

## **Sports Culture in South Asia: Effects of Modern Bowling Action Rules on Cricket, an Information Technology Perspective**

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### **ABSTRACT**

Cricket, a famous game played and watched at its peak in Asia. The game is governed by International Cricket Council (ICC). It is a team sport of eleven players in each side with different roles, of which one is bowler. The bowlers have followed different styles of bowling since game has started, of which some declared illegal initially. In our study, we have focused on the cases of illegality reported from South Asian region in post 1990 period a new era of biomechanics based bowling laws started. We have also investigated the updated ICC process for bowlers review and remedy along with biomechanics based labs established worldwide. Finally, we have proposed a new information technology based bowling action evaluation solution, lower in cost and affordable at domestic level. Such study will help bowlers, their coaches and viewers to understand the biomechanics based bowling laws, standings of South Asian bowling after these laws and alternative solutions to rescue it.

**Key Words:**        **Reported and Banned Bowlers, Biomechanics, Bowling Laws, Information Technology**

### **Introduction**

Cricket is probably a game with maximum numbers of its players and viewers from South Asian region (Gupta, 2004). The game is a sport played between two teams. Each team has 11 players with different roles, like batsman bowlers, wicket keeper and all-rounders etc. ("Dates in cricket history," 1978).

For now, we are dealing with the role of a bowler in the game of cricket. Over the years, many different bowling styles like underarm, roundarm and overarm etc. became the part of game. Some of these styles were banned by the cricket

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governing council, the ICC, while the rest are in practice today. The styles which are found in today's game are round arm and overarm styles (Bowen, 1970).

The emergence of these bowling styles also produced many controversies termed as throwing or chucking. The issue of throwing or chucking is actually an attempt to impart the ball with an extra speed/velocity ("Throwing in Cricket," 2016). A debate of legal versus illegal bowling action started. There were many bowlers who faced bans from couple of weeks to years long ("List of International Cricketers called for Throwing," 2016).

Initially, it was completely the responsibility of field umpires to monitor the bowling action of a bowler. Whenever, umpires found someone accused of straightening his arm, simply a restriction of bowling applied on him, sometimes resulted in terms of ending his career ("ICC Rules & Regulations," 2016). Apart from that, as new bowling styles emerged, new controversies about them emerged and finally, the laws to remedy these controversies were also constituted. In simple words, throwing or chucking never ended in its essence ever. There are multiple reasons for it ("Throwing in Cricket," 2016).

Finally, the laws to stop throwing were reshaped in 1990 when aid from the field of human biomechanics were used to constitute a new set of bowling action laws ("Throwing in Cricket," 2016). In our study, we have discussed the biomechanics and its rules related to bowling action (Knudson, 2007).

As South Asian cricket is our major agenda item here, that is why, we have studied South Asian bowlers with suspect action post 1990. The study is aimed to discern the impact either positive or negative of these laws on South Asian bowlers. What initiatives South Asian cricket bodies have taken to make these laws applicable at domestic level? What are the standings of South Asian cricket in illegality issue with respect to the rest of the world?

We have studied multiple aspects about the bowlers reported from South Asian region in post 1990 period, like number of reported and banned cases from South Asia, how many bowlers belong's to each of ICC full time South Asian member, number of times a particular bowler reported or banned with its current status and international formats attended by a banned bowler before and after ban.

In modern era of game, the ICC has also provided the bowlers with illegal action, an opportunity to review their bowling action instead of straight forward ban (Committee, 2015). The ICC current procedure of reviewing bowlers with illegal action is also a part of our discussion and the facilities provided by the ICC for this purpose, like affiliation with biomechanics based laboratories in various ICC full time member countries.

Finally, it has been planned to make a new contribution in this particular domain. It is also intended to introduce a new technology for this purpose details of which is presented in coming section. In our opinion, it will be a low cost solution for South Asian region affordable at domestic level.

The whole work is divided in multiple sections. The section II discusses the biomechanics and its relevance to bowling action, particularly, key terminologies

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for bowling action evaluation. A summary of bowlers reported or banned from South Asia is part of section III. The section IV discusses the ICC procedure to review suspected bowling action cases and current facilities available for this purpose. then, a new information technology based solution for this purpose has been introduced that is, lower in cost and affordable at domestic level of South Asian cricket. In last, conclusion and future dimensions of the work has been presented.

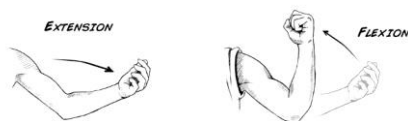
### **Bowling Action Laws & Biomechanics**

Although, the definition of legal bowling action remained unchanged in its essence since has been introduced that is, however, various new controversies emerged over the years and added more to the definition of legal bowling action ("Throwing in Cricket," 2016). The major addition was appeared in 1990 when biomechanics were applied to define legal bowling action. The biomechanics reshaped the mechanism of bowling action evaluation. The rules developed by human movement specialists and mathematical models were used to calculate various body angles (Knudson, 2007). That is why, it is obvious to understand those rules of biomechanics which are the basis for these new laws. Following are the biomechanical rules involved in analyzing legality of a bowler's action:

- Flexion & Extension
- Hyperextension

### **Flexion & Extension**

These are actually the movements between upper and fore arm. Whenever, the angle between fore and upper arm reduces it is flexion, the opposite of it is extension(Marshall & Ferdinands, 2003). The concept of flexion and extension is presented in Figure 1.



**Figure 1: Flexion & Extension**

### **Hyperextensions**

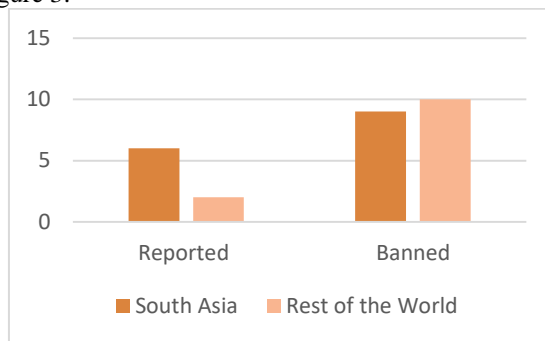
It is possible that sometimes an extension between two body parts can cross the normal limits of body movement. This extension beyond the normal limits is referred as hyperextension(Elliott, Lloyd, Alderson, & Foster, 2001). The elbow straightening which is more than 180 degrees is an example of hyperextension shown in Figure 2.



**Figure 2: Hyperextension**

### Suspect Bowling Cases from South Asia

As discussed above, South Asian region which is considered a richest region of cricket players and viewers, leading in case of suspect bowling action too. The issue is high in numbers in South Asia. In our study, we have presented the number of cases reported and banned in post 1990 era from South Asia and rest of the world in Figure 3.



**Figure 3: Reported and Banned Bowlers (South Asia Vs. Rest of the world)**

It is clear from the Figure 3 that South Asian bowlers are leading the arena as a whole. However, they have more reporting issues and less ban issues. An important point to keep in mind is that every bowler is reported first, then he has a chance for review which leads him towards comeback or ban.

It is clear from Figure 3 that count of south Asian bowlers is higher than the rest of the world. There are total 15 bowlers from South Asia who have been reported or banned in post 1990 era. We have presented a categorical sum of bowlers reported, get cleared after reporting or imposed with a ban of shorter or longer duration in Table 1.

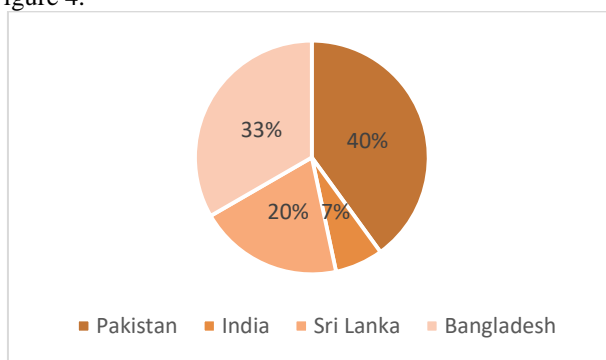
**Table 1: Reported and Banned Cases from South Asian Post 1990 period**

Case	No. of Bowlers
Reported & Cleared	6
Reported, Banned Once & Cleared	4
Reported, Banned Once & Still Banned	3
Reported, Banned Twice & Still Banned	2
<b>Total</b>	<b>15</b>

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There are total 06 bowlers who were reported and cleared without any remedial work, out of them 03 belongs to Pakistan while one from each India, Sri Lanka and Bangladesh. The bowlers who reported and faced ban once and get cleared themselves after remedial work are total 04, out of which 02 belongs to Bangladesh, one from each Pakistan and Sri Lanka and no one from India. In case of bowlers who reported in recent times and facing the ban yet are total 03, out of which 02 belongs to Bangladesh and one from Sri Lanka. No one belongs to Pakistan and India. There is another category of reporting twice and getting banned. There are total 02 bowlers in this category, both belong to Pakistan, one is Shabbir Ahmed whose career has now ended(Long, 2005). However, the other one is Muhammad Hafeez, hopping to join the game as bowler soon(E. STAFF, 2014a).

There is another way to look into this problem in the South Asian perspective. How many cases are from which country is the key question to be answered here? There are 04 ICC full time member countries in South Asia. We have presented a percentage distribution which reflects the share for each of the ICC full time member in Figure 4.



**Figure 4: Percentage of Bowlers Reported/Banned (South Asian Full Time ICC Member)**

The picture is worth cleared, Pakistan cricket is leading the house, although Bangladesh cricket is not far behind but they have more issues in recent years. The cricket India and Sri Lanka have relatively lesser issues. We look into this problem in another way. This percentage share is sum of reported and banned ones. That is why, it is essential to break down the percentage share. There are 06 bowlers from Pakistan, from which 03 bowlers have been reported but get cleared without any remedial work however, 03 have faced one time or more ban. The situation is not good for Bangladesh cricket. Out of 05, their 04 bowlers were imposed with ban in recent years and still in that particular phase. The Sri Lankan cricket has only 03 bowlers reported since 1990, out of which only one got cleared without any remedial work, however one has cleared the ban while other is still facing.

We have also summarized the bowlers with number of times they have been imposed with ban. As per the ICC laws, the ban could be from 2 weeks to 2 years

or more. Some of these bowlers have cleared from the ban after remedial of their action while couple of those are still facing the ban or may be ending their career. There are total 09 bowlers which have been imposed with any type ban illustrated in Table 2.

There are total 04 bowlers which have faced ban once and cleared their action after appropriate remedial action. There is another category of bowlers who have been imposed with ban once but they are banned. The count for such type of bowlers is three. There are only 02 bowlers who have been banned twice, both are from Pakistan. The one is Muhammad Hafeez whose second ban will be ended soon and will be available for evaluation (E. STAFF, 2014a). However, Shabbir Ahmed has ended his career (Long, 2005).

**Table 2: South Asian Bowlers Imposed With Ban & Their Current Status**

Bowler Name	Country	Ban Count	Current Status
Sachithra Senanayake(E. STAFF, 2014c)	Sri Lanka	1	Cleared
Saeed Ajmal(E. STAFF, 2014b)	Pakistan	1	Cleared
Sohag Ghazi(E. STAFF, 2014d)	Bangladesh	1	Cleared
Abdur Razzak(W. C. STAFF, 2004)	Bangladesh	1	Cleared
Shaminda Eranga(E. STAFF, 2016)	Sri Lanka	1	Still Banned
Taskin Ahmed(Isam, 2016)	Bangladesh	1	Still Banned
Arafat Sunny(Isam, 2016)	Bangladesh	1	Still Banned
Muhammad Hafeez(E. STAFF, 2014a)	Pakistan	2	Still Banned
Shabbir Ahmed(E. STAFF, 2005)	Pakistan	2	Still Banned

We have investigated another interesting fact. It has been observed that bowlers which have been imposed with ban once or twice, cleared their action after ban period, but they have not been provided with an opportunity to participate in each format of international cricket. Most of the banned represented their side in each international format before ban but after removal of ban their side hesitated to give them opportunity to participate in all international formats. The T20 bowlers is the format where an opportunity was given first or sometimes in one day internationals. The event of giving an opportunity in a test match is very rare. We have presented a summary of bowlers who have been recovered from ban, their pre and post ban international format appearance in detail in Table 3.

**Table 3: Pre & Post Ban Attendance in International Formats by Bowlers Faced Ban**

Bowler Name	Pre-Ban			Post-Ban		
	Test	ODI	T20Is	Test	ODI	T20Is
Sachithra Senanayake(E. STAFF, 2014c)	√	√	√	×	√	√
Saeed Ajmal(E. STAFF, 2014b)	√	√	√	×	√	√
Sohag Ghazi(E. STAFF, 2014d)	√	√	√	×	×	√
Shabbir Ahmed(E. STAFF, 2005)	√	√	√	×	×	√
Abdur Razzak(W. C. STAFF, 2004)	√	√	√	√	√	√
Muhammad Hafeez(E. STAFF, 2014a)	√	√	√	√	√	√

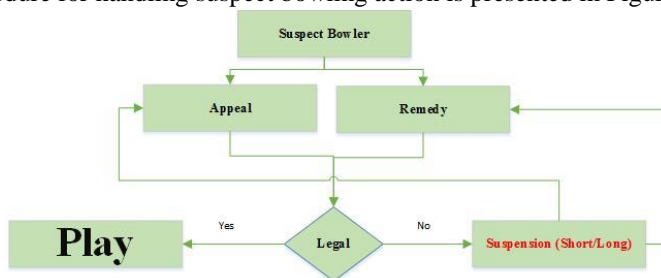
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There are total 06 bowlers who cleared themselves from ban in post 1990 period. However, only 02 of them got chance to represent their side in all international formats. This is one third of the total. An important fact is that everyone has played T20Is after removal of ban while only 04 have played one day international. Overall, it has been observed that teams hesitate to provide their suspect bowlers an opportunity to represent their side in longer format first. In other words, it is a lack of confidence too.

### **Bowling Acton Review Process & ICC Affiliated Labs**

The evolution of bowling action laws is not an assurance of stopping bowlers from violations. A notable number of bowlers have been found accused of suspect bowling action over the years("List of International Cricketers called for Throwing," 2016). However, suspect bowling action in current era does not mean simply termination. There is a room for appeal, or remedy and reevaluation after remedy. The ICC has modified its process to deal with bowlers reported with suspect bowling action(Committee, 2015).

It is highly important to understand the updated process now as it provided bowlers with an opportunity to appeal and remedy, despite of straight forward ending of their career. Another, important aspect is full or partial ban. This is really interesting to understand. Sometimes, bowlers have been restricted to bowl a particular delivery or a set of deliveries instead of complete bowling ban. Also, the duration of ban varies from 02 weeks to 02 years etc. A graphical abstraction of ICC procedure for handling suspect bowling action is presented in Figure 5.



**Figure 5: ICC Standard Bowling Action Review Process**

The right to appeal, remedy and review, provides bowlers with suspect bowling action to carry on their career. However, the ICC has clear motive that there should be a check at domestic level so that bowlers will never ever lead towards international cricket. For this purpose, establishment of biomechanics based laboratories is essential in at least each full time member country(Committee, 2015). A practice of this kind will not only provide remedial services but also minimize the number of reported cases at international level, for

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which higher cost to be beard. Currently, the ICC has 05 affiliated labs for this purpose. The names and location of the ICC affiliated labs are the following:

1. National Cricket Performance Centre - England
2. Cardiff Metropolitan University - England
3. Brisbane - Australia
4. Pretoria University - South Africa
5. SRASSC (Sri Ramchandra Athroscopy & Sports Science Center) - India

We have noticed from above that South Asian cricket has higher number of suspect bowling action issues, however, there is only one lab in South Asia, located in India. This is really not good for the future of South Asian cricket. At least, one lab in each full time member country is essential.

Apart from that, ICC has clear motive that evaluation of bowlers will be at neutral venue/lab. The cost in this situation increases a lot for the South Asian full time members, considered countries with relatively poor economy.

The absence of lab in each South Asian full time member country is also a reason of bowlers with suspect bowling action to be appeared at international level of cricket. That is why, it is too essential to have a lab in each South Asian full time member country which provide remedial and evaluation services on routine basis at a lower cost.

### **Proposed IT Based Low Cost Solution**

As discussed above, there is a need to develop bowling action evaluation infrastructure in each of the ICC full time member country situated in South Asia. The reasons for this are very simple and straight forward, the number of reported and banned cases is higher from South Asian members, high cost of remedial and evaluation services at neutral venue is not affordable for developing South Asian countries. Also, routine scans at domestic level are not possible without this practice that will definitely minimize the suspected cases at international level.

Currently, different labs worldwide are using different technologies for the same purpose. We are planning to introduce a newer technology for this purpose, lower in terms of cost, affordable at domestic level of cricket.

We categorize the bowling action evaluation in human movement/activity domain. That is why we intend to use specialized motion sensing cameras, particularly developed to capture human motion. An example of such type of camera is Microsoft Kinect, specifically developed to capture human motion. Then, based upon this captured motion, we can apply various mathematical techniques to acquire different kind of results.

The Microsoft Kinect is a motion sensing camera with its cost less than few hundred dollars. Only one sensor is used. However, the use of more than one sensor will not affect the cost.

In our opinion, it will be a novel contribution that is lower in cost and available at doorstep. Certainly, it will not only help suspected bowlers but will



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serve as a check at domestic level. It will also be available for routine remedial and evaluation of bowlers so that their actions can be modified as per the ICC defined laws.

### **Conclusion and Future Work**

In this study, various aspects related to bowling action have been concerned, like difference between legal and illegal bowling action, the use of biomechanics in modern era for constituting laws against throwing, a particular focus was on South Asian cricket after introduction of biomechanics bases bowling action laws, the ICC procedure for the review of bowlers with suspect bowling actions, and the ICC affiliated labs. Finally, we have proposed a new information technology based bowling action evaluation solution lower in cost for the South Asian region.

A comprehensive study and a proposed solution of this kind will definitely work for the improvement of bowling standard in South Asia. It will definitely save the talent to become a part of wastage. It is hoped to build the prototype of our this low cost bowling action evaluation system very soon.

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