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Longitudinal Association Between Sprint and Jump Performance in Youth Male Soccer Players: Implications for Talent Development

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ABSTRACT

This study analyzed the longitudinal relationship between short sprints and counter movement jump (CMJ) in youth male soccer players. Players (n = 304, age 13.0 ± 1.9 years) from a Scottish soccer academy completed sprints (10 m, 20 m splits [s]) and a CMJ (cm), on 3 to 14 occasions across 10 seasons. Within-player (repeated measures) and between-player (mean of repeated measures) correlation coefficients were calculated, and a linear mixed model (LMM) was applied to determine whether CMJ can predict sprint changes over a meaningful threshold (0.04 s, equivalent to the suggested minimum difference [~40 cm] for a player to be ahead of the opponent to win a ball in a one-on-one duel). Very large, negative between-player correlations were found for CMJ vs. sprint time (10 m: r = -0.746, 95% CI [−0.792, −0.691]; 20 m: r = -0.822, 95% CI [−0.856, −0.782], respectively). Within-player correlations were moderate-to-large (10 m: r = -0.485, 95% CI [−0.525, −0.443]; 20 m: r = -0.576, 95% CI [−0.611, −0.539]). The LMM analysis revealed that chronological age influenced the within-player correlations, while CMJ did not predict sprint changes over the meaningful threshold. While CMJ might be useful for distinguishing between players with differing sprint ability, it is not a suitable proxy for tracking individual sprint development over time, especially when accounting for chronological age-related changes. Coaches and practitioners should therefore consider incorporating direct sprint assessments into longitudinal monitoring.

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KEYWORDS
CMJ; football; sprinting; talent identification

Talent identification and development systems place a large emphasis on enhancing the physical qualities of youth athletes which play an important part in the multi-faceted talent selection processes in soccer academies (Bergeron et al., 2015; Sarmento et al., 2018). The quantification of physical qualities has been important for talent identification, player evaluation, and informing training prescription (Murr et al., 2018; Unnithan et al., 2012; Williams & Reilly, 2000). The highly individual nature of both timing and tempo of growth and biological maturation, alongside inevitable differences in training age and status (Cumming et al., 2017; Lloyd & Oliver, 2012) mean regular and longitudinal monitoring of physical qualities is important to ensure training prescription is appropriate. Among these physical qualities, power and sprint speed are seen as important performance indicators in soccer (Boone et al., 2012; Haugen et al., 2014; Reilly et al., 2000) by having an impact on match outcomes during both defensive and offensive plays with movements such as accelerations, decelerations, and vertical jumps. Furthermore, the development of these physical qualities plays an important role in long-term athlete development and are emphasized throughout childhood and adolescence within the Youth Physical Development model proposed by Lloyd and Oliver (2012).

Counter movement jump (CMJ) and short sprint performance are relevant in soccer-specific movements and commonly assessed in academies (Noon et al., 2021; Sarmento et al., 2018). The CMJ test is time efficient and easily administered (Paul & Nassis, 2015b), including different settings using portable equipment (jump mats or force plates) with a large group of academy players (Dickinson et al., 2025; Enright et al., 2018; Towlson et al., 2018). The CMJ is widely used in soccer academies for its ability to measure lower body power (Murtagh et al., 2018; Towlson et al., 2018), monitor performance (Dickinson et al., 2025), performance changes and potential injury risk markers such as interlimb asymmetry throughout the season (Bishop et al., 2023). Concurrently, short sprint performance (≤20 m; Nicholson et al., 2021) is important in soccer, with straight sprinting related to goal scoring actions (Faude et al., 2012).

Previous research has established moderate-to-very large correlations (−0.47 to −0.76) between CMJ and short sprint performance, suggesting that players who jump higher also tend to sprint faster over short distances (Dietze-Hermosa et al., 2021; McFarland et al., 2016). However, much of the existing body of work mainly focuses on single time point cross-sectional analyses, which do not clarify the individual performance variations over time. Moreover, there is a growing interest in understanding within-player variability (Buchheit et al., 2012; Laas et al., 2023; Wright & Atkinson, 2019) to provide a more personalized approach into player evaluation and performance enhancement as an addition to between-player comparisons (Morris et al., 2018). Studies exploring both the between-player and within-player

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variations would provide extended insights to how individual and group dynamics progress over time.

Longitudinal analyses can capture the paths of young players' physical development and the usefulness of training interventions over long-term (Wright & Atkinson, 2019; Wrigley et al., 2014). Such analyses can compare performance changes across different individuals and track individual performance changes over time (Hopkins et al., 2009; Laas et al., 2023; Wright & Atkinson, 2019). Longitudinal tracking of talent development processes has been advocated to mitigate confounding factors (e.g., biological age, non-linear development) and drop out (Barraclough et al., 2022; Bennett et al., 2019). Regardless of the probable benefits, there is a paucity of longitudinal studies in this field, especially those investigating CMJ and short sprint performance concurrently in youth soccer players. The existing literature primarily analyzes either CMJ or short sprint performance (Morris et al., 2018; Williams et al., 2011; Wrigley et al., 2014), instead of examining their long-term interrelations.

Laas and colleagues (2023) monitored the leap-for-distance test and short sprint speed (10 m, 20 m) over a three-season period. They found a very large between-player relationship and a small within-player relationship between the leap and sprint tests. Due to the small within-player relationship, the authors concluded that the leap test cannot predict changes in short sprint speed and should not be used as a proxy to sprint tests on an individual level, irrespective of the players maturation stage. In contrast, CMJ is a familiar measure in performance testing batteries in boys' soccer academies (Lolli et al., 2023; Towlson et al., 2018) and known to be associated with short sprint performance. However, the nature of any within-player associations between CMJ and short sprint speed is yet to be established. Furthermore, with more mature players outperforming their less mature counterparts (Gundersen et al., 2022; Meyers et al., 2016), the extent to which biological and/or chronological age influences any association is important to determine. The present study extends the work of Laas et al. (2023) by investigating long-term correlations between short sprints and a commonly used jump test in boys' soccer academies (CMJ) plus the impact of both the players' biological and chronological ages on the relationships.

We aimed to longitudinally track CMJ and short sprint performance in youth male soccer players, analyzing both between-player and within-player relationships to determine whether changes in CMJ can predict meaningful changes in sprint speed. In addition, we examined the potential influence of age-related variables (biological and chronological age) on these associations.

Methods

Study design

A longitudinal retrospective design was used to assess the relationship between short sprint time (10 m, 20 m; s) and CMJ (cm) in young male soccer players. Players performed the sprint and CMJ tests from 2006 to 2016. Measurements took place during the players' regular physical performance testing at their club three times per season. The data were collected as per the Club Academy Scotland's criteria to "conduct research on players on a regular basis," with informed consent obtained by players and guardians through the contractual process. The retrospective analysis presented here received ethical approval by the institutional review board at the Robert Gordon University (Ethics approval ID SHS/19/44). Consistency was obtained across the entire data collection period by standardizing playing surface (indoor sports hall), testing order, time of collection (seasonal observations on three evenings per year in August, December, and May). The same two assessors (together or alone) conducted the testing across the 10-year period to ensure inter-rater reliability. Players who were injured did not participate and to increase validity, assessments conducted for the purpose of return to play, or for those on trial and not signed to the academy were excluded from the analyses.

Participants

Five-hundred and twelve young soccer players (U10–U17 age groups) from a Scottish soccer academy participated in the study. They were classified as highly trained (Tier 3) or elite (Tier 4) athletes based on a participant classification framework (McKay et al., 2022). Several players (208) had to be withdrawn from the study as a minimum criterion of three data points was required for both the CMJ and sprint tests (concurrently) from everyone. This rendered a final sample size of $n = 304$ (age: 13.0 ± 1.9 years; stature: 158.4 ± 13.9 cm; body mass: 48.2 ± 12.8 kg; years from peak height velocity [YPHV]: −0.5 ± 1.7). YPHV was calculated to establish the players biological age from their chronological age and height maturity offset regression equation (Moore et al., 2015). We note that such methods of somatic maturation are practical and ethical but subject to error and may not be valid across different ethnic backgrounds (Fransen et al., 2021; Mirwald et al., 2002; Moore et al., 2015). The average number of testing sessions completed by the players over the 10 years was 5.7 ± 2.6 with a range of 3–14.

Procedures

Given the consistency of the testing battery, the clear guidelines provided, and the regular inclusion of aspects of the tests in physical conditioning sessions, players were well familiarized with the testing process. The assessment battery comprised measurement of stature and body mass, followed by performance of CMJ with hands-on-hips, 20 m sprints (with intervals recorded at 5, 10, and 20 m). Albeit 5 m intervals were collected, they were not reported given the very large correlation between the 5 and 10 m acceleration distances ($r = 0.855$). Stature was measured using a free-standing stadiometer (SECA Height Measure, Hamburg, Germany) and body mass measured using digital scales recording to 0.1 kg (SECA floor scale, Hamburg, Germany). Participants then performed the same standardized warm-up comprising a progressive and intermittent dynamic structure (4 × 15 m jog, 12 × 15 m walking dynamic stretches incorporating all major muscle groups, 4 × 15 m leaps/bounds, 10× body mass squats, 4 × 15 m progressive acceleration/decelerations). Standardized instructions and technical demonstrations were provided to the group prior to the commencement of each testing station. Individual participants then received technical instruction prior to the commencement of each activity with further feedback provided. A trial was removed and redone if incorrect technique was shown (e.g., lifting knees to chest in the CMJ). Physical testing began with three repetitions of the CMJ to a self-selected counter movement depth on an infra-red jump mat (MuscleLab IR Jump MAT, Ergotest, Langonsund, Norway) with the greatest jump height being recorded for analysis. Repetitions that did not conform to a CMJ technique were excluded, with additional trials allocated to obtain three successful jumps. Immediately following the CMJ, participants performed the sprint protocol comprising 3 × 15 m warm-up runs (1 × 80%, 1 × 90% and 1 × 100% perceived maximum) followed by 3 × 20 m maximum sprint efforts with timing gates recording split times to the nearest 0.01 s (Speed Trap Timing, Brower Timing Systems, Utah, USA). Each sprint was separated with a recovery period of at least 1:10, with the start line located 1 m behind the initial timing gate. Participants initiated sprints with one foot self-selected in front of the other. Appropriate test validity and reliability for all equipment and protocols adopted in the testing battery have been established previously with similar age groups within soccer (Deprez et al., 2015; Paul & Nassis, 2015a). Specifically, 10 m and 20 m sprint times have demonstrated good reliability in youth soccer players. For the 10 m sprint, intraclass correlation coefficients (ICC) were reported at 0.85, with 95% confidence intervals ranging from 0.67 to 0.93, and a coefficient of variation (CV) of 1.7% (1.3% to 2.5%). For the 20 m sprint, ICC was 0.87 (95% CI: 0.72 to 0.94) with a CV of 1.4% (1.1% to 2.0%) (Enright et al., 2018). For CMJ, lower bounds of ICC confidence intervals have been reported to range between 0.71 and 0.90 across age groups (Hulse et al., 2013).

Statistical analysis

Statistical analyses were performed in R (version 3.6.1, R Foundation for Statistical Computing, Vienna, Austria). The best (highest) score of CMJ and the best (fastest) sprint times were retained for the analyses. Baseline player characteristics and outcome measures are presented as mean ± SD.

Between-player correlations were calculated between the mean CMJ and short sprint scores (Bland & Altman, 1995a). This method was used to remove within-subject differences to identify whether the highest jumping players also had the fastest sprint times (Bland & Altman, 1995a). Assessing whether a change in jump performance was associated with a change in sprint performance in an individual, the within-player correlations via parallel slopes general linear models (ANCOVA) were calculated and between-subject differences removed (Bland & Altman, 1995b), using the rmcorr package (Bakdash & Marusich, 2017). All correlation coefficients were presented with 95% confidence intervals (CI) as markers of uncertainty in the estimates. The magnitude of the correlation coefficients was interpreted from the following thresholds: ±1.0, Perfect; ±0.9 – 1.0, Nearly perfect; ±0.7 – 0.9, Very Large; ±0.5 – 0.7, Large; ±0.3 – 0.5, Moderate; ±0.1 – 0.3, Small, ±0.0 – 0.1, Trivial (Hopkins et al., 2009).

In the secondary analysis, a linear mixed model (LMM) was implemented with sprint scores as the outcome variable and CMJ height as the predictor in case of substantial within-subjects correlations detected in the first phase of analysis. Here, we investigated three models; in our base model (model 1) the predictor (CMJ; independent variable) was entered as a fixed effect (slope) with each player modeled as random effects, for predicting sprint times (dependent variable). Given the potential influence of growth-related characteristics on the players CMJ and sprint correlation, the chronological age (model 2) and biological age [years from peak height velocity] (model 3) were modeled as additional confounding variables. These models were compared using the "performance" package revealing model 2 as the best fit (AIC value 10 m: −3395.7 with a weight of >.999; 20 m: −2406 with a weight of >.999) and explained the most variation (R^2 = 10 m; 0.683, 20 m; 0.840). Furthermore, non-normality of residuals was observed in model 3 for both 10 m and 20 m time, thus model 2 was retained for further analysis.

The slopes for these models (the change in sprint time for each 1 cm change in CMJ height) were extracted alongside their confidence intervals. These were then presented as the required change in CMJ height required to meet the minimal practically important change (MPIC) in sprint performance. Here, we defined the MPIC based on the anchor method, in this case the minimum change in sprint time anchored to a performance advantaged in one-to-one duels (Haugen & Buchheit, 2016; Haugen et al., 2014). It is suggested that this is the minimal change that could translate to having body or shoulder in front of the opposing player in one-on-one duels is between 30 and 50 cm difference (0.04–0.06 s in short sprints tests over 20 m; Haugen et al., 2014). Based on the consensus of Haugen and Buchheit (2016) it was decided that a 40 cm difference in reaching to the ball before the opponent to win a one-one-one duel would be of practical significance to the athletes (MPIC) which should correspond to a change of 4% for 10 m and 2% for 20 m (~0.04 s change; Haugen & Buchheit, 2016; Haugen et al., 2014).

Results

Descriptive statistics for all players (n = 304) are presented in Table 1, summarizing age, maturity offset, body mass, and stature, as well as jumping and sprinting scores for each age group. A total of 1629 observations were included in the analyses.

Visual observations of the players' performance scores between the age groups are visible in Figures 1–3, and a notable change can be observed with the transition from U13 to U14s.

The between-player mean of repeated measures correlation coefficients for CMJ was very large with both 10 (r = −0.746 [95% CI, −0.792 to −0.691]) and 20 m sprint times (r = −0.822 [95% CI, −0.856 to −0.782], Figure 4). Very large correlations were also reported between the performance scores with chronological age (Figure 4).

The within-player correlation coefficients for CMJ with 10 m, 20 m speed were moderate to large (−0.485 [−0.525 to −0.443] and −0.576 [−0.611 to −0.539], Figures 5 and 6).

Table 1. Testing data across age groups (mean ± standard deviation).

Test	Age Group						
	Under 10s	Under 11s	Under 12s	Under 13s	Under 14s	Under 15s	Under 17s
Age (y)	9.8 ± 0.5	10.6 ± 0.4	11.6 ± 0.4	12.6 ± 0.4	13.6 ± 0.4	14.6 ± 0.4	15.9 ± 0.6
YPHV (y)	−3.2 ± 0.3	−2.5 ± 0.4	−1.8 ± 0.4	−0.9 ± 0.5	0.0 ± 0.5	1.0 ± 0.5	2.1 ± 0.6
Stature (cm)	136.7 ± 7.9	143.3 ± 6.0	148.3 ± 6.7	154.9 ± 7.5	163.0 ± 7.9	170.9 ± 7.0	175.7 ± 6.0
Mass (kg)	32.1 ± 5.5	35.5 ± 4.9	38.6 ± 5.6	44.1 ± 7.1	51.1 ± 7.5	59.1 ± 8.1	65.6 ± 7.2
CMJ (cm)	19.8 ± 3.9	23.5 ± 4.5	25.6 ± 4.7	27.2 ± 4.2	31.0 ± 5.3	33.6 ± 4.9	36.4 ± 4.7
10 m (s)	2.00 ± 0.09	1.99 ± 0.10	1.96 ± 0.09	1.91 ± 0.09	1.85 ± 0.09	1.82 ± 0.11	1.79 ± 0.11
20 m (s)	3.59 ± 0.18	3.56 ± 0.15	3.49 ± 0.16	3.38 ± 0.14	3.27 ± 0.15	3.15 ± 0.14	3.07 ± 0.14

YPHV = years from peak height velocity (maturity offset)

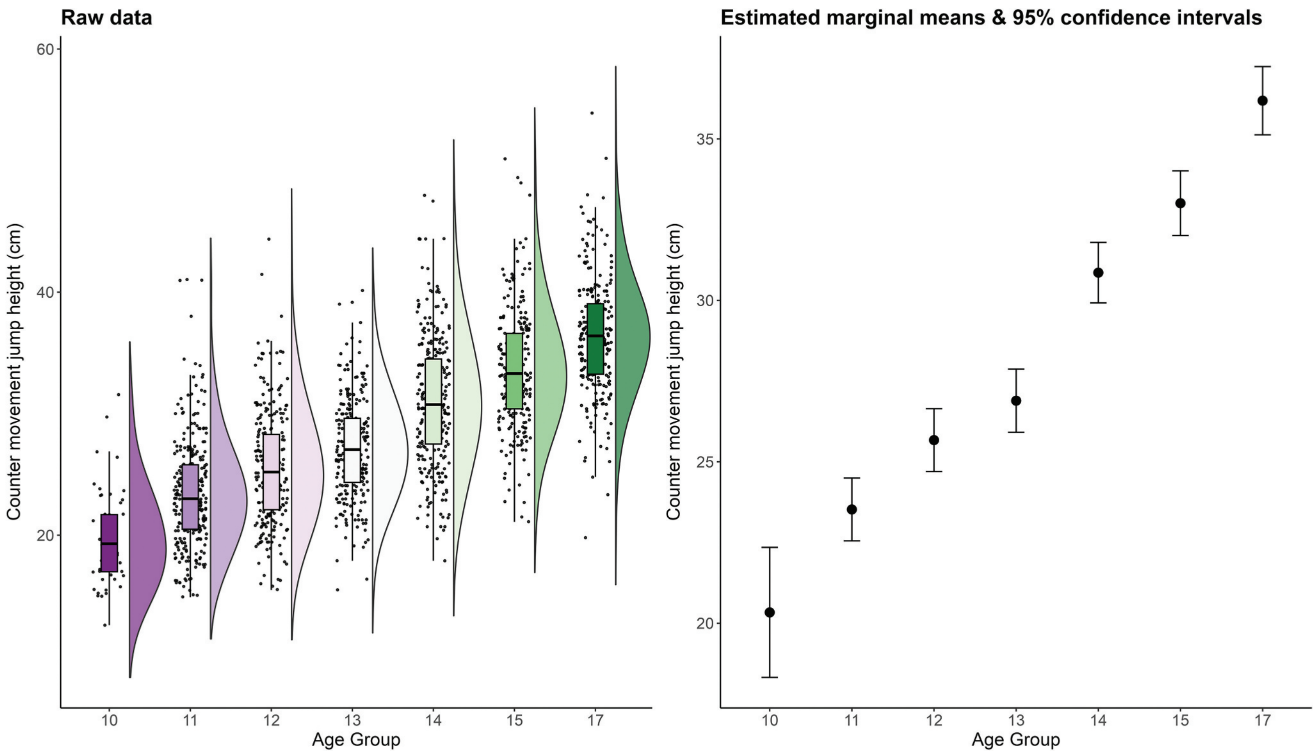

Figure 1. Counter movement jump data across age groups. Raw data is represented as flat violin and raincloud plots to demonstrate the distribution of the data and box plots visualising the median and interquartile range. Estimated marginal means plots are presented to represent the estimated mean jump height and 95% confidence intervals at each age groups when individual player repeated data is considered.

When chronological age was modeled as a covariate with the individual players within the analysis, these correlations were reduced to small with 10 and 20 m −0.139 (−0.184 to −0.092), −0.124 (−0.170 to −0.078). This suggests that age is a key confounding factor in the relationship between changes in jump and sprint performance. Indeed, within-player correlations between chronological age and physical performance were large for CMJ, 0.639 (0.606 to 0.670), 10 m speed, −0.621 (−0.653 to −0.588) and very large for 20 m speed −0.806 (−0.824 to −0.787).

The observed slope for the change in CMJ relative to changes in sprint times, whilst controlling for chronological age was −0.005 s (95% CI, −0.006 to −0.004 s; t-value, −9.10) for 10 m and −0.005 (95% CI, −0.007 to −0.004; t-value, −7.98) for 20 m. These results show that predicting sprint changes from CMJ were all below the set MPIC (0.04 s) and heavily influenced by chronological age. The slope when converted to the change in CMJ associated with the MPIC in sprint time for 10 m was 8.73 cm (95% CI, 7.14 to 11.2) and 7.39 (95% CI, 5.89 to 9.89) for 20 m. Indeed, a change in CMJ of between ~7 and ~9 cm would be associated with a change 0.04 s. Previously a CMJ change of 2.8 cm has been perceived important by practitioners with female soccer players (Datson et al., 2022).

The slope, intercept, and t-values are presented in Supplementary Table S1 for those players who went on to become professionally contracted and separately those who did not gain a professional contract.

Discussion

We investigated between- and within-player associations between CMJ and short sprint performance in academy soccer players from a longitudinally (10 seasons) data set. After controlling for chronological age, within-player correlations between CMJ and sprint were small, indicating that CMJ is not suitable for tracking sprint development. However, CMJ remains useful for differentiating players according to sprint ability and should not replace direct sprint assessments in

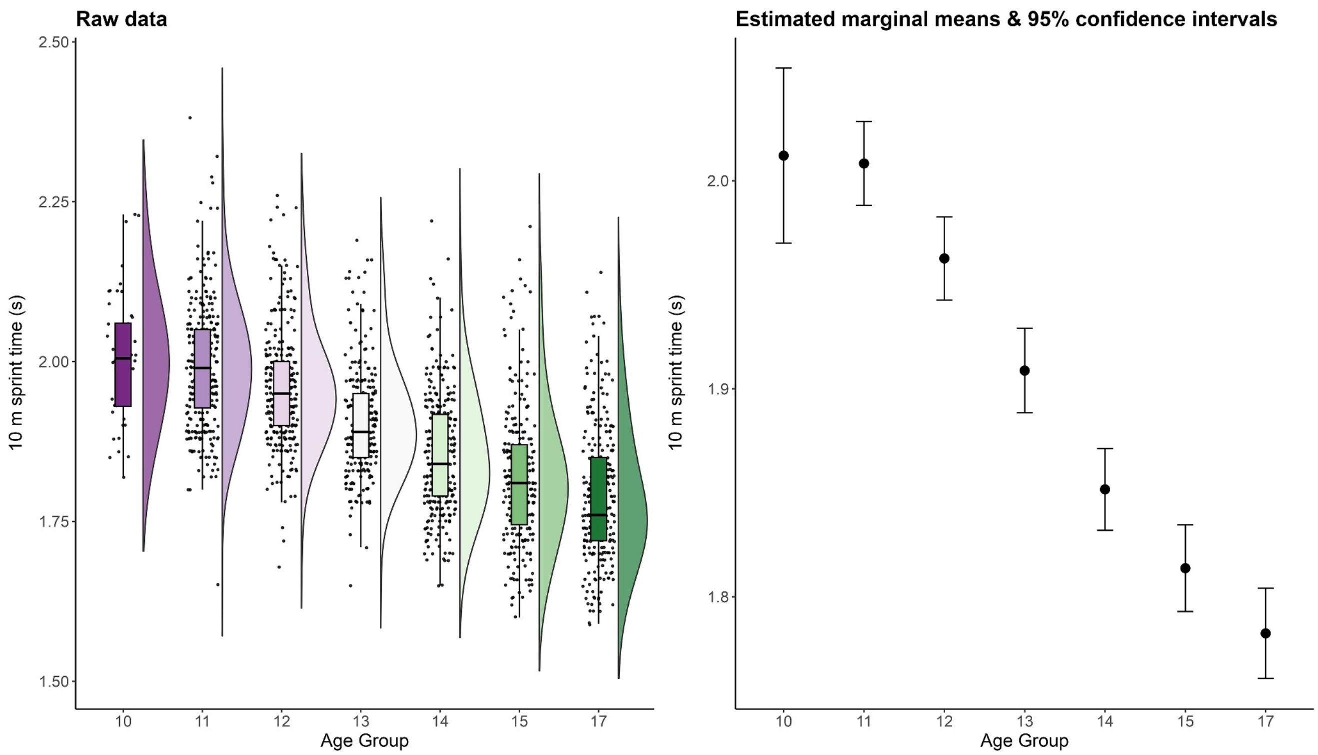

Figure 2. Ten-meter sprint time across age groups. Raw data is represented as flat violin and raincloud plots to demonstrate the distribution of the data and box plots visualising the median and interquartile range. Estimated marginal means plots are presented to represent the estimated mean sprint time and 95% confidence intervals at each age groups when individual player repeated data is considered.

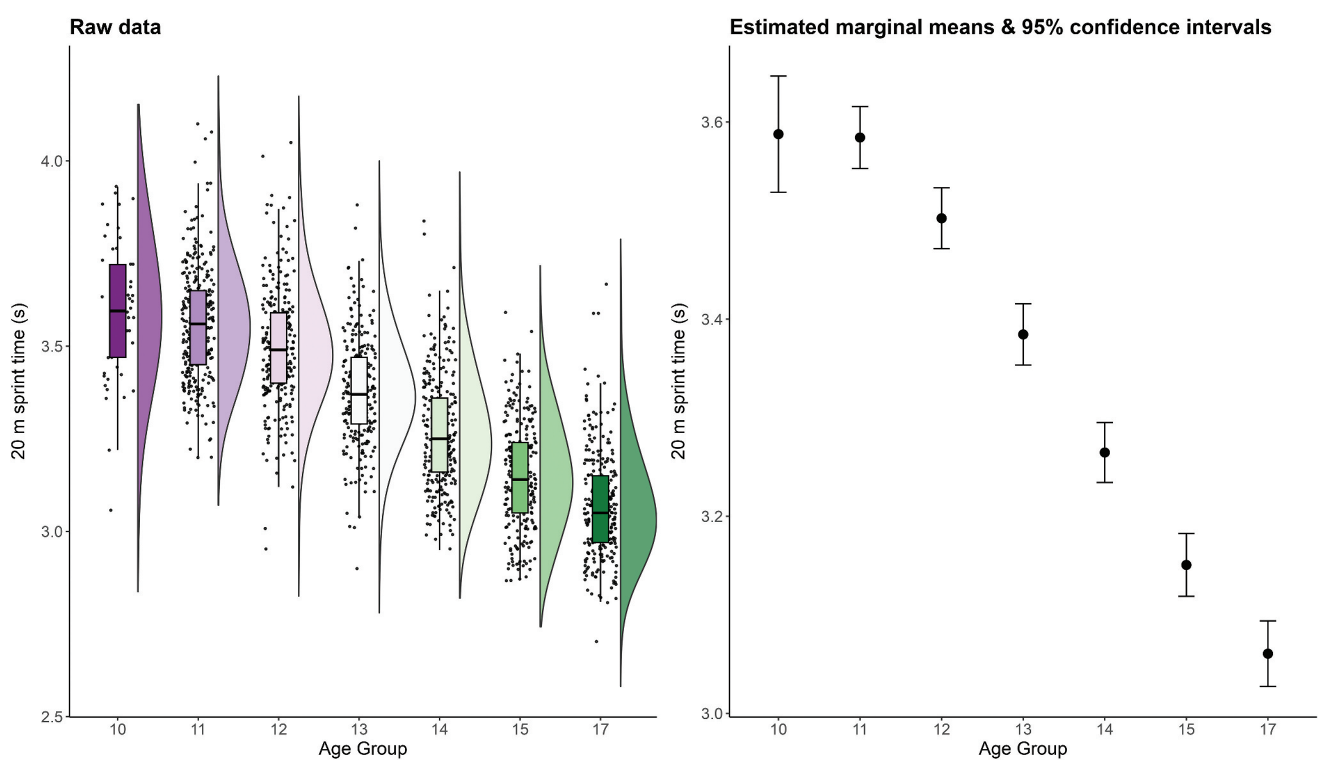

Figure 3. Twenty-meter sprint time across age groups. Raw data is represented as flat violin and raincloud plots to demonstrate the distribution of the data and box plots visualising the median and interquartile range. Estimated marginal means plots are presented to represent the estimated mean sprint time and 95% confidence intervals at each age groups when individual player repeated data is considered.

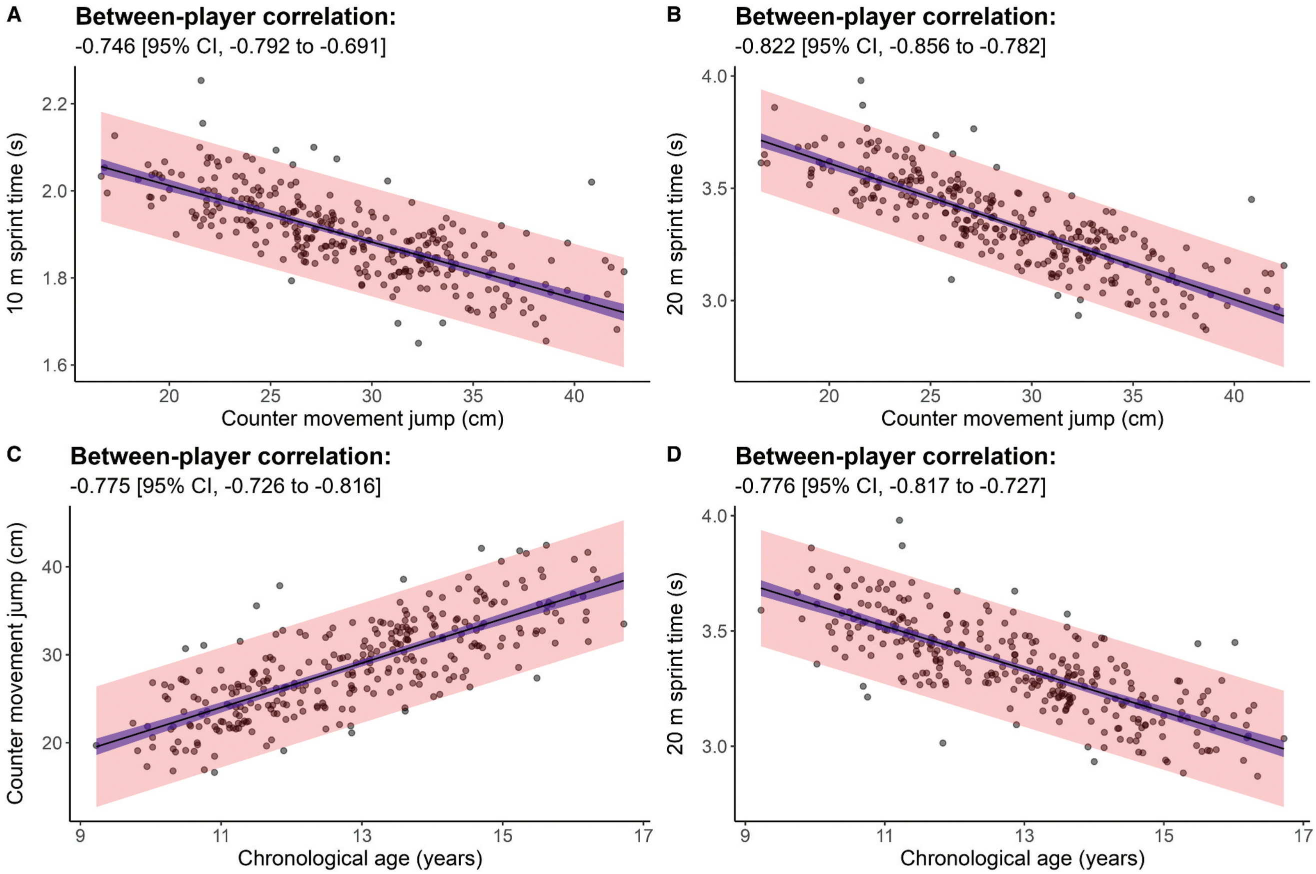

Figure 4. Between-player correlations between player mean counter movement jump height and mean sprint time (A & B) and between mean chronological age at testing and counter movement jump height (C) and 20 m sprint time (D). Blue shaded areas represent the confidence intervals and red shaded areas the prediction intervals.

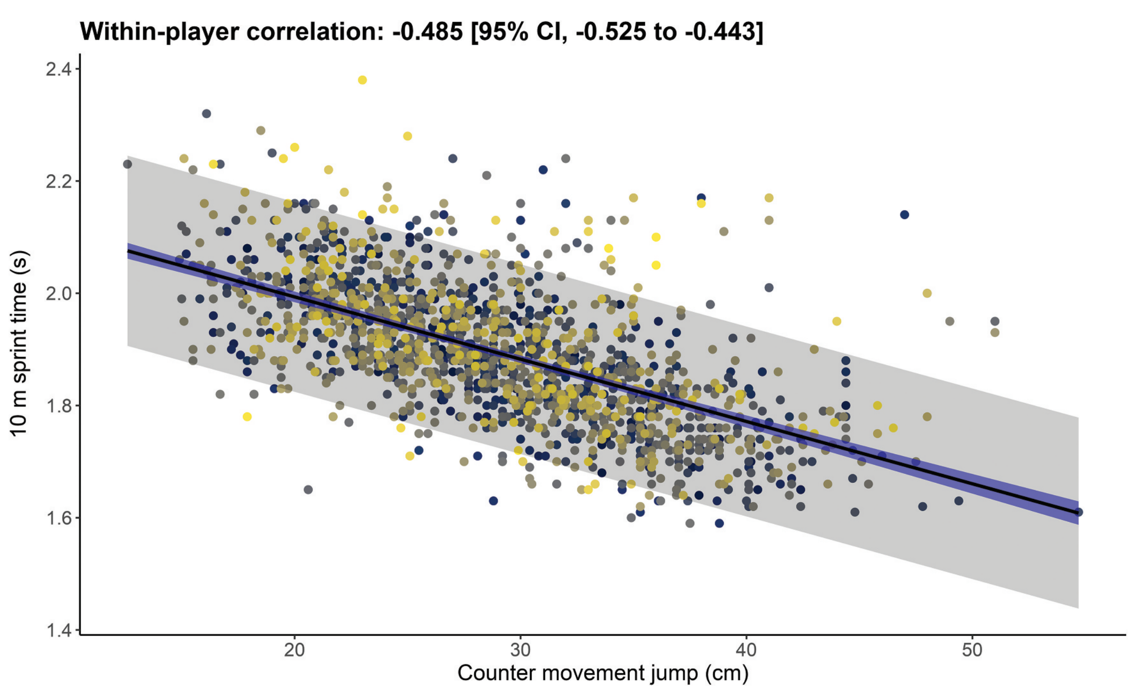

Figure 5. Repeated measures within-player correlations between counter movement jump height and 10 m sprint time. Observations from the same player are given the same colour (totalling 1629 observations from 304 players). For clarity corresponding lines to show the slope for each player have not been plotted, the overall repeated measure correlation is shown as the black line with the blue shaded area representing the 95% confidence interval. The grey shaded area represents the prediction intervals for the model.

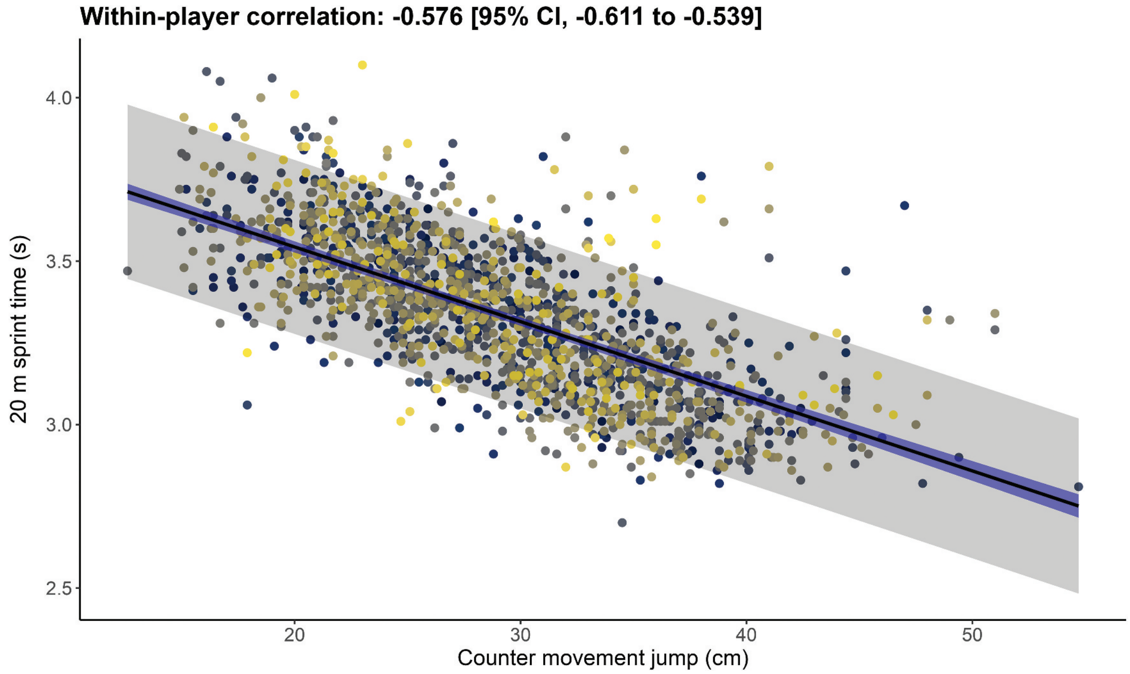

Figure 6. Repeated measures within-player correlations between counter movement jump height and 20 m sprint time. Observations from the same player are given the same colour (totalling 1629 observations from 304 players). For clarity corresponding lines to show the slope for each player have not been plotted, the overall repeated measure correlation is shown as the black line with the blue shaded area representing the 95% confidence interval. The grey shaded area represents the prediction intervals for the model.

longitudinal monitoring programs. Our data supports previous research suggesting a very large negative association between CMJ height and sprint time (Dietze-Hermosa et al., 2021; McFarland et al., 2016).

Between-player correlations

Very large between-player correlations were observed between CMJ scores and both 10 m and 20 m sprint times (Figure 4), indicating that players who jumped higher tended to sprint faster. These findings are consistent with previous data (Laas et al., 2023) although these correlations do not imply causation. We cannot conclude that improving CMJ or lower limb power will directly lead to faster sprint times. Chronological age emerged as a key confounding variable, showing strong associations with both CMJ and sprint performance. This likely contributed to the magnitude of our correlations, which were slightly higher than those reported by Radnor et al. (2021), who examined performance within age categories. Our analysis spanned a wider age range, increasing data heterogeneity and correlation strength (Atkinson & Nevill, 1998). Despite these limitations, CMJ may still serve as a practical tool for differentiating faster and slower players across an academy cohort, though it may offer no greater insight than chronological age alone.

Given the established reliability of CMJ and sprint tests in youth populations (Enright et al., 2018), individual deviations from the observed between-player trends (Figure 4) could offer practitioners useful insights for guiding individualized athletic development. Previous recommendations suggest that strength-focused training may suit faster players with lower CMJ scores, while ballistic exercises might benefit slower players with higher jump performance (Taylor et al., 2022; Turner et al., 2021). However, these strategies should be applied with caution, as the current findings are correlational and do not demonstrate that modifying CMJ will directly influence sprint performance.

Within-player correlations

Sprint and CMJ performance improved with chronological age, consistent with previous findings in youth soccer populations (Lovell et al., 2015; Radnor et al., 2021). Moderate-to-large within-player correlations were observed (Figures 5 and 6), which were stronger than those reported by Laas et al. (2023). Chronological age had a strong influence on these relationships, supporting earlier studies (Craig & Swinton, 2021; Laas et al., 2023; Mendez-Villanueva et al., 2011), and likely reflecting growth-related changes such as increased limb length and hormonal development during adolescence (Engebretsen et al., 2010; Ford et al., 2011). These findings reinforce the importance of accounting for age-related physical development when interpreting longitudinal performance data in academy settings.

Differences in timing and tempo of growth, and associated biological maturation, mean that players of the same chronological age vary with regards to biological maturation (Cumming et al., 2017; Lloyd & Oliver, 2012). As such, biological age may better reflect maturation than chronological age, but commonly used noninvasive methods to estimate this, such as maturity offset, are prone to error, particularly in ethnically diverse populations and varied environments (Fransen et al., 2021; Malina et al., 2021; Moore et al., 2015). These inaccuracies are more pronounced in early and late matures, where predictions can deviate substantially from actual biological development (Malina et al., 2021). Furthermore, biological maturation is likely to be influenced by the social and environmental contexts in which players grow up, which may add to the variability in biological but not chronological age (Thompson et al., 2025). More robust measures, such as skeletal age assessed via radiography, could reduce classification error and provide a clearer understanding of maturation-related performance changes (Lloyd et al., 2014). However, these methods are rarely feasible in applied academy settings due to ethical, logistical, and financial constraints (Lloyd et al., 2014). Considering these limitations, our findings support the use of chronological age as a practical and sufficiently explanatory variable, while acknowledging that more precise biological maturity assessments could refine future analyses.

Additional factors may have influenced the modest within-player correlations. Testing conditions were consistent (indoor, evening), but longitudinal changes may have been smaller than the short-term variability ("noise") in the tests, reported as 4.3% for CMJ and 1.7–1.4% for 10 m and 20 m sprints (Enright et al., 2018). Other factors may include variability in running technique, motivation, or physical and mental readiness. Overall, our findings confirm that CMJ is not a suitable proxy for tracking individual sprint performance. Practitioners should continue to assess sprint performance directly when monitoring speed progression over time.

This study has limitations. Firstly, while the data represents a large longitudinal sample, it is important to highlight that these data are from a single academy, which may limit extrapolation of results to other populations. Players were assessed at consistent times (August, December, May) and not all of them were present for these sessions. Testing points for the players during the 10-year duration of the study ranged from 3 to 14 indicating high academy turnover of players. Using the best score at any time point in the season might have influenced the testing performance and through that the relationship between the two measures. Another limitation was that the players did not stay in the study the same amount of time. Some started from the early age groups and stayed in the study to the end while others entered the academy during later ages. Earlier recruited players might be at an advantage of receiving professional contracts (Noon et al., 2021). The longer amount of time spent in the academy and the sport science support could have given those players a superior physical development and subsequently larger correlations between the performance measures. Lastly, while biological age was calculated for this study, it was based off a height maturity offset regression equation (Moore et al., 2015) from the main model including sitting height (Mirwald et al., 2002). The authors accept that the maturity offset prediction has a certain amount of error (Mirwald et al., 2002). Nevertheless, identifying peak height velocity was not calculated for this study, and this noninvasive method has been used in large groups of soccer players (Laas et al., 2020, 2023; Portas et al., 2016; Towlson et al., 2018). Further research should include more robust measures of biological maturation, such as skeletal age, if feasible.

Exploratory findings

Although not the primary aim of this study, exploratory analysis was conducted on a subset of 66 players who later received professional contracts. Previous research has shown that CMJ and sprint performance do not reliably differentiate professional from amateur players (le Gall et al., 2010), nor do they predict contract attainment (Craig & Swinton, 2021). Additionally, early recruitment into academies is associated with higher chances of earning a contract, but not necessarily with superior performance scores at younger ages (Noon et al., 2021).

In this dataset, exploratory supplementary analysis suggested that 20 m sprint performance may have developed more steeply with chronological age in players who progressed to professional contracts (Supplementary table S1). No such trend was observed for CMJ or 10 m acceleration. While this may indicate differentiated speed development, the magnitude of slope differences was small, and we caution against overinterpretation. These findings warrant further investigation into longitudinal speed progression as a potential marker of elite development.

Conclusion

We observed that CMJ was strongly associated with sprint performance across players, confirming its value as a simple indicator of speed-related ability in youth soccer. However, within-player changes in CMJ do not reflect corresponding improvements in sprint speed. Chronological age emerged as a central factor influencing both CMJ and sprint performance, underscoring its importance in longitudinal monitoring. Practitioners should avoid using CMJ as a substitute for sprint testing to track individual sprint development and should account for age-related changes when interpreting performance data.

Data availability statement

The data used in this study are available on request from the corresponding author.

Disclosure statement

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