics of an elite intercounty Gaelic football squad within a competitive season. This study is the first to assess anthropometric and performance characteristics over the course of a season. Seasonal variations are evident within an elite intercounty Gaelic football squad, with the greatest variations observed between the start of preseason and early in-season. Variations were also evident from early in-season to midseason; however, these were less pronounced. A secondary aim of the study was to determine whether a positional variation exists and to establish whether variations are position specific. Positional variations were also observed for anthropometric and performance characteristics. The observations reinforce previous findings regarding positional variations in Gaelic football, with these variations now identified as consistent across the course of the season (16,33). The current information is important for applied practitioners for the planning and implementation of seasonal periodized plans.

Gaelic football players are relatively heterogenous with respect to body size. Midfield players are the tallest, whereas defenders are the shortest. It is apparent that anthropometric characteristics vary with positional roles, with taller players occupying more central roles to contest possessions more easily, which may be a tactical decision from coaches (9). The mean squad body mass increased across the season; however, the change was nonsignificant. By contrast, ΣSkf8 and bf% significantly decreased by 21.5 and 11.8%, respectively, between preseason and midseason, similar to decreases observed by Shortall et al. (33). Nascent data suggest preseason training regimes for players are ineffective in achieving desirable changes in body composition (34), with the greatest variations observed after the start of the competitive season. The additional match load in-season, resulting in increased energy expenditure, may be the reason why greater improvements in body composition were observed midseason rather than early in-season.

High power output is a requirement for Gaelic football players and was assessed using vertical jump tests (4). The mean squad SJ height recorded in preseason was 36 ± 5 cm and is similar to previous observations (16). The mean SJ height increased across the season, with a significant 10.1% improvement observed between preseason and midseason (33.7 ± 5 vs. 37 ± 4.9 cm). Similarly, the mean CMJ height significantly increased by 9.8% between the preseason and midseason (35.2 ± 4.9 vs. 38.6 ± 5 cm). The CMJ values recorded were lower than previously reported for elite hurlers (7) and elite Gaelic footballers (23). It was hypothesized that the greatest increases in power output would be seen after preseason, as the training focus was primarily on performance characteristics and less on technical and tactical work. Increases were observed; however, the change was nonsignificant. It could be hypothesized that the resultant increases are from training game-like scenarios that incorporate a wider array and assortment of tasks (jumping, accelerations, etc.), increasing all around performance. In addition, the reduction in excess adipose tissue seen during this period would enhance players' power to weight ratio. A positional hierarchy was also noted for power outputs, with half-forwards possessing the greatest lower-body power, outperforming all other positions for SJ and CMJ. Horgan and Collins (16) observed midfield players to have the greatest jump heights; however, in this instance, midfielders and full-backs had the lowest jump heights. A surprising observation was that jumping ability in midfield players was not as well developed as previously observed (16). A rationale for the poor jumping performance may be a higher body mass in comparison with the surrounding positions and the evolution of short kick-outs, where jumping ability is less important in midfield players who traditionally would have contested for aerial possession. Half-backs and half-forwards performed the best in jumping tasks, which is in contrast to previous observations (16).

Speed is an important characteristic for Gaelic football, as it is often the quick bursts of anaerobic activity that have an important bearing on the outcome of games (18). Players in this study demonstrated a mean time over 5 m as 1.15 ± 0.09 seconds at the beginning of preseason, which decreased by 7% to 1.07 ± 0.07 seconds in the early in-season. The increase in sprint speed can be linked to the observed increase in players' lower-body power, as measured by SJ and CMJ. Strength is important for Gaelic football, as it can have great bearing on mechanical ability, tackling success, and overall player robustness (12). Results show that Gaelic football players are relatively homogenous in terms of lower-body strength, with only 1 significant difference observed between half-backs and midfielders for 1RM DL. The 19.7% increase in lower-body strength would also contribute to players' increased sprinting ability (31).

The Yo-Yo IR2 is a test of an athlete's ability to perform high-intensity intermittent exercise, with its use in Gaelic football increasing (15,16). Previous research has identified peak distances in Gaelic football of 1,751 ± 398 m (15). Values have been observed to increase from 1,102 ± 353 m to 1,450 ± 420 m from preseason to midseason (15). Similar findings were observed in this study preseason squad distance of 1,174 ± 335 m, subsequently increasing to 1,567 ± 333 m in-season. A total increase of 34% in Yo-Yo IR2 performance is in line with previous research; however, variations are less pronounced in this instance. Total distance increased 18% from the start of preseason to after preseason ($p \leq 0.05$). This is less than the 31% increase

witnessed by Horgan et al. (15) and the 27% increase noted by Krustrup et al. (20). However, it is consistently evident that increases in performance are most prevalent in the preseason period. Increases such as these would be an expected outcome, as during this period, players undertake specific training dedicated to running-based drills to enhance physiological function (35). Increases in Yo-Yo IR2 distance are less pronounced from early in-season to midseason, and this would be an indication that the training is shifting to a more technical focus with a reduction in direct fitness work. No significant difference was observed between the middle 3 positional lines, suggesting a relative homogeneity for repeated high-intensity performance in Gaelic football. This finding supports data from match play suggesting midfielders, half-forwards, and half-backs have greater activity profiles compared with other positions (22). This study shows that half-forwards cover the greatest distance in Yo-Yo IR2, with somewhat of a stepped variation with respect to positions (Figure 2) moving from midfielders to half-backs and then full-backs, with full-forwards covering the least distance.

A major limitation of this study is that only a single squad was recruited, resulting in reduced sample sizes per position for comparison. Although positional sample sizes are small, the data still provide insight into the variation that may be present amongst players at the elite level. Future work may wish to address this by monitoring variations of a single squad over multiple seasons. Another approach could be to include players from multiple squads across the same season increasing the positional sample size.

Practical Applications

This study is the first to assess the seasonal variations in anthropometric and performance characteristics of elite intercounty Gaelic football players and has demonstrated that both seasonal and positional variations exist for both profiles. This study suggests that Gaelic football players are relatively heterogenous in terms of stature, body mass, and adiposity. Variations for anthropometric characteristics are most significant between the start of preseason (November) and in-season (March), with some less significant variations witnessed from the start of preseason to after preseason (January). This suggests that current training practices may not be enough to adequately manipulate body composition. The study also demonstrates that a positional performance hierarchy is apparent, providing increasing evidence of position-specific roles. As suggested previously by Collins et al. (7), the identification of position-specific performance characteristics may be useful for targeting, selecting, and planning of training programs to fit the player, e.g., enhancing the full-back and full-forward positions' ability to perform repeated high-intensity efforts to match those in the other positions. The middle 3 positional lines display similar aerobic/anaerobic profiles, suggesting their physiological demands are similar; however, differences in power and speed were apparent within these lines. This may be indicative of the present squads' approach to match play, or may represent a strength deficit in some key positions that should be considered by strength coaches. Applied practitioners can assess and evaluate Gaelic football players based on the data provided by this study. Coaches should be aware of the periods of the season where most variations occur and use this information to plan training appropriately to maximize training adaptations. Finally, coaches should also be aware of positional demands and use this to implement the most effective training plans.

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