

## Reducing the pitch length: Effects on junior cricket

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### ABSTRACT

The pitch lengths used for junior cricket are a subject of debate but to date there have been no studies of their influence on the game. This study evaluated the effect of reducing the pitch length on batting, bowling and fielding. County under 10 and club under 11 matches were analysed, ten played on pitch lengths currently recommended by the England and Wales Cricket Board, 19 yards/17.37 m or 20 yards/18.28 m respectively, and ten played on 16 yard (14.63 m) pitches. Differences between measures of batting, bowling and fielding were calculated to assess the effects of the shorter pitch length. In club and county matches on 16 yards, running between the wickets increased by 22% and 39% respectively, while boundary fours and sixes decreased by 54% and 68%. Deliveries played to the Mid-wicket area decreased by 44% in club and 33% in county matches, both accompanied by a more even distribution of fielding opportunities. Club matches saw a 15% increase in playable deliveries, largely due to fewer deliveries bouncing twice. Attempted shots, full toss No balls and Wide balls changed negligibly. Playing on a shorter pitch had positive impacts for bowlers, batters and fielders, consequently resulting in matches which were more engaging. Coaches and governing bodies should consider shorter pitches as a means of enhancing junior cricket.

Keywords: Match analysis; modified sport; competitive engineering; youth sport

### INTRODUCTION

The standard length of a cricket pitch is 22 yards (20.12 m) between the stumps at each end,<sup>1</sup> a distance equivalent to the antiquated unit of one 'chain'. Below the age of 14, the age by which many young players have begun to play open-age or "senior" cricket, the Marylebone Cricket Club (MCC) and the England and Wales Cricket Board (ECB) recommend slightly shorter pitches and following trials in their 2016/17 season. Cricket Australia also revised their guidance for junior formats, making a range of changes including shorter pitches than they had previously endorsed.<sup>2</sup> It is unclear how these pitch length recommendations (Table 1) were determined: for example simply scaling a full length pitch based on the average height of juniors compared with adults would result in a pitch for under 11 boys approximately 17.8 yards (16.3 m) long rather than the 20 yards (18.28 m) the MCC and ECB have specified, but close to the 16 m recently advocated by Cricket Australia. The MCC acknowledged criticism and debate over the junior pitch lengths in earlier codes of the Laws of Cricket<sup>3</sup> and removed their recommendations from the 2017 Code effective from 1st October 2017,<sup>1</sup> leaving governing bodies to make their own recommendations. However, to date no research has been published which quantifies the effects that playing on shorter pitches might have on junior matches.

Table 1. MCC, ECB, and Cricket Australia pitch length recommendations for junior cricket.

	MCC <sup>4</sup>	ECB*	Cricket Australia**
Under 7		16 yd / 14.6 m	
Under 9	18 yd / 16.5 m	18 yd / 16.5 m	15.3 yd / 14 m
Under 10		19 yd / 17.4 m	
Under 11	20 yd / 18.3 m	20 yd / 18.3 m	17.5 yd / 16 m
Under 12		21 yd / 19.2 m	
Under 13	21 yd / 19.2 m	21 yd / 19.2 m	19.7 yd / 18 m
Under 14		22 yd / 20.1 m	22 yd / 20.1 m
Under 15		22 yd / 20.1 m	22 yd / 20.1 m

*Note.* Age groups- MCC and ECB are based on age at midnight on August 31<sup>st</sup> of the preceding year, Cricket Australia are indicative only. \*Retrieved August 2016 from

<http://www.ecb.co.uk/sites/default/files/ecb-recommendations-for-junior-cricket-521.pdf>

\*\*Retrieved April 2017 from <http://www.community.cricket.com.au/clubs/junior-formats/format-summary>.

In the only study to consider reduced cricket pitch lengths for junior players, Elliott, Plunkett and Alderson<sup>5</sup> examined under 11, under 13 and under 15 bowlers when bowling as fast as possible on full length (20.12 m/22 yard), 18 m (19.7 yard) and 16 m (17.5 yard) pitches in a laboratory environment. They found all age groups to be more accurate on shorter pitches and the under 11 and under 13 bowlers to use actions they deemed to be “safer” on shorter pitches. They commented that bowling with a correct action is more likely when the performance demands are reduced by shortening the pitch, but concluded that both under 11 and under 13 players should play on 18 m pitches as their actions were not statistically significantly better on the 16 m pitch.

The recommendation of Elliott et al.<sup>5</sup> is close to the 19 and 20 yards the ECB currently recommends for under 10 and 11 players respectively. Nevertheless many bowlers of this age have difficulty over these distances, with numerous deliveries being unplayable by the batters and difficult for the wicket-keepers to take cleanly. The playable balls are often hit to Mid-wicket by batters benefitting from ample time to play to their strengths and limiting the involvement of fielders in other areas. At a time when cricket is embracing exciting forms of the game, junior cricket can have prolonged spells where little meaningful activity takes place and, as one former

England Test player put it, “it looks nothing like senior cricket” (G. Thorpe, personal communication, 7 November, 2014).

Modifying the structure, rules, facilities and/or equipment of sports has been termed “competitive engineering” by Burton, Gillham and Hammermeister<sup>6</sup> and is aimed at promoting “positive youth sport experiences”<sup>6</sup> (p. 215) by increasing player engagement, retention and skill development. In junior flag-football, Burton, O’Connell, Gillham and Hammermeister<sup>7</sup> found that playing with a more appropriately sized ball and introducing a “delayed rush” rule change to aid the offensive team more than doubled the scoring, increased the number of scorers by 75% and more than halved player drop-out. Perhaps unsurprisingly Talpey, Croucher, Mustafa and Finch<sup>8</sup> found that opportunities for players to participate and express their skills were significant contributors to keeping junior cricketers playing the game. The data at their disposal didn’t allow analysis of fielding participation or performance, but as cricketers of all ages generally field for longer than they bat or bowl, it would seem likely that regular fielding involvement during matches would also predispose players to continue playing. While Martens, Rivkin and Bump<sup>9</sup> increased the opportunities for batters and fielders to develop their skills in under 10 baseball matches by having a coach pitch the ball rather than an opposing player, this obviously didn’t enable pitching skills to be practiced competitively. Farrow and Reid<sup>10</sup> found that scaling down the court increased hitting opportunities for young tennis players, which in a cricket context would benefit the batters and also result in more fielding involvement. They, and more recently Timmerman et al.,<sup>11</sup> also noted overall that scaling the playing environment resulted in a more engaging experience for young tennis players.

Morley et al.<sup>12</sup> highlighted the lack of empirical research comparing traditional and modified games in a competitive setting, however they also acknowledged the inevitable difficulties of field-based research of this kind. Different sample sizes and lengths of interventions between conditions, and understanding which of several interventions may have led to the changes observed were all limitations they noted in their study. These difficulties must be weighed against the “the more representative performance... observed during match-play conditions”<sup>13</sup> (p. S21). Recognizing this challenge, our approach in the current study was to focus on one modification, pitch length, a limited age range of players and a small number of objective measures of bowling, batting and fielding (the three main components of cricket). From these measures the potential for playing on shorter pitches to enhance junior cricket could be evaluated.

Specifically we anticipated that shorter pitches would: increase the number of playable deliveries bowled (i.e. not Wide or bouncing more than once) although the number of full toss No balls (balls reaching the batter above waist height without bouncing) might also increase; increase the number of shots attempted by the batters; increase the amount of running by batters; reduce the number of boundaries and shots to the Mid-wicket area; and result in a more even involvement of outfielders (i.e. excluding the wicket-keeper and bowler).

## **METHODS**

### **Participants**

An English county cricket board agreed to facilitate the study by playing their three county under 10 boys’ home matches on a reduced pitch length. The Board also gained the agreement of a junior league within the county to play all of their under 11 club league matches during the same season on the same length of pitch. A total of 155 players participated in the short pitch matches and 153 in the existing

pitch length matches (Table 2). Assent from the participants and informed consent from their parents was obtained, and ethical approval was obtained from the university.

The under 11 age group (based on a player’s age at midnight on 31<sup>st</sup> August of the preceding year) is commonly the entry level for “hardball” club cricket, though some leagues in England start at under 10 or even under 9. In the counties involved in this study, under 10 was the youngest county representative age group team. In club matches boys and girls were allowed to play in the same team, though only 12 girls played in total.

Table 2. Match and player details.

	Pitch length (yards)	Number of matches	Number of teams	Match format	Number of players	Player ages (years; mean $\pm$ s)
Club	20	7	11	8-a-side pairs	92	10.41 $\pm$ 0.98
Club	16	7	10	8-a-side pairs	98	10.46 $\pm$ 0.95
County	19	3	5	11-a-side traditional	61	10.08 $\pm$ 0.53
County	16	3	4	11-a-side traditional	57	10.15 $\pm$ 0.50

*Note:* Seven club and two county teams played in more than one match (not against the same opponents) but rotated some players. Player ages given at the start of the season.

### Study Design

A trial pitch length of 16 yards (14.63 m) was chosen by a Level Four county coach on the basis of previous experience, including pilot games conducted prior to the season. Ten matches played on the reduced pitch length were recorded and a further ten (played by five counties and two comparable, neighbouring club leagues) were recorded on the existing ECB recommended pitch lengths (Table 2). As only one county was trialling the shorter pitch, that county team featured in each of the three 16 yard under 10 games. Due to the shortness of the junior cricket season in England (approximately 10 weeks), weather and scheduling constraints, four club teams featured twice in the 16 yard and three teams twice in the 20 yard matches. Despite some teams being recorded on more than one occasion, the team members were not identical and the opponents were different. Both club and county matches were analysed as it was considered important to assess whether any effects of shortening the pitch were similar at both club and representational levels.

Club matches were played using an 8-a-side pairs format in which each pair of batters bat for four, six ball overs, with runs deducted for wickets lost but the batters continuing and each fielder (except the wicket-keeper) bowling two or three overs in a 16 over innings. Of the county matches two were scheduled for 40 overs per innings, three for 35 overs per innings and one shortened to 20 overs per innings due to rain. Only seven of the 12 county innings reached their maximum duration, in the

other five innings 10 wickets were taken to end the innings before all the available overs had been bowled. A total of 224 overs (approximately 1344 deliveries) of club cricket on each pitch length were observed, the same for county cricket on 19 yard pitches, and 178 overs (approximately 1068 deliveries) of county cricket on 16 yard pitches.

### Match Data Collection

An experienced Level Two cricket coach observed all of the matches, completing a ball-by-ball scoresheet including runs scored, Wides and No balls, (no player names were attached to the data). To assess shot distribution, the playing field was notionally divided into seven areas: the wicket area (where the ball was fielded by the bowler or wicket-keeper) and six sectors surrounding it (Figure 1). A count was kept of the number of times the ball was played into each of these areas during each innings. In addition, a Panasonic DMC-FZ200 camera was positioned just outside of the boundary, approximately mid-way along and perpendicular to the pitch, zoomed in so that the field of view included the length of the pitch from wicket to wicket plus approximately one meter at either end. HD MP4 video at 30 fps was recorded throughout each innings.

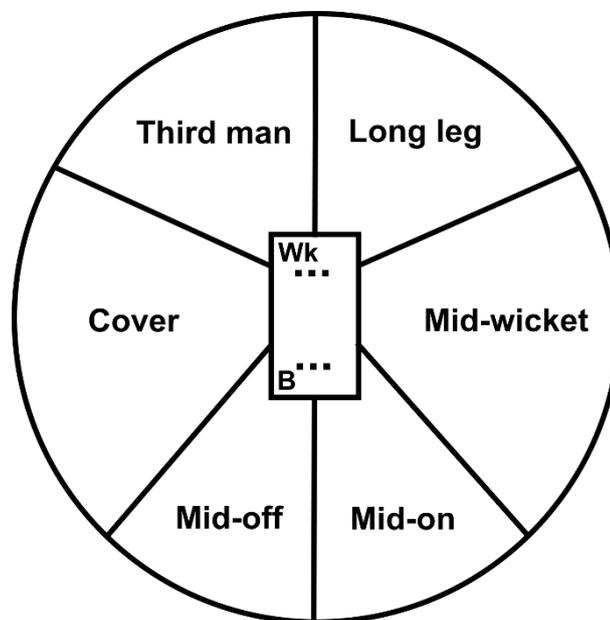


Figure 1. Playing field areas for a right-handed batter (B: bowler; Wk: wicket-keeper).

During the matches score details were corroborated with the match score as displayed at the ground. In order to assess reliability of the shot distribution data, a second observer independently recorded this aspect of one trial innings and the two sets of data showed that of the 97 deliveries only two were allocated to different (neighbouring) areas. Subsequently the Level Two coach recorded all matches.

For every innings the total number of each of the following measures were calculated and expressed per 100 deliveries (i.e. count x 100 ÷ number of deliveries in that innings):

- the number of playable deliveries, defined as those not called Wide by the umpires and which bounced not more than once before reaching the batter (determined by viewing the videos);
- the number of full toss No balls, as determined from the videos;

- the number of attempted shots, whether successful or not, as determined from the videos;
- the number of deliveries which resulted in the batters running one, two or three runs, including extra runs on Wide or No ball deliveries, counted from the scoresheets and checked on the video;
- the number of deliveries hit over the boundary for four or six runs, counted from the scoresheets;
- the number of deliveries played to each of the seven defined areas of the pitch as noted during the matches, and from this the number played to the Mid-wicket area and the overall distribution of shots around the outfield.

Attempted, not just successful, shots were counted<sup>9</sup> as this reduced the influence of the relative abilities of the batters and bowlers, which could not be controlled. Similarly any occasion where the batters ran at least one run was recorded, with no importance attached to the actual number of runs scored, thereby limiting the influence of the ability of the fielders. While the number of deliveries hit to the boundary is affected by ground conditions (e.g. boundary distances, grass length, slopes, ground hardness), prior to each match grounds staff in conjunction with team managers or coaches adjust boundary distances according to the prevailing conditions and over a number of matches any minor influences are mitigated.

#### Data Analysis

SPSS (version 22) was used to check for normality (Shapiro-Wilk test), equality of variance (Levene's test) and outliers, as well as to calculate means, standard deviations, differences between means (16 yard pitch – current length) and 95% Confidence Intervals for the differences. In county matches on 16 yard pitches the full toss No ball data were not normally distributed, three of the six innings having none at all.

Following the recommendations of Cumming<sup>14</sup> significance testing was not conducted as it gives no information regarding practical importance or precision of the result, however where the 95% CI does not include zero difference between the means it is equivalent to a statistically significant difference at the  $p < .05$  level. To maintain the connection between the measures and the game setting, raw differences between means were calculated as the primary measure of the effects.<sup>15</sup> Effect size interpretation was based contextually on knowledge of the game<sup>14,16</sup> with a difference of at least one occurrence per 6-ball over considered to be a large effect (equivalent to 16.6 per 100 deliveries), from that to one every two overs as moderate (8.3 to 16.5 per 100) and from that to one every four overs considered a small effect (4.2 to 8.2 per 100). In the pairs format the batters had four overs to bat, so a difference of one occurrence every four overs was considered to be the smallest meaningful difference and anything smaller was considered to be trivial.

## RESULTS

Playing on a 16 yard pitch increased the number of playable deliveries in the club under 11 matches by 15%, a moderate effect of 11 per 100 deliveries, 95% CI [3.5, 18.6] (Figure 2a), the biggest difference being the halving of the number of deliveries bouncing twice or more (Table 3), and the number of Wides bowled was also reduced. In the county under 10 matches this effect was absent (Figure 2b) with the number of playable deliveries being similar on both pitch lengths and on neither

pitch length did the county players bowl any double bouncing balls. Full toss No balls occurred rarely in any of the four match conditions and only trivial differences were apparent between pitch lengths.

There was an increase in the amount of running activity by batters on 16 yard pitches despite there being no overall difference in the number of shots attempted (Table 3). In the county games on short pitches, running events increased by 9.9 per 100 deliveries, 95% CI [0.82, 18.1], a 39% change (a moderate effect by our definition), and in the club games there was a 22% increase of 4.9 per 100 deliveries [-2.7, 12.4], a small effect (Figures 2a and 2b). On the shorter pitches the number of boundaries was reduced by 7.1 per 100 balls [2.5, 11.7], or 68%, in county matches and 4.5 per 100 balls [1.7, 7.2], or 54%, in club matches, small effects in both cases.

Table 3. Summary game measures for each of the match formats (mean  $\pm$  s, per 100 deliveries).

	Wide	Double Bounce	Playable Deliveries	Full toss No ball	Attempted Shots	Running	Played to Mid-wicket	Boundaries
Club 20	10.2 $\pm$ 4.8	18.5 $\pm$ 7.8	71.4 $\pm$ 9.6	1.7 $\pm$ 1.5	89.1 $\pm$ 4.9	22.4 $\pm$ 8.4	14.0 $\pm$ 5.5	8.2 $\pm$ 4.2
Club 16	8.6 $\pm$ 5.0	9.4 $\pm$ 7.6	82.4 $\pm$ 9.9	3.4 $\pm$ 2.5	89.1 $\pm$ 3.9	27.3 $\pm$ 10.8	7.9 $\pm$ 2.1	3.7 $\pm$ 2.8
ES	-1.6	-9.1**	11.0**	1.7	0.0	4.9*	-6.1*	-4.5*
County 19	2.6 $\pm$ 1.7	0.0 $\pm$ 0	97.4 $\pm$ 1.7	0.8 $\pm$ 0.6	95.1 $\pm$ 2.0	25.3 $\pm$ 7.1	16.2 $\pm$ 5.1	10.3 $\pm$ 4.5
County 16	3.4 $\pm$ 1.9	0.0 $\pm$ 0	96.6 $\pm$ 1.9	0.5 $\pm$ 0.5	94.4 $\pm$ 4.3	35.1 $\pm$ 7.0	10.8 $\pm$ 2.9	3.2 $\pm$ 2.3
ES	0.8	0.0	-0.8	-0.4	-0.7	9.9**	-5.4*	-7.1*

Note: ES= raw effect size; \*\*= moderate ES; \*= small ES. Positive ES indicates a higher count in the short pitch matches.

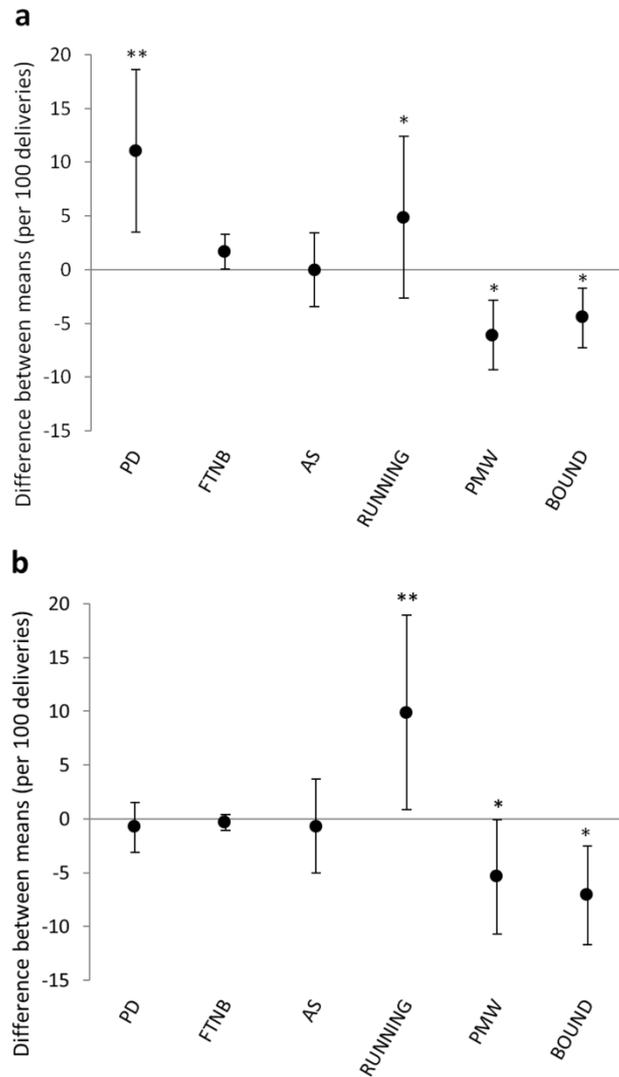


Figure 2. Differences between means of measures in (a) club under 11 (16 yard – 20 yard) and (b) county under 10 matches (16 yard – 19 yard) matches. Error bars are 95% confidence intervals; \*\* indicates a moderate effect size, \* indicates a small effect size. (PD = Playable delivery; FTNB = full toss No ball; AS = Attempted shots; RUNNING = deliveries resulting in completed runs; PMW = shots played to Mid-wicket; BOUND = deliveries resulting in boundary 4s or 6s).

The number of deliveries played to the Mid-wicket area decreased on the 16 yard pitches in both club and county matches, by 6.1, 95% CI [2.9, 9.3], or 44%, and 5.4, [0.1, 10.7], or 33%, per 100 deliveries respectively, again small effects. The shorter pitch length resulted overall in a more even distribution of outfield fielding opportunities (excluding the balls which go through to the wicket-keeper or are played back towards the bowler). This is shown by a reduction in the standard deviation of the number of times balls were played to the various field areas of 3.5, [1.9, 5.2], 36%, in club matches and 1.4 [-2.0, 4.8], 15%, in county matches (Table 4; Figures 3a and 3b).

Table 4. Frequencies with which deliveries were hit to each pitch area and variability with which outfield areas were involved (mean  $\pm$  s, per 100 deliveries).

	Wk/Bowler	Long Leg	Mid-wicket	Mid-on	Mid-off	Cover	Third Man	Outfield SD
Club 20	52.3 $\pm$ 10.2	10.6 $\pm$ 5.1	14.0 $\pm$ 5.5	5.1 $\pm$ 1.9	3.0 $\pm$ 2.2	9.5 $\pm$ 3.3	5.4 $\pm$ 2.0	9.7 $\pm$ 2.5
Club 16	49.0 $\pm$ 9.3	11.3 $\pm$ 3.8	7.9 $\pm$ 2.1	7.8 $\pm$ 3.5	7.0 $\pm$ 4.2	9.1 $\pm$ 3.5	7.9 $\pm$ 3.3	6.2 $\pm$ 1.8
County 19	36.6 $\pm$ 5.5	8.1 $\pm$ 2.1	16.2 $\pm$ 5.1	5.8 $\pm$ 2.3	7.2 $\pm$ 2.1	20.1 $\pm$ 6.6	5.9 $\pm$ 2.1	9.5 $\pm$ 3.4
County 16	42.5 $\pm$ 2.4	6.4 $\pm$ 1.7	10.8 $\pm$ 2.9	5.7 $\pm$ 3.1	8.6 $\pm$ 2.2	17.9 $\pm$ 1.7	8.1 $\pm$ 3.7	8.1 $\pm$ 1.6

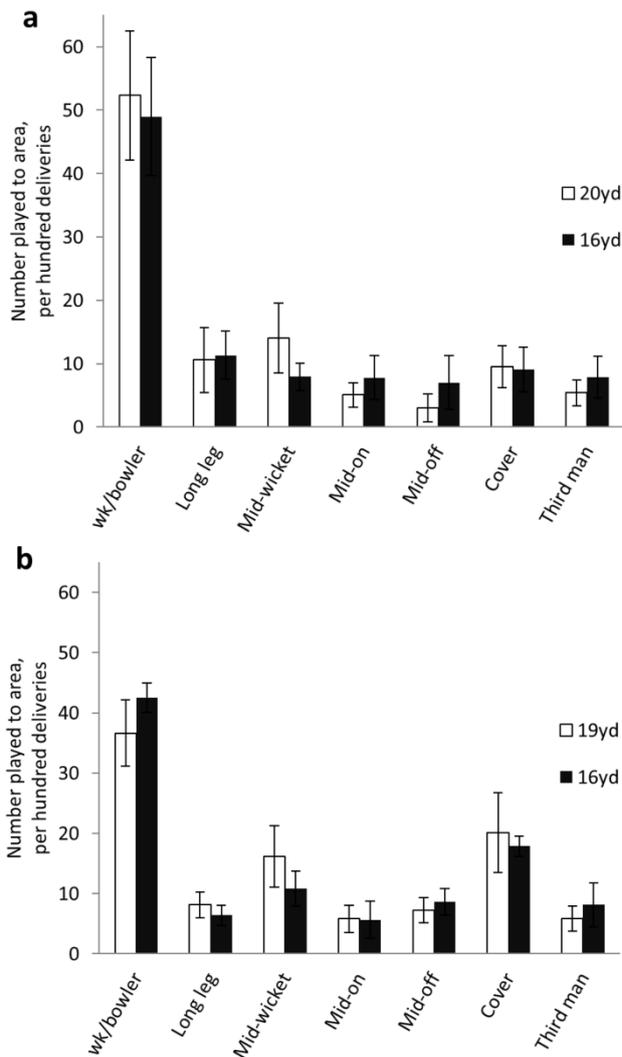


Figure 3. Mean number of balls played to each area of the field in (a) club under 11 and (b) county under 10 matches. Error bars indicate standard deviation..

## DISCUSSION

In this study we assessed for the first time the effects of playing junior cricket on a shorter pitch length using a number of straightforward measures of bowling, batting and fielding. County under 10 matches (16 yards compared with 19 yards) and club under 11 matches (16 yards compared with 20 yards) were analysed separately, and shortening the pitch improved outcomes in both standards of competition.

Lee and Smith<sup>17</sup> stated “In cricket the use of short pitches allows bowlers to be more accurate which itself benefits batsmen because the ball will arrive more often in the striking area.” (p. 265). The belief that playing on shorter pitches would increase the number of playable deliveries was borne out in club (a 15% increase) but not county matches; this was due mostly to the reduction at club level of deliveries bouncing twice or more (Table 3). Double bouncing deliveries are difficult for batters to play, occasionally inducing a play and miss resulting in being bowled, and moreover are disheartening for bowlers. Shortening the pitch should lead to greater efficacy and self-efficacy on the part of bowlers, similar to that found when basket height was modified in basketball.<sup>18</sup>

The difference between the numbers of double bounce deliveries in club and county bowling may be explained by the fact that under the club match rules everyone in the fielding side except the wicket keeper bowls, whilst in county games a minimum of five players from the eleven must bowl (and naturally the best bowlers are chosen). Furthermore county bowlers have effectively been selected because they can cope with the current pitch length for their age group, possibly because of better technique, but also perhaps because they are comparatively tall. It proved impractical to measure individual stature for this study, but in related work<sup>19</sup> we found that the median stature of county under 10 and top club under 11 bowlers was 59<sup>th</sup> centile for their age. This study did not look at how the shorter pitch may have affected bowling technique and associated risk of injury, but it is likely that even county bowlers bowled with better and safer technique on the 16 yard pitches, in line with the findings of Elliott, Plunkett and Alderson<sup>5</sup>, who looked at pitches down to 17.5 yards (16.0 m).

Unexpectedly, the number of Wide balls was not very different between pitch lengths in either standard of match. However it became apparent while recording club matches (where coaches and parents rather than qualified umpires take charge) that the calling of Wide balls was inconsistent and had a tendency to be lenient with the weaker bowlers. If the calling of Wides in club matches had been stricter, it is likely that the playable deliveries count on the longer pitches would have been lower and consequently the beneficial effect of playing on short pitches larger.

By quantifying attempted shots rather than just successful contacts we were considering the engagement of the batters, regardless of the relative skill levels of batter and bowler. Even an unsuccessful shot demonstrates that the batter is engaged with the game, as Martens, Rivkin and Bump<sup>9</sup> put it “...the player at least did something...swinging and missing is unquestionably the first step towards swinging and hitting.” (p. 353), better still if the swing and miss is at a delivery which is accurate enough to give the batter a reasonable chance of success. Overall in neither club nor county matches were there differences between the numbers of attempted shots on the different pitch lengths. However the frequency of double bouncing deliveries and the leniency in calling deliveries as Wide leads players in club matches (perhaps out of frustration) to attempt to play at some balls with which they have little hope of making effective contact. This is illustrated by the

substantially higher rate of attempted shots compared with the rate of playable deliveries in club matches, particularly on the longer pitch length (Table 3).

One concern associated with playing on a shorter pitch was that the response time of batters is reduced and “full toss No balls” (deliveries which reach the batter above waist height without bouncing) could potentially be more dangerous and more frequent. However, compared with the longer pitches, full toss No balls on the shorter pitches were no more frequent in county matches and were only slightly, but trivially more frequent in club matches. No instances of injury occurred in the recorded matches and no reports of any were received from the other approximately 45 club matches played between the 13 teams in the under 11 league playing on 16 yards during the season.

The clear increase in running between the wickets on shorter pitches in club and county matches (22% and 39% increases respectively) is a very positive outcome. Judging when to run, communication between batting partners and “rotating the strike” (frequently changing which of the two batters is facing the bowler) are all features which coaches seek to encourage. The bigger effect size in county matches is probably explained by the better judgement by these players of when to run and better communication between partners. More running (and attempted and “considered” runs) by batters also results in more demanding fielding opportunities (defensive involvement), as Speith<sup>20</sup> and Martens, Rivkin and Bump<sup>9</sup> also found in baseball studies. The fielding involvement is both direct (where the fielder gathers the ball straight from the bat) and indirect (where fielders have to “back up the throws” from the first fielder towards the stumps). The more frequently batters run (or consider running), the more alert and engaged all fielders need to be, the more attempted run outs there should be and ultimately the more excitement there is. Balls hit over the boundary were excluded from the measure of running as very often there is little meaningful activity involved for batters or fielders once the ball has been struck, rather like being ‘aced’ in tennis.

It was anticipated that on shorter pitches a combination of the slightly reduced time available to the batter, and the naturally fuller length and improved accuracy of the bowlers would limit the opportunity for batters to hit to Mid-wicket, the favourite area for young club cricketers in particular, and limit the number of boundaries scored. The reduction in the number of balls played to Mid-wicket and boundaries scored was clear in both club and county matches on short pitches, furthermore the distribution of where balls were played to around the outfield was more even. Keeping more fielders more involved has motivational benefits as recognized in the basis for competitive engineering,<sup>6</sup> but also gives more opportunities to practice fielding skills and a greater incentive to become better fielders. From a team perspective, reducing the dominance of one area of the outfield also makes it less attractive for the best fielders to monopolize it, plus spreading the fielding opportunities around more reduces the effect on individuals of isolated mistakes by providing chances to “make amends” for them. The need to be able regularly to play the ball into all areas of the field should also lead to more rounded stroke development in batters as they adapt to the functional instability the shorter pitch introduces.<sup>21</sup>

As acknowledged by Morley et al.,<sup>12</sup> collecting data in a natural, competitive environment has an impact on the control of data collection. In this study the number of teams trialling the 16 yard pitch, the scheduling of matches and weather cancellations limited the number of matches which could be observed, nevertheless the number of deliveries, in excess of 1000 in each of the four cases, was

substantial. Another limitation was the inability to control the number of balls faced by each batter and which bowlers bowled at them, though in club matches each pair of batters was limited to four overs between them. Furthermore, although measures were chosen to limit subjectivity, control of the consistency of the umpiring of club matches was not possible. These factors are likely to have reduced the precision in the results somewhat (as illustrated by the size of the confidence intervals and standard deviations in Figures 2 and 3 respectively), nevertheless meaningful effects were clearly found.

Boundary sizes particularly affect the ability of batters to hit fours and sixes, and also the “density” of the fielders. While they were not at fixed distances and were not recorded as part of this study, they were set by the team managers, coaches and grounds staff for each match based on their experience and the conditions pertaining at each match. Boundary size guidelines exist but allow great flexibility, for example between 30 and 55 m from the pitch for under 13 boys.<sup>22</sup> Like pitch lengths, boundary sizes for junior cricket should be subject to further research as they too are task constraints which influence player development.

The choice of 16 yards as the shorter pitch length in this study was made by a very experienced county cricket board coach and having found benefits for all facets of the game over a range of playing abilities it is likely that it is close to the optimal pitch length for under 10 and 11 players. Further research is ongoing to attempt to determine optimal pitch lengths across junior age groups in an effort to make the pitch lengths suit the players as they mature physically and technically.

In common with studies which investigated scaling in junior tennis,<sup>10,11</sup> reducing the pitch length resulted in a more engaging game where players had more opportunities to develop their batting and fielding skills, as well as achieving more success when bowling. While Timmerman et al<sup>11</sup> and Limpens et al<sup>23</sup> found that scaling the tennis court and/or the net resulted in a more attacking style of play, the influence of the shorter pitches was less clear cut. There were fewer clearly attacking shots (e.g. boundaries) by batters but arguably more attacking bowling, certainly in terms of length even if not so clearly in line. The greater urgency in running between the wickets can also be seen as a more attacking approach by the batters.

The overall feel of the games on shorter pitches was more like that of adult cricket which is a feature of appropriately scaled junior sport.<sup>24</sup> It is hard to quantify the ‘intensity’ of the games that was apparent to participants and observers of the 16 yard matches but informal, subjective feedback from them made it clear that the matches were more fun and a more absorbing experience. This was perhaps best summarized by one young club cricketer who was quoted as saying to his team manager after a game “It’s like a proper match. When is the next one?” (M. Lomas, personal communication, August 2015).

## **CONCLUSIONS**

Marking out a shorter pitch is a simple and very cost effective example of competitive engineering. Playing on a shorter pitch than is currently recommended benefitted club under 11 and county under 10 batters and fielders, as well as club level bowlers. For county standard bowlers the shorter pitch made little difference, however their ability to cope with a longer pitch was effectively a prerequisite for their selection to play at that level. Overall the combination of objectively measured improvements led to games which were more engaging and it is clear that if juniors played on shorter length pitches their enjoyment and experience of cricket would be improved. While these clear improvements were found, the 16 yard pitch trialled may not have been

optimal for these players and research to determine optimal lengths for all junior age groups is required. Coaches and governing bodies should consider reducing the pitch lengths played on as a simple way to encourage desirable outcomes for young cricketers.

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