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ORIGINAL ARTICLE

A Comparison of the Physical Characteristics of Adolescent Female, Academy Cricket Players

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Abstract

Purpose Women's cricket has grown in popularity over the last decade, however despite this there is a paucity of literature examining the female version of the game. Furthermore, no research has examined the physical attributes of female cricketers, particularly adolescents. Therefore, the purpose of this research was to develop a physical profile for u/11, u/13, u15, and u/18 female adolescent cricket players.

Methods One hundred and five (age: 13.00 ± 2.37 years, stature: 156.91 ± 12.06 cm, mass: 50.85 ± 10.40 kg) female academy players were profiled for body composition, flexibility, lower and upper body power, sprint speed, and change of direction ability.

Results Both the u/11 and u/13 age groups differed significantly ($P < 0.05$) to each other and the u/15 and u/18 age groups for stature, lower and upper limb power, and change of direction time. No significant differences ($P < 0.05$) were observed for all tests between the u/15 and u/18 age groups.

Conclusion The findings of this investigation provide normative data for adolescent female cricketers that can be used by strength and conditioning coaches for the implementation of scientifically based training programs, as well as to set goals to identify progression in physical ability during maturation and training. Additionally, the study is relevant for coaches working within the age group to support their own learning and development within the applied nature of coaching and support of their female athletes.

Keywords Cricket · Adolescents · Females · Physical characteristics

Introduction

Cricket is a field-based sport that has grown in popularity in the last few decades; it is played by approximately 300 million individuals worldwide [8, 14, 40]. This is likely because the game is unique in nature consisting of several different formats such as Test (multi-day) and one-day matches, as well as the shorter T20 and "The Hundred" formats [2, 21, 24]. Traditionally cricket was considered a gentlemen's game specifically for male players, however recently the women's game has expanded to reach multiple nations globally [23]. The introduction of the women's 50 over and T20 world cups and competitions has resulted in an increased interest in the female form of the game [11].

Despite this popularity, there is a paucity of literature that has examined the physical attributes of the women's game; most research has been on males [43]. Furthermore, it is well known that male and female cricketers differ concerning morphological and physical characteristics (for example, strength, power, and speed) as well as physiological capabilities (oxygen consumption, heart rate), particularly post puberty [14, 15, 23, 40]. This is evident by factors such as differing force-velocity profiles, bowling speeds, and fielding characteristics, which are reflected in the adaptations to the female game through boundary size (field of play) as well as ball mass and size [19]. Furthermore, research has shown that more runs are scored from running between the wickets in the female version of the game compared to boundary hitting for male players, particularly in the shorter formats [24]. Therefore, the physical characteristics of

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female cricketers (within the context of their matches) must be examined so that specific training interventions can be implemented to improve performance and reduce the risk of injury.

There is limited research that has studied the physical attributes of female cricketers in general and most has focused on professionals, adults or both [2, 14, 15]. To the authors' knowledge, no literature has investigated adolescent players. This is important considering that physical qualities typically develop during adolescence and body systems become structurally and functionally mature [15]. Furthermore, success in cricket depends on several technical and physical abilities, such as strength, power, agility, speed, and change of direction ability [2, 25, 30, 43]. These physical abilities are important for all disciplines and levels in cricket particularly for running between the wickets, ground fielding, catching, bowling velocity, hitting the ball to the boundary, and reducing the risk of injury [10, 30, 33, 41, 43]. Furthermore, physical development can vary widely among adolescents and are particularly dependent on when the individual reaches puberty [3]. Literature suggests that in elite youth female soccer players, speed, change of direction, lower body power and aerobic fitness improve with more mature players [6]. Research in male pathway cricketers has also shown that individual maturity should be assessed for the retention and progression of players [34]. However, pathway cricket in general has received very little research attention; to the authors' knowledge, no literature has investigated female pathway cricketers.

Therefore, the purpose of this investigation was to develop a physical profile for u/11-u/18 female adolescent cricket players in the United Kingdom and compare these characteristics according to age group. This was deemed important for normative data for different age groups for the design of scientifically based training programs, injury prevention plans, and the identification of factors that may be relevant to player progression. The information from this study could also support coaches with age group female athletes, as well as working efficiently within multi-disciplinary teams.

Materials and Methods

Participants

One hundred and five female cricketers (see Table 1 for demographics), currently playing for elite academy age group teams in the United Kingdom were recruited for the investigation. Ethical approval was granted by the *University of Derby Ethics Committee*, and all players were volunteers. For this study, participants were not required to define their specialist roles in the team (batter, bowler, or all-rounder) as the overall physical characteristics of age group cricketers were investigated. All players partook in a weekly cricket specific strength and conditioning session in conjunction with a net based training session, in the off-and pre-season respectively (see Table 2).

Table 1 Demographic characteristics and physical fitness parameters of the u/11-u/18 age groups for the cricket-specific test battery [Mean (SD)]

Variable	u/11 (*n* = 32)	CV (%)	u/13 (*n* = 37)	CV (%)	u/15 (*n* = 18)	CV (%)	u/18 (*n* = 18)	CV (%)	*df*	F/H	*P* value
Age	10.31 (0.83)	8.05	12.45 (0.50)	4.02	13.55 (0.51)	3.76	16 (1.37)	8.56			
Stature (cm)	140.56 (7.03)*	5.00	155.13 (8.44)*	5.44	166.94 (9.05)	5.42	165.00 (5.67)	3.44	3	56.19	< 0.001
Mass (kg)	36.68 (8.63)*	23.5	49.46 (10.91)	22.06	59.25 (9.43)	15.92	58.00 (5.09)	8.78	3	47.54	< 0.001
Sit and reach (cm)	21.60 (4.84)	22.41	24.79 (7.51)	30.29	27.04 (6.78)	25.07	22.35 (10.34)	42.26	3	6.86	> 0.05
Standing broad jump (m)	1.46 (0.32)*	21.92	1.61 (0.18)*	11.18	1.84 (0.17)	9.24	1.79 (0.14)	7.82	3	46.70	< 0.001
OH medicine ball throw (m)	2.84 (0.64)*	22.54	3.92 (0.67)*	17.09	4.95 (0.69)	13.94	5.22 (0.65)	12.45	3	66.28	< 0.001
Sprint a "1" (s)	3.93 (0.32)*	8.14	3.50 (0.28)	8.00	3.40 (0.19)	5.59	3.36 (0.16)	4.76	3	42.51	< 0.001
CoD 1 (s)	2.91 (0.20)*	6.87	2.68 (0.17)#	6.34	2.60 (0.20)	7.69	2.52 (0.15)#	5.95	3	35.35	< 0.001
CoD 2 (s)	2.99 (0.24)*	8.03	2.69 (0.18)#	6.69	2.57 (0.17)	6.61	2.54 (0.13)#	5.12	3	51.15	< 0.001

Where: * represents significant differences ($P < 0.05$) between all age groups for specific responses; # represents significant difference ($P < 0.05$) between u/13 and u/18 age groups for CoD time 2. *CoD* change of direction, *df* degrees of freedom, *F* ANOVA F statistic, *H* Kruskal-Wallis H statistic

Table 2 Lower and upper limb power responses relative to stature and body mass [Mean (SD)]

Group	Stature		Mass	
	Standing broad jump (cm/cm)	OH med ball throw (cm/m)	Standing broad jump (cm/kg)	OH med ball throw (m/kg)
u/11	1.00 (0.16)	0.02 (0.00)	0.26 (0.08)	0.08 (0.02)
u/13	0.97 (0.12)	0.03 (0.00)	0.31 (0.07)	0.08 (0.01)
u/15	0.92 (0.11)	0.03 (0.00)	0.33 (0.07)	0.09 (0.01)
u/18	0.92 (0.06)	0.03 (0.00)	0.32 (0.03)	0.09 (0.01)

Design

A cross-sectional experimental design was used to build a physical profile of female academy cricket players between the u/11 and u/18 age groups. The test battery was designed based on the movement demands of the game, previous studies that have investigated the physical characteristics of cricket players, and specific test batteries implemented by strength and conditioning coaches for cricket activity [12, 16, 28–30, 43].

Procedures

Players were required to attend two testing sessions. Before this the aims, risks, and benefits of the investigation were explained to the players, coaches, and parents, and individuals were allowed to ask any questions. Participants over the age of 18 years provided consent, and those under the age of 18 years provided assent; gatekeeper permission was granted by the cricket club. The testing sessions took place either in the Performance Suite, at the *University of Derby* (u/11 and u/13), or, in the indoor cricket nets at the cricket club (u/15 and u/18). Before performing the test battery, the coach or strength and conditioning coach took each team through a warmup to prevent any injuries from occurring. Due to the large number of participants, as well as time constraints, players were split into smaller groups and therefore a specific testing sequence was not possible. However, players were given enough recovery time before each test. Once the test battery was completed, participants were debriefed, and any additional questions were answered.

Equipment and Test Battery

Body Composition (Stature and Mass)

Stature was measured using a calibrated Seca stadiometer (model 766 1321009), calculated accurately to the nearest millimetre. In the case of no stadiometer being available, a tape measure was placed on the wall. Players were instructed to remove shoes, and any form of headgear and asked to stand in an upright position, facing forward with feet together and heels pressed against the base of the stadiometer. The measurement was taken at the highest point of the player's head. Body mass was determined using a Seca (model 766 1321009), electronic scale with measures recorded to the nearest 0.01 kg. Players were required to remove footwear as well as any other heavy accessories and clothing and stand as still as possible in the middle of the scale until the measure was recorded.

Flexibility (Sit and Reach)

Lower back and hamstring flexibility were assessed using the sit and reach test (Cartwright fitness sit and reach box). The zero point of the box was set at 15 cm (i.e., players touching their toes). Players were required to sit on the floor, with shoes removed, knees extended, ankles flexed, and bare feet flat against the edge of the box. Participants were then instructed to flex at the hip, reach towards their toes, and push the marker on the box as far forward as possible. Players were instructed to stop if there was any pain or if the knees flexed at any point during the test. The furthest point reached, after two attempts, was recorded in centimetres.

Lower Body Power (Standing Broad Jump)

Lower body power was assessd using a standing broad jump. Each broad jump required players to stand behind a demarcated start line. Flexing (bending) of the knees and swinging of the arms was allowed without any run-up or prior shuffle. Players were then instructed to jump as far as possible, and the maximum distance (in meters) was recorded from the start position to the back of the heel closest to the starting line. A successful jump was defined as players being in control of the landing. The maximum jump distance out of two trials was recorded.

Upper Body Power (Overhead Medicine Ball Throw)

Upper body power was assessed using an overhead medicine ball throw. These involved players throwing a 3 kg medicine ball overhead for maximum distance. Participants stood with feet shoulder width apart facing the direction in which the ball would be thrown. In one motion players threw the ball as far as possible (elbow bend and back extension were permitted) and the maximum distance was measured (in meters). During the throw, the player's feet were required to be "planted" i.e., no run-up or lunge after the ball was thrown was permitted. The maximum throw distance of two trials was recorded.

Speed (Sprinting a Single)

Sprint speed was measured by sprinting a "quick single" and the method was adapted from previous cricket-specific research [16]. Smartspeed pro (Vald, Australia) timing gates (height: 56 cm from base to sensor) were placed 17.68 m apart at each popping crease, to replicate the length of a full-size cricket pitch (Fig. 1). Players were required to pad up with full protective gear (helmet, pads, gloves, and thigh pads) and, after mimicking a shot with the bat (within the crease area), sprint a single in the quickest time possible [5, 17, 32]. The quickest time (in seconds) of two trials was recorded, between timing gates A and D (Fig. 1).

Change of Direction Time (Sprinting a Three)

Sprinting a three was used to determine the change of direction time, and the method was adapted from previous cricket-specific research [16]. The timing gate set-up (height: 56 cm from base to sensor) was the same as for sprinting a "quick single" (Smartspeed pro, Vald, Australia), with an additional two timing gates set up five meters from each popping crease (Fig. 1). Players were required to pad up with full protective gear (helmet, pads, gloves, and thigh pads) and, after mimicking a shot with the bat, sprint a three as quickly as possible [5, 17, 32]. Change of direction time one was recorded from timing gate C to D and back to C, whereas change of direction time two was recorded from timing gate B to A and back to B (Fig. 1). The quickest change of direction times of each trial (in seconds) after two attempts were recorded. No overall time for three runs was recorded.

Statistical Analysis

Normality assumptions were determined using the Kolmogorov-Smirnov test. Box plots were used to visually assess data variance and a follow-up Levene's test was used to formally evaluate the equality of variances. Following the assessment of normality and variances for each respective variable, a series of one-way ANOVAs or Kruskal-Wallis tests were used to identify differences in the dependent variables between age groups (i.e., u/11, u/13, u/15, and u/18). Where statistical significance ($P < 0.05$) was identified, post-hoc analyses using the Tukey HSD or Dunn-Bonferroni test were undertaken to identify the specific pairwise participant groupings that statistically differed. Descriptive data was presented as mean ± SD where appropriate. The alpha level was set at $P < 0.05$ and all analyses were carried out using the R analysis software environment (packages: 'tidyverse', 'car', 'FSA'). The effect size calculation (Cohen's d) was used to characterise the magnitude of the difference between the age groups [9]. The criteria for interpreting effect sizes were: < 0.2 trivial, 0.2–0.5 small, > 0.5–0.8 medium, > 0.8 large. Coefficient of variation was assessed by dividing the sample standard deviation by the mean for each variable and age group (i.e. per test). Pearson's correlation (r) was utilised to assess the strength and directionality of relationship between lower limb power and sprint speed for each age group. The relationship between relative (stature and mass) lower and upper limb power and sprint speed and change of direction was also assessed using a Pearson's correlation (r). The magnitude of the correlation was evaluated as follows: <0.1 = trivial, 0.1–0.3 = small; 0.3–0.5 = moderate; 0.5–0.7 = large; 0.7–0.9 = very large; and 0.9–1.0 = almost perfect.

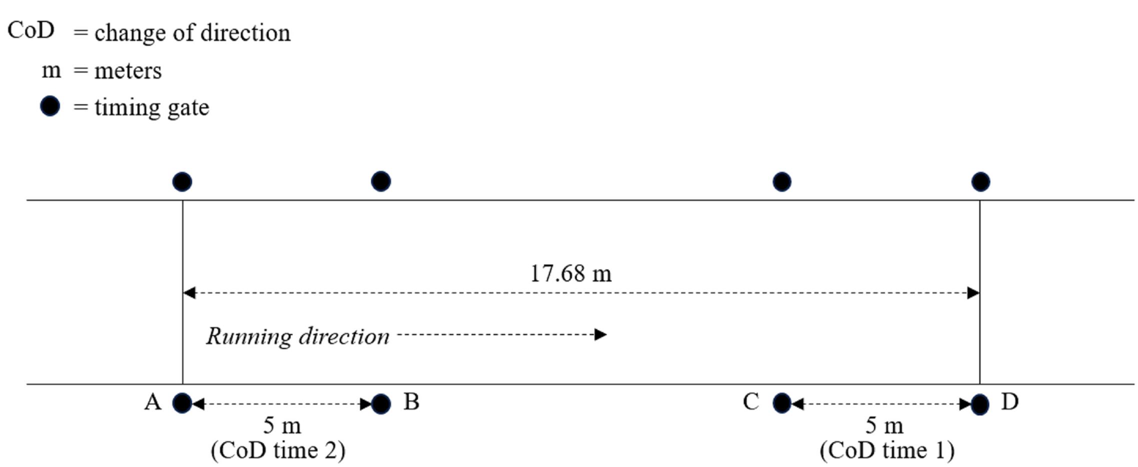

Fig. 1 Timing gate and pitch set-up for sprinting a "quick single" and sprinting a three. (adapted from Lockie et al., [16])

Results

Stature The u/11 (140.56 ± 7.03 cm) and u/13 (155.13 ± 8.44) age groups were significantly ($P < 0.001$; ES = 1.29–3.71) shorter in stature compared to their u/15 and u/18 counterparts (Table 1).

Mass The u/11 age group was significantly ($P < 0.001$; ES = 1.29–2.82) lighter (36.68 ± 8.63 kg) in mass compared to all other age groups (Table 1). No other significance was shown for mass in the other age groups (u/13, u/15, and u/18).

Flexibility No significance was observed between any of the age groups for the sit-and-reach test (Table 1). However, the u/15 age group was more flexible than their u/11 counterparts (ES = 0.98).

Lower body power The u/11 (1.46 ± 0.32 m) and u/13 (1.61 ± 0.18 m) age groups showed significantly ($P < 0.001$; ES = 0.59–1.38) shorter standing broad jump distances compared to their u/15 (1.84 ± 0.17 m) and u/18 (1.79 ± 0.14 m) equivalents (Table 1).

Upper body power As with lower body power, the u/11 (2.84 ± 0.64 m) and u/13 (3.92 ± 0.67 m) age groups showed significantly ($P < 0.001$; ES = 1.52–3.70) shorter overhead medicine ball throw distances compared to the u/15 (4.95 ± 0.64 m) and u/18 age groups (5.22 ± 0.65 m) (Table 1).

Sprint speed The u/11 age group was significantly ($P < 0.001$; ES = 1.44–2.08) slower (3.93 ± 0.32 s) compared to all other age groups when sprinting a single (Table 1). The u/18 age group elicited the fastest sprint times (3.36 ± 0.16 s).

Change of direction time For both change of direction time one and two, the u/11 age group was significantly ($P < 0.001$; ES = 0.91–2.17) slower (CoD time one = 2.91 ± 0.20 s; CoD time two = 2.99 ± 0.24 s) compared to all the other age groups (Table 1). The u/13 age group was also significantly ($P < 0.05$; ES = 0.91–2.17) slower than their u/18 counterparts, for CoD time one (2.68 ± 0.17 s) and two (2.69 ± 0.18 s) respectively. For both changes of direction trials, the u/18 age group elicited the quickest times (CoD time one = 2.52 ± 0.15 s; CoD time two = 2.54 ± 0.13 s).

Correlations between lower body power and sprint speed Large, significant and non-significant, negative correlations were observed for the u/11 (r = –0.61; P = 0.003), u/15 (r = –0.54; P = 0.02), and u/18 (r = –0.64; P = 0.07) age groups between lower body power and sprint speed. A moderate, non-significant, negative correlation (r = –0.44; P = 0.12) was shown between the same variables in the u/13 age group.

Correlations between lower/upper body power (relative to mass) and sprint speed and change of direction time A large, significant, negative correlation was shown in the u/11age group (r = –0.51; P = 0.01) between upper body power and change of direction time two (Table 3). Furthermore, large, significant, negative correlations were shown in the u/15 age group between upper body power and sprint speed (r = –0.70; P = 0.01), change of direction time one (r = –0.57; P = 0.01) and two (r = –0.57; P = 0.01). Lastly, a large, significant, positive correlation was shown between lower limb power and sprint speed in the u/15 age group (r = 0.57; P = 0.02).

Correlations between lower/upper body power (relative to stature) and sprint speed and change of direction time Large, significant, positive correlations were shown between lower limb power and sprint speed for the u/11 (r = 0.53; P = 0.02), u/15 (r = 0.66; P = 0.09), and u/18 (r = 0.62; P = 0.02) age groups (Table 4). Further large, significant, positive correlations were also shown for lower limb power and change of direction one (r = 0.62; P = 0.02) and two (r = 0.52; P = 0.04).

Discussion

To the authors' knowledge, this is the first investigation to examine the physical characteristics of adolescent female cricketers. This is even though the development of specific physical attributes such as strength, power, speed, and agility are important not only in cricket activity [2, 14, 25, 30, 43], but also for other sports such as football, rugby, and netball [6, 13, 42]. The findings herein are like those in male and female youth soccer players where anthropometrics and physical characteristics improved with age, depending on when puberty was reached [6, 20, 22]. Puberty is a dynamic stage of development characterised by rapid changes in body size, shape, and composition all of which differ according to sex [18, 37]. Research has shown that there is intraindividual variation in the timing and tempo of the onset of puberty among children of different sex and ethnic backgrounds [26, 37]. Therefore, it is important to consider early and late maturing individuals (biological age compared to chronological age) for sports performance and injury risk [18], particularly in sports such as cricket which requires unique physical characteristics. This is also

Table 3 Correlations between lower and upper body power (relative to mass) and sprint speed and change of direction time

Group	SBJ/Sprint a "1" (*r*)		SBJ/CoD1 (*r*)		SBJ/CoD2 (*r*)		OH med ball throw/Sprint a "1" (*r*)		OH med ball throw/CoD1 (*r*)		OH med ball throw/CoD2 (*r*)	
u/11	0.38	*P* = 0.03	0.1	*P* = 0.63	0.42	*P* = 0.02	−0.43	*P* = 0.01	−0.06	*P* = 0.76	−0.51	*P* = 0.01
u/13	−0.22	*P* = 0.23	−0.06	*P* = 0.76	−0.13	*P* = 0.51	−0.18	*P* = 0.22	−0.35	*P* = 0.02	−0.26	*P* = 0.10
u/15	0.57	*P* = 0.02	0.37	*P* = 0.15	0.37	*P* = 0.15	−0.7	*P* = 0.01	−0.57	*P* = 0.01	−0.57	*P* = 0.01
u/18	0.33	*P* = 0.29	0.15	*P* = 0.65	0.02	*P* = 0.97	−0.16	*P* = 0.56	0.12	*P* = 0.65	0.3	*P* = 0.33

Where p indicates level of significance

highlighted by the high variation within groups for flexibility, lower and upper limb power, and mass; the stage of maturation impacts power measures which have been shown to be related to body mass [18]. However, maturity and maturation weren't directly assessed in this investigation and can only be inferred.

In this investigation, the u/11 and u/13 age groups were significantly ($P < 0.05$) shorter, and the u/11 group significantly ($P < 0.05$) lighter than their u/15 and u/18 counterparts. This finding was expected as changes in both stature and mass are rapid during puberty often referred to as the *adolescent growth spurt* [1, 26, 37]. Females typically reach peak height velocity and peak weight gain at approximately 12 years of age; during this period, they can grow up to 9.00 cm in stature and gain 8.30 kg of weight annually [18]. No significant differences were observed for stature and mass in the u/15 and u/18 age categories, likely because *late matures* catch up to *early bloomers* by these ages (girls stop growing) and because there was more variation in this data within age groups [26]. These increases in height and weight around age 12 years in females are important from a cricketing perspective. Research has shown that increased stature and mass can improve performance by increasing bowling speed and bounce off the pitch, as well as allowing batters to hit the ball further [31, 38, 39, 41, 43], all important for improving cricket performance [2].

For cricket activity, little is known about the influence of maturation on strength, power, speed, and change of direction ability [6, 30, 43]. With regards to upper and lower limb power the u/15 and u/18 age groups were significantly ($P < 0.05$) more powerful than their u/11 and u/13 counterparts. The u/13 age group was also significantly ($P < 0.05$) different from all the other age groups for sprint and change of direction times, and the u/13 age group was significantly different ($P < 0.05$) to the u/18s for change of direction time. These findings are like those shown in previous studies related to male and female adolescent football players [6, 20, 22]. Again, this could be attributed to the biological changes associated with advanced maturity [6]. With puberty, there is an increase in growth resulting in longer levers (limb lengths), an increased muscle mass and an increase in nerve activation, which may have a positive impact on upper and lower limb power, as well as the ability to sprint and change direction quickly [18]. This was also evident by the correlations observed between lower limb power and sprint speed in this investigation. However, it is also important to consider normalised measures when considering the impact upper and lower limb power on sprinting and change of direction ability; several strong correlations were observed when relativised to stature and mass (Tables 3 and 4).

Table 4 Correlations between lower and upper body power (relative to stature) and sprint speed and change of direction time

Group	SBJ/Sprint a "I" (r)		SBJ/CoD1 (r)		SBJ/CoD2 (r)		OH med ball throw/Sprint a "I" (r)		OH med ball throw/CoD1 (r)		OH med ball throw/CoD2 (r)	
u/11	0.53	$P=0.02$	0.01	$P=0.95$	0.47	$P=0.06$	−0.46	$P=0.20$	0.09	$P=0.61$	−0.43	$P=0.26$
u/13	−0.43	$P=0.09$	−0.35	$P=0.04$	−0.26	$P=0.12$	−0.34	$P=0.03$	−0.33	$P=0.05$	−0.39	$P=0.03$
u/15	0.66	$P=0.09$	0.49	$P=0.10$	0.45	$P=0.10$	−0.41	$P=0.50$	−0.43	$P=0.23$	−0.43	$P=0.23$
u/18	0.62	$P=0.02$	0.62	$P=0.02$	0.52	$P=0.05$	−0.3	$P=0.24$	−0.11	$P=0.58$	0.04	$P=0.75$

Where p indicates level of significance

Additionally, research has shown that at puberty, there is an improved elastic energy release, greater excitation and contraction coupling, and an improvement in strength to different bone levers which could also impact lower and upper limb power and strength [18]. These changes are important when considered within a cricketing context. Increased upper body strength and power (specifically the pectoral musculature) has been correlated with increased ball release speeds for bowlers and the ability to hit the ball further (power hitting), for batters [2, 27, 33, 38, 41]. Furthermore, a stronger upper body has been shown to reduce the risk of upper trunk injuries [39]. Moreover, improved lower limb strength and power is important for both fielders and batters due to the rapid acceleration, deceleration, maximum speed, and changes of directions that occur when performing these responsibilities [24, 36]. An increase in lower limb strength and power is also essential to prevent hamstring and quadricep strains due to the repeated eccentric demands associated with batting, bowling, and fielding [7, 35]. However, it should be noted that the standing broad jump measure, while practical, may not be the best representative of lower limb strength and power; more reliable measures (counter movement jump, isometric mid-thigh pull) could be considered in the future.

Practical Applications and Future Research

Several practical applications arise from the current investigation as well as directions for future research:

- This study provides normative data for female pathway, and age group cricketers which is important for the growth and progression of the sport. Future research should consider assessing maturity (including biological age) and include individuals from different backgrounds and countries to determine if the same trends are observed. Furthermore, this methodology could also be used to profile male cricketers of the same age groups, to determine if there are any biological differences between players of different sex.
- The findings highlight the within group variation particularly with the measures of flexibility, body mass, and upper and lower limb power; these should be considered when working with young athletes.
- The data and findings of this investigation can be used by trainers and coaches for the development and implementation of scientifically based strength and conditioning programs, for the progressive development of female adolescent cricketers. This should be considered from a biological standpoint rather than individual chronological and training age. Future research should consider whether the implementation of these programs

(as well as access to additional equipment and resources) would contribute to enhanced performance, rather than standard growth development, which is the case in this study.

- Future studies should consider the physical characteristics of each specific discipline (batters vs. bowlers), and how this may impact batting and bowling performance.
- The study is relevant for coaches working within the age group (both within cricket and sport as a whole) to support their own learning and development within the applied nature of coaching and support of their female athletes. This can be supportive within the context of utilising and enhancing the use of Coaching Process models, where more developed models consider the coaches own style and interpretation, the athlete themselves and the varying contextual factors that impact upon performance with the overall goal of considering the development and nurturing of the athlete [4].

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Data Availability Available on request.

Declarations

Competing Interests The authors have no relevant financial or non-financial interests to disclose.

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