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# Balance of the Game

May 2016

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MCC's research into the  
balance between bat and ball



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# Executive Summary

There is incontrovertible evidence that the balance between bat and ball has changed, favouring the former, over recent years. MCC has undertaken research into this and has produced some proposals as to how this balance might be redressed, if it is felt to be necessary.

There are many factors which have affected this, such as smaller boundaries, more stringent fielding restrictions, better pitches and fitter and stronger batsmen, but there is little doubt that one of the most significant factors is the development of the size and shape of the bat.

One approach to redress the balance would be to limit the bat's dimensions using a gauge through which a bat would have to pass; another would be to consider using balls which spin, seam or swing more and which retain their hardness and shape for longer. Consultations were therefore held with both bat and ball manufacturers, in addition to the commissioning of scientific and statistical research.

The key question for cricket, however, is whether it wants to redress the balance of the game, as there are many benefits, particularly commercially, of the current situation.

▼ Big Bash League - Melbourne v Hobart.



**This paper will be split into the following sections:**

01	<b>Anecdotal evidence</b>
02	<b>Statistical evidence</b>
03	<b>Scientific evidence</b>
04	<b>The size and shape of bats</b>
05	<b>Cricket balls</b>
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# 01 | Anecdotal evidence

There is a general acceptance that bats have become significantly more powerful in recent years. One does not have to watch too much televised cricket before hearing a commentator say something about 'the modern bats these days'. These tend to be former players who speak to the current players and who have held and sometimes even had some hits with the modern bats.

Slow motion and Hotspot cameras now clearly show the viewers where the ball hit the bat and it is not uncommon to see sixes coming from areas near the toe and edges. Not so long ago, such a mis-hit would have resulted in the ball landing within the outfield, or being caught.

Attempted shots through mid-wicket have sometimes been seen to hit the leading edge and fly over the third-man boundary for six, or even through mid-off for four, which many feel is an injustice to the bowler.

# 02 | Statistical evidence

There is strong statistical evidence to support the view that the balance of the game has shifted towards the batsmen.

The following statistics have been taken from all ODIs since the late 1970s:

**Runs per Over:** The Runs per Over has increased in an almost steady pattern from 3.68 in the 70s to 5.26 now. This is an increase of around 43%.

**Percentage of Runs through Fours & Sixes:** This figure was 33% in 1980. That means less than a third of the runs were scored in boundaries. In the current year, it has almost touched 50%. This is an increase of almost 50%.

**Runs per Over for non-Fours & Sixes:** This indicates how the non-boundary balls were scored off. It was around 2.84 in 1980 and, for the current period, the figure is 2.97. This minimal increase shows that there has been no significant change in the dots/singles/twos situation. Principally, it shows that the reason for the 40+% increase scoring rate is the increase in boundaries scored.

**Fours frequency:** The four-hitting frequency has moved from around once-in-19-balls during 1980 to around once-in-12-balls now. That is a change of about 40%.

**Sixes frequency:** The six-hitting frequency was once in 250 balls during the first decade of ODIs. That means two sixes per match. The current frequency is one every 57 balls. That is an average of 10 sixes per match, an increase of almost 400%.



▲ The Scorebook.

## 02 | Statistical evidence

continued

The following is analysis from Test matches:

**Fours frequency:** The four-hitting frequency has increased from around once in 30 balls in the 1950s to once in every 14 balls in 2016.

**Sixes frequency:** The six-hitting frequency has increased dramatically. In the 1950s, it was once every 4,217 balls. It has reduced every decade, with it being every 809 balls in the 1980s, every 313 balls in the 2000s and every 246 balls in the 2010s. So far in 2016, a six has been hit every 189 balls.

**Type of bowling:** The pace bowlers tend to get hit for fours more often than the spinners – in 2016, every 12.8 balls compared to every 20 balls. The spinners tend to get hit for sixes nearly three times as often as the pace bowlers.

## 03 | Scientific evidence

MCC commissioned Imperial College, London to research 5 bats from the same manufacturer, all made from similar willow but shaped into bats from different eras dating back to 1905. The main conclusions were:

Whilst the mass has increased, it is the shape of the bat which makes the most significant difference to the greater carry of the ball.

The 'ping' (coefficient of restitution) off the sweet spot of a bat has changed very little, but the area of the sweet spot has increased significantly over time. The bat from 1905 had a sweet spot of 80mm while the 2013 bat had one measuring 215mm.

By making the depth of the edges much thicker, modern bats have a much higher moment of inertia about an axis passing through the handle, and therefore rotate less after impact when a ball strikes the face close to the edge. This means that the ball hit near the edge travels significantly further because less energy is lost on impact, and there is a greater impulse imparted on the ball.

Imperial College's conclusion stated:

*Bat design can have a significant effect on performance. The newer bats confer a performance advantage in terms of the feel to the batsman, which will result in less energy absorption by the bat and by the batsman and thus a greater proportion of the energy will be imparted to the ball. This advantage is shown by the greater 'sweet spot' of the newer bats. Of note is the fact that Bat 4 (the scooped bat) has the largest 'sweet spot', yet it is not the heaviest bat. 'Pick-up weight' Moment Of Inertia (MOI) has also increased dramatically over the years. This is a function of absolute weight, but also of geometry and balance. The results show that even if*

## 03 | Scientific evidence

continued

*the bats were made of equal weight, the newer bats will be harder to 'pick up', but will impart greater energy to the ball due to the greater moment of inertia; thus conferring a performance advantage. Finally, the 'Polar' MOI has shown that the greater torsional stiffness of the newer bats will likely confer an advantage in the 'mis-hit' or a shot off the edge of the bat.*

*If bat regulations were to be developed beyond the current Laws, then two approaches can be taken. The first approach would be to define performance parameters such as are presented here. This approach would allow bat manufacturers to utilise new materials and manufacturing techniques. The second approach, and the one followed by the law makers, is one in which the bat parameters (size, shape, materials) are constrained. The latter can be further enhanced by the addition of a constraint on the bat profile and mass to limit the polar moment of inertia and pick up weight moment of inertia. We propose that the law makers consider this specific recommendation.*

## 04 | The size and shape of bats



▲ West Indies' Chris Gayle.

Consultations were undertaken with a range of bat-makers, including SG, Stanford, Salix, Kookaburra, and Gunn & Moore.

As the scientific evidence shows, the development of the bat-makers' skills has provided an advantage to the batsmen. The bats nowadays tend to be drier, so they can contain a higher volume of wood than the older bats. The disadvantage of this is that the bats will break more easily. Top players tend to look for a narrower grain in the willow. In general, they are much more selective than they used to be and will get through a huge number of bats – up to 40 per year for some players.

All the bat manufacturers acknowledged that modern bats are heavier than they used to be (2lb 8oz – 2lb 10oz on average, although some are significantly heavier). However, the edges are now much thicker (40mm approx.), and the distribution of the mass is now very different, with sophisticated designs retaining the 'pick-up' as the mass has increased. There are now more flat-faced bats to make the edges thicker. Some blades are slightly shorter, allowing them to be deeper than usual.

All acknowledged that a bat gauge would be a sensible way of controlling the shape and size of bats; they agreed that restricting the depth of the edge would be the most significant measure. They generally felt that restricting the maximum edge depth to 30-35mm, and maximum overall depth to 60-65mm, would be acceptable. They felt that there would still be room for skilful bat development within these limits.

## 04 | The size and shape of bats

continued

The bats from 1905 and 1980 had edges measuring 14mm and 18mm respectively. The 2013 bat's edge was 41mm but there are bats available with edges over 50mm.

If a bat gauge were to be used to regulate the shape and size of bats, the key dimension to control would be the depth of the edge. If this were controlled and reduced to something approaching its former depth, the bowler who induced a mis-hit by the batsman would be significantly more likely to be rewarded with a wicket because the ball would be less likely to clear the boundary. It would have little impact on the length of carry of a ball which hit the sweet spot. Note that Albert Trott is still the only person to have hit a ball over the Lord's pavilion, in 1899.

## 05 | Cricket balls

Looking at ways of controlling the balance of the game from another angle, consultations were held with Dukes, Kookaburra and Tiflex to find whether modifications to the ball could be made which would result in greater support for the bowler.

The manufacturers said that they could produce balls which would perform differently to suit what is required:

- More spin:** increase mass of core (needs to bounce after plenty of use), use heavier thread to make seam more prominent and to grip more.
- More seam:** alter stitching using thicker thread and polishing it, making the seam more prominent and longer lasting.
- More swing:** small alteration to shape and size of core, or use 2 piece ball.

Tiflex in particular have done a significant amount of research on this, and have engineered consistency into their product. They claim to know why a ball swings and can control the amount. They can produce a ball which has little variability in performance.

In terms of the balance of the game, Dukes were of the opinion that their hand-stitched ball offered more help to the bowlers than those of their machine-stitched rivals. If a hand-stitched ball was to be used globally, the method of treating the leather would need to change, depending on the conditions in the host country. This is achievable, however, as Dukes already produces slightly different balls for Tests in England and the West Indies and their balls will be used in some Sheffield Shield cricket next season in Australia.



## 05 | Cricket balls

continued

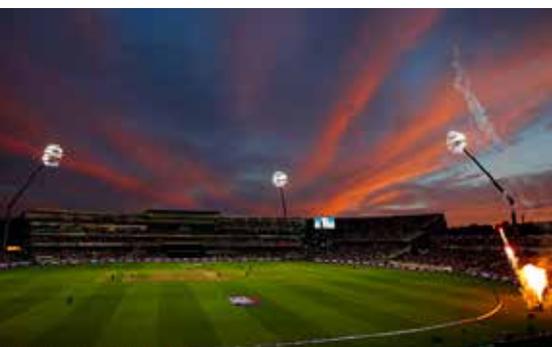
Two of the manufacturers suggested experimenting with different balls for different formats. Tiflex showed MCC a ball which had been used for a 50 over innings on a grass pitch which had retained its shape, hardness and colour impressively, so that it compared well with a new ball.

Tiflex was asked to produce a ball for county cricket which offered more to the bowlers. It was used in the 2nd Division of the County Championship for three seasons in 2009-2011 but it was not popular, as the ball was seen as being too bowler-friendly. The important message therefore is that if the administrators of the game want to change the characteristics of the ball to alter the balance of the game, then the ball manufacturers would be able to produce balls which offer the desired characteristics almost immediately.

## 06 | Other factors affecting the balance of the game

It is myopic to think that it is simply the increased power of bats that is altering the balance of the game. There are a number of other factors which must be considered when looking at this topic.

▼ Boundaries are often greatly reduced from the ground's maximum size.



- **Boundaries** – the redevelopment of many grounds has resulted in the boundaries being shortened. Furthermore, safety requirements now require the rope to be at least 2.5m from any advertising hoardings but it is often the case the boundaries are brought in considerably further than this. An easy solution is to ensure that boundaries are made to be as long as is safely possible.
- **Pitches** – it is generally accepted now that pitches tend to be more batsman-friendly, with pitches getting marked down if they seam or spin too much.
- **Batsmen's skill** – it is undoubtable that modern batsmen have upskilled to a great degree. The introduction of T20 has seen the emergence of new shots, with players now intentionally hitting the ball to all 360 degrees. A huge amount of practice and effort has gone into mastering these strokes.
- **More attacking styles** – the game has changed in all formats, with a more attacking brand of cricket being seen. Batting is now more often about domination, rather than survival. Batsmen are taking more risks, linked to the point above about practicing more innovative shots.

## 06 | Other factors affecting the balance of the game

continued

- **Strength** – batsmen spend a lot of time in the gym now to build up their strength and they practice 'range-hitting', where the sole purpose is to clear the boundary. It is suggested that the strength of the modern batsmen has had an impact on the power with which they hit the ball.
- **Field restrictions** – these have evolved over the years, making it easier for batsmen to find gaps in the outfield, particularly in the lead-up to, and during, the 2015 ICC Cricket World Cup, when only four fielders were ever allowed outside the 30 yard circle. Such changes made it harder for fielding captains to defend the boundaries.
- **Helmets** – although helmets were around in the 1980s and have been worn throughout the years that the run rates have increased, there are many who feel that the introduction of helmets is the biggest factor to have changed the balance of the game, as they give the batsmen so much more confidence in facing fast bowling.

## 07 | Arguments to retain the status quo

There are credible reasons for not making any changes that would alter the balance of the game. These include:

- ▼ Fours and sixes help to attract new and younger fans.



- **Bringing new audiences to the game** – At a time when cricket is competing with other sports for its fans' time and money, the excitement generated by fours and sixes being hit is an excellent marketing tool. Fans that are new to the game, particularly children, prefer seeing boundaries than ones and twos, and enjoy the fanfare of music and placard waving that often follows. Cricket is about entertainment and the regular boundaries provide that.
- **Commercial benefits** – There are obvious commercial benefits of the game being more attractive to as diverse an audience as possible. In certain tournaments, such as the Indian Premier League, the sixes are sponsored, making it financially beneficial to the sponsor, and therefore to the Board in receipt of the funds, that the sixes are hit more often. Any limit of the bat's power could have an effect on revenues.

# 07 | Arguments to retain the status quo

continued

▼ Limiting the power of bats may be detrimental to women's cricket.



- **Three formats of the game** – One of the advantages that cricket has over other sports is that there are three formats that cater for varying cricketing tastes. With attendances at limited overs matches generally being greater than those at Test Matches, the fans are indicating their preference for the shorter format, partly as there will be a winner in a relatively short timescale, but also as the play tends to be more action-packed. This excitement is needed to attract new audiences, who may graduate to watching Test Matches once they develop a deeper knowledge of the sport. Limiting the power of bats in Test Matches could act as a further deterrent to fans attending what is, in many countries, an already declining product.
- **More edges carrying to slip & gully?** – Whilst no research has been carried out on this area, it is logical to suggest that the thicker edges on bats make it more likely that an edge will carry to the slip and gully region more often. It might also allow the fielders to stand slightly further back, giving them more time to react to catches, therefore giving more benefits to the fielding side.
- **Women's cricket** – There are some who are suggesting that the women's game could be made more exciting by allowing them to have more powerful bats than currently exist. Limiting the power of bats would be another obstacle for women's cricket.

# 08 | Methods to alter the balance of the game

There would be various methods of altering the balance of the game. These include making changes to:

- The pitches
- The Laws & playing conditions
- The balls
- The bats

# 08 | Methods to alter the balance of the game

continued

## Making changes to the pitches

Pitches can vary greatly around the world and indeed this is part of cricket's allure that it is played on different types of pitches around the world. It would be difficult to create any guidelines on the preparation of pitches that could be globally applicable. Cricket will not return to the days of uncovered pitches. Attempts have been made at introducing regulations, such as limits on rolling once the match has started, but these would again need to vary around the world, as the effect of the rolling can benefit either bat or ball, depending on the nature of the pitch.

## Making changes to Laws & playing conditions

Changes could be made to both the Laws and playing conditions to help to redress the balance of the game. Options that have been suggested are listed below:

- Ensuring that the boundaries are as long as possible.
- Amending the fielding restrictions in limited overs cricket.
- Altering the specification of the bat and the ball. (See below)
- Increasing the number of bouncers permitted by bowlers.
- Disallowing leg byes.
- Altering the LBW Law to allow the ball to pitch outside the leg stump.
- Reducing the width of the blade of the bat.
- Increasing the size of the stumps

These are listed in the order that they are considered viable, with the first three being seen as the most probable options.

▼ Allowing more bouncers would be one way of giving more to the bowlers.

## Making changes to cricket balls

As was shown in section 5 above, the ball manufacturers could make small but significant changes to cricket balls to alter their behaviour. This would be a matter for the game to decide if it wanted balls that bounced, seamed or swung more than the current balls.

## Making changes to cricket bats

As was shown in sections 3 and 4 above, changes could be made to limit the dimensions of cricket bats which would limit their performance. The most practical alteration would be to limit the thickness of the edges and the overall depth of the bat. This would mean that a ball that is 'middled' would still travel as far as they do now but that the mis-hit would be limited in its trajectory.



## 09 | Player and umpire safety



There are increasing concerns for the safety of close fielders, bowlers and umpires. Some umpires have started to wear helmets and body protection and are tending to stand further back from the stumps, which some would argue is having a detrimental effect on the ability to call No balls.

If restrictions were placed on the thickness of the bats' edges, it would be unlikely to alter the speed of the ball that is hit off the 'middle' of the bat. It would, however, reduce the speed of balls hit closer to the edge of the bat. Consequently, the risk to players and umpires would not be eradicated by reducing the dimensions of the bat, although the frequency of dangerous situations would be slightly lessened.

◀ Bruce Oxenford arm protector.

## 10 | Is this a problem for the whole game?

MCC's responsibility is to the Laws of Cricket, which cater for the game at all levels around the world. MCC has consulted with players and umpires from the amateur game and there is a recognition that the trends seen at the professional level are present in the recreational game, albeit to a lesser degree.

Umpires feel that the stroke-play is now more attacking and that the players are using more powerful bats. Even though the quality of the willow in the amateurs' bats will not be quite as good as that saved for the professionals', many of the bats are still extremely powerful. Umpires in amateur cricket are feeling in more danger now than ever before.

MCC feels that, if any changes are made, they should apply equally to all levels of the game and not just at the professional level.

Furthermore, there are increasing numbers of recreational grounds being threatened with closure as a result of the number of balls that are hit into neighbouring houses or roads.

▼ Village cricket in England.



# 11 | Conclusions

There are contrasting opinions, all entirely valid, as to whether anything should be done to alter the balance between bat and ball. There is clear scientific and statistical evidence that bats have become more powerful, principally as a result of having larger sweet-spots. The crucial question for the sport is whether it wishes to take steps to redress the balance, which might cheer the purists but raise concerns amongst a large proportion of the fan-base and those looking after the commercial side of the game.

The easiest step to take is to ensure that the boundary sizes are kept to as large as possible for the ground, save for the necessary safety zone between the rope and the fence or advertising hoardings.

If the decision is made that something needs to be done to redress the balance, it can be done by limiting what the batsmen can do or augmenting what the bowlers can do, or indeed both. The easiest method of limiting what the batsmen can do is by reducing the permitted dimensions of the bat, notably the edges. The easiest ways of helping the bowlers are to alter the behaviour of the balls, allow them to bowl more bouncers and set more defensive fields.

# 12 | Recommendations

Updated July 2016

MCC, through its various committees including the World Cricket committee, has debated this topic for over three years. It recently sought guidance from the ICC Cricket Committee on the desirability of making changes that would help to redress the balance between bat and ball. That Committee gave a firm recommendation that the dimensions of the bats should be limited.

After further discussions by MCC's Cricket Committee and World Cricket committee, the following recommendations are made:

1. All governing bodies must ensure that boundaries are kept to a maximum possible length.
2. The MCC Committee should amend the Laws of Cricket to place further limits on the bats' dimensions, as well as possibly on their weight. A limit on the thickness of the edge of bats of between 35mm and 40mm should be introduced, as well as limiting the overall depth of the bat to between 60mm and 65mm.
3. Further consultations should be held with bat manufacturers and scientists to finalise the exact measurements, and means of evaluating them, as well as to investigate the viability and need for a weight limit.

# | Acknowledgements

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Imperial College for the scientific evidence in section 3.





Marylebone Cricket Club, Lord's Ground, London, NW8 8QN

Photographs by: © Getty Images, Matt Bright