



Australian Cricket

Suspected Illegal Bowling Action Procedures

Version:	2.0
Date last reviewed:	1 July 2017
Review frequency:	Annual

The Cricket Australia Head of Cricket Operations is responsible for this document.

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1 DEFINITIONS

1.1 In these Illegal Bowling Procedures the following words and phrases have the following meanings:

Accredited Testing Centre: Any laboratory or testing centre accredited by the ICC to conduct analysis of bowling actions pursuant to the ICC Standard Analysis Protocols.

Analysis: Means the analysis of bowling actions pursuant to paragraph 5 of these Procedures.

Assessment: As defined in paragraph 5.1(f) of these Procedures.

BRG Hearing: As defined in paragraph 5.4 of these Procedures.

CA Competition: Means any of the following competitions:

- (a) Sheffield Shield;
- (b) Domestic One-Day Cup;
- (c) KFC Big Bash League;
- (d) Women's National Cricket League;
- (e) Rebel Women's Big Bash League;
- (f) Toyota Futures League; and
- (g) any other event organised or sanctioned by CA from time to time to which CA deems it appropriate that these Illegal Bowling Regulations should apply.

CA Standard Analysis Protocols: The Standardised Protocols for the assessment of Suspected Illegal Bowling Actions, as may be amended from time to time, which sets out the test methods and protocols developed for and on behalf of CA to analyse bowling actions, a summary of which is set out in Annexure 2 of these Procedures.

ICC Illegal Bowling Regulations: As defined in paragraph 2.1 of these Procedures.

ICC Standard Analysis Protocols: The ICC Standardised Protocols for the Assessment of Suspected Illegal Bowling Actions, as set out in the ICC Illegal Bowling Regulations as may be amended from time to time.

Illegal Bowling Action: As defined in paragraph 5.1(i) of these Procedures.

Illegal Delivery: If an umpire believes a bowler has bowled a delivery that is clearly illegal (i.e. deliberately and blatantly thrown), the umpire shall call "no-ball" and report the bowler on the Suspected Illegal Bowling Action Report form set out in Annexure 1 of these Procedures. To be considered an illegal delivery, the ball must be delivered with a markedly different action to his/her normal deliveries.

Match: Any match played in a CA Competition.

Player: Any cricketer who participates in a Match.

Suspect Delivery: If an umpire believes a bowler has bowled with an action that may be illegal, the umpire should not "call" the bowler, but record the bowler's name and any relevant details pertaining to the over and ball(s) bowled on the Suspected Illegal Bowling Action Report Form.

Suspected Illegal Bowling Action: As defined in paragraph 4.1 of these Procedures.

Suspected Illegal Bowling Action Report: A report in the form set out in Annexure 1 of these Procedures, as may be amended from time to time.

Warning: As defined in paragraph 5.2 of these Procedures.

2 INTRODUCTION

- 2.1 The aim of these Procedures is to ensure that all Players playing interstate cricket and W/BBL have bowling actions that comply with the MCC Laws of Cricket 2017, Law 21.2, and the ICC Regulations for the Review of Bowlers Reported with Suspected Illegal Bowling Actions (**ICC Illegal Bowling Regulations**). A ball is fairly delivered in respect of the arm if, once the bowler's arm has reached the level of the shoulder in the delivery swing, the elbow joint is not straightened partially or completely from that instant until the ball has left the hand. This definition shall not debar a bowler from flexing or rotating the wrist in the delivery swing.
- 2.2 As with other regulations and Playing Conditions issued by Cricket Australia (**CA**), these Procedures modify the Laws of Cricket as applied to cricket played under CA's jurisdiction.
- 2.3 These Illegal Bowling Procedures:
- (i) Detail the process for dealing with players bowling with a suspected illegal action in a CA Competition; and
 - (ii) Provide for an additional mechanism for the reporting of players suspected of bowling with illegal bowling actions at CA Pathway Championships.
- 2.4 Nothing contained herein shall override an umpire's responsibility and discretion to apply Law 21.

3 SCOPE AND APPLICATION

- 3.1 All Players are automatically bound by and required to:
- (a) comply with all of the provisions of these Procedures; and
 - (b) submit to any Analysis convened under these Procedures pursuant to a Suspected Illegal Bowling Action Report.
- 3.2 CA umpires have a duty to ensure the game is played within both the Laws and the Spirit of Cricket. Umpires must police Law 21.2 ("Fair Delivery – The Arm"), read in conjunction with Law 21.3 ("Ball thrown or delivered underarm – action by umpires"), by notifying CA if they observe any bowler in a match situation who, in their opinion, possesses an action that may contravene these Laws.
- 3.3 CA has instructed umpires that there are three categories of delivery:
- (i) Fair Delivery;
 - (ii) Illegal Delivery (Blatant Throw); and
 - (iii) Suspect Delivery.
- 3.4 Umpires, in deciding whether to call or report a Player under these regulations, should use the naked eye viewing the action live and/or on television at normal speed. Slow motion television replays should only be used to confirm initial suspicions.

- 3.5 Umpires should complete a CA Suspected Illegal Bowling Action Report when reporting a Player under these Regulations. The Form can be completed by all officiating umpires in a Match or can be completed by a single umpire.

4 REPORTING PROCEDURE FOR A SUSPECTED ILLEGAL BOWLING ACTION

- 4.1 If, in any CA Competition, a Player (a) is called by an umpire for an Illegal Delivery in accordance with Law 21.3 or (b) is suspected by the umpire(s) for bowling a Suspect Delivery with an action which contravenes Law 21.2 as read with Law 21.3 (each, a ***Suspected Illegal Bowling Action***), the following procedure shall apply:

- (i) At the conclusion of the Match the umpires shall write a Suspected Illegal Bowling Action Report detailing their concerns about the Suspected Illegal Bowling Action of the Player, including whether those concerns relate to the Player's bowling action generally or whether they relate to one or more specific types of delivery;
- (ii) Within 24 hours of the end of the Match in which the report is made or the Player is called, the appointed CA Match Referee will notify the Player, the Player's coach/Team Manager, and CA's Head of Cricket Operations by providing each a copy of the Suspected Illegal Bowling Action Report;
- (iii) Within 24 hours of receipt of the Suspected Illegal Bowling Action Report, CA will notify the CEO of the Player's State Association or W/BBL Team and the Australian Cricketers Association (**ACA**) that the Player has been reported, provide a copy of the Suspected Illegal Bowling Action Report, and describe the implications of the report for the Player with respect to these Procedures;
- (iv) Within 24 hours of the Player being provided with a copy of the Suspected Illegal Bowling Action Report, CA may make a media statement to the effect that the Player has been reported as having a Suspected Illegal Bowling Action and shall be subject to the review process set out herein;
- (v) CA shall arrange for three copies of any available video footage of the bowling spells of the Player in the Match in question to be produced as soon as possible. Two copies of this footage will be sent to the Player's State Association or W/BBL Team. The State Association or W/BBL Team will be responsible for providing a copy of the footage to the Player. The third copy shall be retained by CA for the Analysis and any BRG Hearing. If no video footage is available, CA shall write to the Player's State Association or W/BBL Team advising that there is no match footage available;
- (vi) If no video footage is available of the Player in the Match in question, upon receipt of the Suspected Illegal Bowling Action Report, CA shall immediately request that the Player's State Association or W/BBL Team provide to CA within seven days any relevant video footage of the Player's bowling (whether in training or matches) that they are able to access;
- (vii) The Player must submit to Analysis as detailed in paragraph 5 below; and
- (viii) Once the Analysis has been completed with the findings submitted in an Assessment to CA, the State Association or W/BBL Team CEO and the Player, CA shall make a media statement providing relevant information about the Player being reported, the Analysis process and the results of that Analysis.

5 EVALUATION OF SUSPECTED ILLEGAL BOWLING ACTIONS

- 5.1 If a Player is reported in accordance with paragraph 4.1 above, they shall be required to submit to an Analysis of their bowling action carried out as follows:

- (a) The Analysis shall be carried out by the CA Biomechanist (or their representative) in accordance with CA Standard Analysis Protocols (Annexure 2) and shall take into account the Suspected Illegal Bowling Action Report.
- (b) The Analysis shall be carried out as soon as possible but, in any event, within 14 days of receipt by the Player's State Association or W/BBL Team of the notice advising that the Player has been reported.
- (c) The Analysis shall be conducted at the National Cricket Centre in Brisbane and CA shall ensure that the Player, through the Player's State Association or W/BBL Team, is given reasonable notice of the testing arrangements.
- (d) If the Player fails to submit to the Analysis as required above, such failure will be regarded as an admission that he/she bowls with an Illegal Bowling Action and he/she shall be immediately suspended from bowling in interstate and W/BBL cricket until such time as he/she so submits.
- (e) If the Player expresses any concern or complaint regarding the circumstances or conduct of the Analysis, he/she should make these known to the CA Sports Science Manager (or their representative) before the conclusion of the Analysis. The CA Biomechanist (or their representative) responsible for conducting the Analysis should make a written note of the relevant concern or complaint which should be agreed with the Player.
- (f) Within 14 days of the date of the Analysis, the CA Biomechanist (or their representative) shall provide CA with a written report (the **Assessment**) in the form as set out in CA Standard Analysis Protocols. Where the Assessment concludes that the Player employed an Illegal Bowling Action during the Analysis, it should indicate whether the Player employed an Illegal Bowling Action generally or in respect of specific type(s) of delivery only and whether, in the opinion of the CA Biomechanist (or their representative), such conclusion is not inconsistent with the relevant video evidence.
- (g) Where the Assessment concludes that the Player did not employ an Illegal Bowling Action during the Analysis it should, where relevant, indicate whether, in the opinion of the CA Biomechanist (or their representative), the Player's bowling action during the Analysis was materially different to his/her action in the Match in respect of which he/she was reported (whether generally or in respect of the specific type(s) of delivery (if any) identified in the Suspected Illegal Bowling Action Report). The Assessment should also include any notes of concerns or complaints of the Player made under paragraph 5.1(e) above.
- (h) Immediately upon receipt of the Assessment, CA shall provide a copy to the Player, Player's State Association and/or W/BBL Team.
- (i) Subject to paragraph 5.2 below, in the event that the Assessment concludes either that (i) the Player employed an Illegal Bowling Action during the Analysis and that such conclusion is not inconsistent with the relevant video footage or (ii) the Player's bowling action during the Analysis was materially different to their action in the Match in respect of which he/she was reported, the Player shall immediately be suspended from bowling in interstate and W/BBL cricket until such time as he/she has submitted to a fresh Analysis in accordance with the provisions set out in paragraph 7 below, and it is concluded that he/she has remedied his/her action. The suspension shall commence on the date of receipt by the Player's State Association and/or W/BBL Team of a copy of the Assessment, and the Player is not able to request a fresh Analysis of his/her action until at least 90 days after the commencement of the suspension.

Note: The CA Standard Analysis Protocols contains reference to a level of acceptable elbow extension. Should the Assessment conclude that the Player's

action exhibits a degree of elbow extension higher than the acceptable level the action of the Player shall be deemed to be an “Illegal Bowling Action”. It should be noted that in order for the action to be classified as a legal action, the degree of elbow extension recorded for each and every delivery shall be within the level of acceptable elbow extension.

- 5.2 In circumstances where the Assessment concludes that the Player employed an Illegal Bowling Action during the Analysis in respect of a specific type of delivery only, the Player will be allowed to continue bowling in interstate and W/BBL cricket but subject to the warning (**Warning**) that should he/she continue to bowl any of the specific type(s) of delivery for which he/she has been found to have an Illegal Bowling Action, he/she will run the risk of being reported a second time. In these circumstances a further Suspected Illegal Bowling Action Report resulting in an Analysis concluding that the Player has employed an Illegal Bowling Action (including only in respect of one or more specific type(s) of delivery) will result in the immediate suspension of the Player from bowling in interstate and W/BBL cricket and such suspension shall be considered a second suspension under the provisions of paragraph 8 below.

Note: This is intended to cover the circumstances where a bowler employs a different technique to deliver a specific type of delivery e.g. propelling the ball out of the back of the hand to produce a “googly” or “doosra”. It is not intended to cover the situation where the same basic technique is used to produce a different type of delivery e.g. more effort to produce a bouncer or a ‘yorker’.

- 5.3 Subject to the provisions of paragraph 5.1(d) above, throughout the period up to the date of receipt by the Player’s State Association or W/BBL Team of the Assessment, the Player shall be permitted to continue bowling in interstate and W/BBL cricket. At any time throughout this period the Player is subject to being called on the field by the umpire(s) in accordance with Law 21.3 and the consequences of such Law must apply. During this period a further Suspected Illegal Bowling Action Report will however have no consequence.
- 5.4 Where the Player does not accept the conclusions of an Assessment he/she shall be entitled to a hearing of the Bowling Review Group (**BRG Hearing**) as set out below.

6 BOWLING REVIEW GROUP HEARING

- 6.1 Upon receipt of an application for a BRG Hearing, CA shall appoint a Bowling Review Group as follows:
- (a) The Bowling Review Group shall comprise three (3) people plus the CA Head of Cricket Operations:
 - (i) Human movement specialist (CA Biomechanist or their representative);
 - (ii) An ex-player; and
 - (iii) A legal practitioner.
 - (b) The CA Head of Cricket Operations (or their representative) will be responsible for appointing the members of the Bowling Review Group who will review the reported player. The CA Head of Cricket Operations (or their representative) shall also be responsible for chairing the Bowling Review Group.
 - (c) No member of the Bowling Review Group shall be from the State or W/BBL Team of the Player who is the subject of the BRG Hearing, unless permission is sought by CA and granted by the Player and/or their State Association or W/BBL Team.

- 6.2 The Player seeking a BRG Hearing shall lodge with the CA Head of Cricket Operations written notice thereof within 14 days of the date of receipt by the Player of the Assessment. The BRG Hearing will be held as soon as reasonably possible but at least within 14 days of receipt by CA of the Player's written notice.
- 6.3 CA shall be responsible for arranging the appointment of the Bowling Review Group in accordance with paragraph 6.1 above and for determining the time and place for the hearing. CA shall ensure that the Player, through the Player's State Association or W/BBL Team, is given reasonable notice of such hearing.
- 6.4 The Player shall attend the BRG Hearing. However, if the Player has received notice of the BRG Hearing and fails to attend, the hearing may proceed in the absence of the Player.
- 6.5 The Player shall be entitled to a representative who may attend the hearing.
- 6.6 The BRG Hearing shall be conducted in accordance with the usual principles of natural justice.
- 6.7 The Bowling Review Group will consider the following:
- (a) The video evidence referred to in paragraph 4.1(v) above;
 - (b) The Suspected Illegal Bowling Action Report;
 - (c) The Assessment together with any image based evidence accompanying such assessment;
 - (d) Any further evidence that the Player and/or their representative wishes to present in the Player's defence. This may include a written report, a verbal submission, any expert evidence and image based evidence; and
 - (e) Any written or video evidence that the Player's State Association or W/BBL Team wishes to be considered on behalf of the Player.
- 6.8 The Player and/or their representative shall be entitled to question any person called to give evidence in the course of the hearing on any issue relevant to the hearing. The members of the Bowling Review Group shall be entitled to question the Player and/or any person called to give evidence on the Player's behalf.
- 6.9 After all the evidence and argument has been presented, the Bowling Review Group shall adjourn the hearing to deliberate on its decision.
- 6.10 The Bowling Review Group shall reach a decision by a simple majority vote. The Chair of the Bowling Review Group has the casting vote.
- 6.11 The Bowling Review Group shall decide whether or not the Player has an Illegal Bowling Action and that (i) the suspension of, or the Warning to, the Player be maintained, or (ii) the suspension of, or the Warning to, the Player be lifted. The Bowling Review Group must, in each case, set out the reasons why the decision has been reached, including a summary of the evidence on which the decision was based.
- 6.12 CA will communicate the decision of the BRG in writing to the Player, through his/her State Association and/or W/BBL Team, within 48 hours of the determination of the Bowling Review Group.
- 6.13 Subject to the right of the Player to re-assessment, the decision of the Bowling Review Group shall be final and binding.

7 RE-ASSESSMENT OF PLAYER'S ACTION

- 7.1 A Player who has been suspended from bowling in interstate and W/BBL cricket under these Procedures shall be permitted, under the supervision and with the consent of his/her State Association or W/BBL Team, to continue to play club cricket.
- 7.2 Subject to the provisions of paragraph 8 below, a Player who has been suspended from bowling in interstate and W/BBL cricket under these regulations, may apply to CA for a re-assessment of their bowling action, provided that this application is not made earlier than 90 days after the date that the suspension commenced.
- 7.3 Such re-assessment shall be carried out in the same manner as the Analysis detailed earlier, save that the purpose of the comparison between the re-assessed action and the action of the Player as employed in the match in which he/she was reported shall be to determine the extent of the improvement to their action.
- 7.4 In the event of such re-assessment concluding that the Player has remedied their action and that their action is no longer an Illegal Bowling Action, the Player's suspension shall be lifted and he/she shall be permitted to resume bowling in interstate and W/BBL cricket.
- 7.5 In the event of such re-assessment concluding that the Player has not remedied their action the CA Biomechanist, in their professional discretion, will outline the severity of the illegality of the Player's bowling action to determine the appropriate period of time before an additional re-assessment can occur. For the avoidance of doubt, the CA Biomechanist will prescribe a period of time between 30 days minimum and up to 90 days maximum after the date of the first re-assessment before the Player can to apply to CA for a second re-assessment of their bowling action.
- 7.6 The Assessment resulting from the re-assessment will stand in the place of the original Assessment.

8 SECOND AND FURTHER REPORTS

- 8.1 In the event of a Player being suspended from bowling in interstate and W/BBL cricket under these Procedures for a second time within a period of 2 years from the date of the commencement of the first period of suspension, the Player shall be suspended from bowling in interstate and W/BBL cricket for a minimum period of 6 months. Only after the expiry of this 6-month period will the player be able to approach CA for a re-assessment of their action in accordance with paragraph 7 above.

9 COSTS

- 9.1 The Player's State Association or W/BBL Team will be responsible for all costs incurred as a consequence of the Player being reported under these procedures:
- (a) Analysis and Assessment (A\$2,000);
 - (b) Travel and accommodation;
 - (c) BRG hearing (if applicable);
 - (d) Representation (if applicable); and
 - (e) Re-assessment (if applicable).

10 NATIONAL PATHWAY CHAMPIONSHIPS

- 10.1 If in any CA pathway championship (male or female), a player (a **Pathway Player**) is called by an umpire for throwing in accordance with Law 21.3 or is suspected by the umpire(s) for bowling with an action which contravenes Law 21.2 as read with Law 21.3, the following procedure shall apply.

Note: Umpires, in deciding whether to call or report a player under these Procedures, should use the naked eye viewing the action live. Slow motion television replays should only be used to confirm initial suspicions.

10.2 Reporting procedure:

- (a) Within 24 hours of the conclusion of the match, the umpires shall complete a Suspected Illegal Bowling Action Report, detailing their concerns about the bowling action of the Pathway Player, including, whether those concerns relate to the Pathway Player's bowling action generally or whether they relate to one or more specific types of delivery and hand the Form to the Tournament Director.
- (b) Within 48 hours of the conclusion of the Match in which the Pathway Player is reported, the tournament director shall provide the Pathway Player's coach and CA with a copy of the Suspected Illegal Bowling Action Report.
- (c) CA shall then notify the Pathway Player's State Association confirming that the Pathway Player has been reported, provide a copy of the Suspected Illegal Bowling Action Report, and describe the implications of this report for the Pathway Player with respect to these Procedures.
- (d) Such written confirmation shall require the Pathway Player to submit to the Pathway Player's State Association, in conjunction with the CA National Cricket Centre Biomechanist, carrying out an analysis of their bowling action (**State Association Analysis**) as provided for below.

10.3 State Association Analysis

If a Pathway Player is reported, they shall be required to submit to an analysis of his/her bowling action carried out as follows:

- (a) The State Association Analysis shall be conducted by a bowling advisor appointed by the Pathway Player's State Association, in conjunction with the CA National Cricket Centre Biomechanist.
- (b) The State Association Analysis need not involve the detailed laboratory analysis as prescribed in the CA Standard Analysis Protocols but should involve a genuine effort to assess the legality of the action, taking into account the provisions of Law 21.2, by using available video footage, and the experience and technical bowling expertise of the appointed bowling advisor.
- (c) The State Association Analysis shall be carried out as soon as possible and the Pathway Player's State Association shall provide CA with a written report (**State Association Assessment**) of the outcome of such analysis within 21 days of the receipt of the confirmation of the report.
- (d) The findings of a State Association Assessment must have the endorsement of the CA National Cricket Centre Biomechanist (or their representative) before being submitted to CA.
- (e) Where the State Association fails to provide a State Association Assessment within 21 days, the Pathway Player shall automatically be suspended from

bowling in interstate competitions (including pathway competitions) and the W/BBL from the date of expiry of such notice period until such time as a State Association Assessment has been properly provided.

- (f) Where the State Association Assessment concludes that the Pathway Player employs a legal bowling action, the Pathway Player shall be permitted to continue bowling in interstate competitions.
- (g) Where the State Association Assessment concludes that the Pathway Player employs an Illegal Bowling Action, the Pathway Player shall be immediately suspended from bowling in any interstate competitions (including pathway competitions) and the W/BBL until such time as a further State Association Assessment concludes that he/she has remedied his action.
- (h) Subject to the provisions of paragraph 10.3(e) above, throughout the period up to the date of receipt of the State Association Assessment, the Pathway Player shall be permitted to continue bowling in interstate competitions (including pathway competitions) and the W/BBL. At any time throughout this period the Pathway Player is subject to being called on the field by the umpire(s) in accordance with Law 21.3 and the consequences of such Law must apply. During this period a further Suspected Illegal Bowling Action Report will however have no consequence.

10.4 The Pathway Player's State Association shall be responsible for any costs associated with the State Association Analysis.

11 RECOGNITION OF DECISIONS

11.1 A suspension from bowling in international cricket imposed on a Player under the ICC Illegal Bowling Regulations shall be respected and enforced by CA in respect of CA Competitions automatically upon receipt of notice of the same, without the need for any further formality. CA and each State Association and W/BBL Team shall take all steps legally available to them to enforce and give effect to such decisions.

11.2 Upon a suspension from bowling in international cricket being lifted, a Player not subject to a bowling suspension under these Procedures shall be permitted to bowl in all CA Competitions without the need for any further formality.

11.3 In circumstances where a National Cricket Federation suspends a Player from bowling in domestic cricket under its own rules, where such suspension is imposed on the basis of an analysis of the respective Player conducted by an Accredited Testing Centre and in accordance with the ICC Standard Analysis Protocols, such suspension shall be respected and enforced by CA in respect of CA Competitions automatically upon receipt of notice of the same, without the need for any further formality. CA and each State Association and W/BBL Team shall take all steps legally available to them to enforce and give effect to such decisions.

11.4 Where a Player has been suspended pursuant to paragraph 11.3, the player may submit at any time to a further analysis of their bowling action arranged by the same National Cricket Federation and conducted at an Accredited Testing Centre in accordance with the ICC Standard Analysis Protocols. Where such further analysis determines that they are able to bowl without using an Illegal Bowling Action, the player shall be permitted to bowl by CA in respect of CA Competitions without the need for any further formality.

12 AMENDMENT AND INTERPRETATION OF ILLEGAL BOWLING PROCEDURES

- 12.1 These Procedures shall come into full force and effect on 1 October 2017 (the **Effective Date**). They shall not apply retrospectively to Matches commencing prior to the Effective Date; provided, however, that any Suspected Illegal Bowling Report pending as of the Effective Date shall be governed by the predecessor version of these Procedures in force at the time of the alleged offence, subject to any application of the principle of *lex mitior*.
- 12.2 If any provision of these Procedures is held invalid, unenforceable or illegal for any reason, these Procedures shall remain otherwise in full force apart from such provision which shall be deemed deleted insofar as it is invalid, unenforceable or illegal.
- 12.3 These Procedures may be amended from time to time by CA, with such amendments coming into effect on the date specified by CA.

ANNEXURE 1 – CA SUSPECTED ILLEGAL BOWLING ACTION REPORT FORM

[To be inserted]

ANNEXURE 2 - CA SUSPECTED ILLEGAL BOWLING ACTION ANALYSIS PROTOCOLS

Biomechanical Analysis of a Bowling Action

1. INTRODUCTION

Cricket Australia has introduced a revised process for the review of bowlers with doubtful bowling actions (Bowling Review Process). This process is in accordance with the ICC doubtful bowling action analysis protocols

In order for the Bowling Review Process to be conducted in a fair and consistent manner the following standard protocols for the collection of data and the assessment and analysis of bowling actions have been introduced.

The overall purpose of the report is to confirm the legality / or not, of the action of the player as used in the match situation. Thus the protocols are provided not only for how the action should be analysed in the laboratory setting, but also highlight the need for a detailed comparison between the action performed during the match in which the player was reported and the bowling action analysed in the laboratory.

Cricket Australia has determined that it is the degree of elbow extension, as opposed to hyperextension or abduction / adduction that is prohibited. Elbow hyperextension and elbow abduction / adduction are involuntary movements that cannot be controlled by the individual during the bowling action. (See Paragraph 5.3 & Appendix A)

The conclusion of the report should be that having analysed the action in the laboratory and having compared it to the action as used in the supplied match footage, in the opinion of the expert, the bowler has faithfully reproduced his match technique in the laboratory. A statement concerning the legality of the action with respect of the amount of elbow extension measured and the 15 degree elbow extension tolerance threshold should then follow.

2. VIDEO FOOTAGE FROM MATCH IN WHICH PLAYER REPORTED

The television video footage of the entire bowling spell(s) of the player in the match where the report was made shall be presented on a master tape. (CA to supply match footage. If possible, rear, frontal and lateral views of the action shall be provided.)

The master tape shall be converted to 50Hz / 60Hz (standard television footage is recorded at 25Hz) to enable more accurate evaluation of the player's bowling action on the day the bowler was actually reported.

Descriptive analysis during the match footage should compare the actions of the bowler e.g. positioning of feet, angle of run up, position of the torso, velocity of arm, velocity of delivery (95% of match speed etc). These comparisons should be clearly presented in the report.

3. ANTHROPOMETRIC ASSESSMENT (Both the bowling & non-bowling arms) See Appendix A

Physical Measurements: Height, weight and assessment of general mobility of the shoulder, elbow and wrist joints. Any specific anatomical variances (eg. carry angle, elbow hyperextension)

History of Previous or Current Injuries: A brief history of previous injuries should be determined as an aid in the biomechanical assessment - particular focus should be brought to the elbow and shoulder joints.

4. BOWLING ANALYSIS (Indoors – Laboratory conditions)

All biomechanical assessment shall be carried out with the player bowling off his normal full run-up, on a correct length cricket pitch.

A three-dimensional motion capture system with a minimum of 12 synchronised cameras (using optio reflective markers) operating at a minimum of 200 frames per second and a maximum of 250 frames per second (preferable) should be used to collect the data. The cameras and computer to be operated and positioned in appropriate positions to facilitate a subsequent three-dimensional analysis of the shoulder, elbow, wrist and ball.

Video data (minimum 120fps) should also be collected in order to allow comparison with match footage. These cameras should be aligned from the side and posterior to the bowlers arm. An additional mobile high-speed camera should be aligned at angles similar to those in the match footage. A minimum shutter speed of 1000Hz is required to prevent blurred images.

Calibration and accuracy procedures must be undertaken in alignment with the ICC standard protocols (see Appendix A) prior to data collection.

Optimal "levels of filter" must be used in the laboratory process. Ideally a laboratory environment using opto-reflective marker system will produce the environment with the least amount of error (Noise) and therefore less filtering can be used. Filtering will be applied in line with the ICC guidelines. This includes a Low-pass Butterworth filter of 10Hz for calibration trials and 40Hz for bowling trials.

Warm up (player's own) – but must include the bowling of a number of deliveries at match pace prior to data collection. The player to have no clothing on the torso, in order to enable the correct marker set to be placed on the bowling arm. (In line with ICC standard protocols) Automatic digitisation of the marker set will enable joint centres to be determined during each delivery.

In respect of a fast bowler, six 'normal' – good length deliveries, six 'yorkers' and six 'bouncers' must be recorded. Six deliveries of each spin variation for the leg or off spin bowler must be recorded. Standard video cameras should be used to assess the position the ball lands, along with the amount of bounce and turn created with each delivery. This video should also be presented in the report.

Three-dimensional analysis of the bowling arm to begin from back foot contact, to include 'arm horizontal' maximum flexion, ball release and a minimum of 10 frames after ball release for each successful delivery.

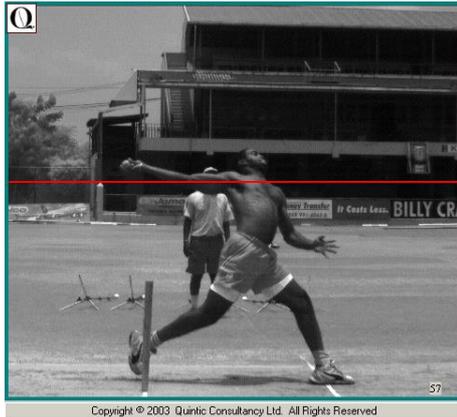
Upper arm horizontal is calculated within the ICC illegal action software GUI and defined as occurring when the shoulder joint centre and elbow joint centre have the same z-axis co-ordinates. Figure 1A depicts upper arm horizontal i.e. The upper arm being level with shoulder and parallel to the ground.

Hand-Ball distance is calculated during the bowler calibration trial. The biomechanist will touch the ball (with reflected tape attached to either side) against the tip of the bowlers fully extended fingers. The distance between the Origin of the wrist marker cluster co-ordinate system and the ball is calculated from this trial. The moment of ball release is defined as occurring when the Hand-Ball distance exceeds that calculated in the calibration trial.

Figure 1a: Arm Horizontal – NO



Figure 1b: Arm Horizontal – YES



Every effort must be made to ensure that the player is bowling as close to match pace as possible. This can be measured after each delivery by comparing ball speeds and video footage during the assessment with those from match play. If deliveries are not at a suitable speed (so as to represent match conditions) or the comparison of video footage deemed dissimilar, the bowler will be required to continue bowling until the Biomechanist is satisfied that the match action is being replicated. In the event that the bowler is unable to and unwilling to replicate his match action the test will be deemed invalid and the bowler will be considered to have failed the assessment.

5. PRESENTATION OF RESULTS

A summary of the results of each delivery to be presented – graphical or table format.

The presentation of still sequences taken from high-speed video footage from each of the delivery type assessed (ie. stock delivery and any variation) as well as any particular delivery of interest will be presented from side-on and posterior views. In the event that match footage is available, still sequences from this footage will be presented alongside the comparable view from the assessment.

The 'flexion-extension' curves should be presented either as a group average \pm standard deviation for each delivery type, or as individual deliveries. This data should be presented in graphical form, with specific data values for flexion-extension angle at arm horizontal, maximum flexion, maximum extension and flexion-extension angle at ball release. Hyperextension values will be represented by negative values, with any values below zero being considered as 0 degrees for all calculations of elbow extension (ie hyperextension is not included in the calculation of elbow extension)

Ball release speeds to be presented for each delivery.

Stick figure representation, to include pictures of the various key positions to aid in the presentation of the results. (Alternatively, an avi file may be provided.)

6. ACCEPTABLE LEVEL OF ELBOW EXTENSION

This should be set at a maximum of 15 degrees 'Elbow extension' for all bowlers and types of deliveries. This specifically refers to extension of the forearm relative to the upper arm to the straight position. Elbow hyperextension or adduction is not included in the 15-degree tolerance threshold. It should be noted that in order for the action to be classified as a legal action, the degree of 'elbow extension' recorded for each delivery should be within the 15 degree limit.

APPENDIX A: MOVEMENTS.

Flexion - This movement takes place about a transverse axis and is a description of the movement that occurs when you move your arm forward. It is described as the approximation (moving closer together) of two ventral surfaces of the body e.g. flexing the elbow joint. There are a number of situations where this rule doesn't seem to apply e.g. at the ankle where the terms dorsi and plantar flexion are used to avoid confusion.

Extension - This movement is the opposite of flexion; it also takes place about a transverse axis and occurs when you approximate two dorsal surfaces e.g. straightening the elbow.

Hyperextension - An abnormal movement beyond the normal limit of extension, such as more than the 180 degrees of extension of the knee or elbow joints.

Abduction and Adduction - These movements take place about an antero-posterior axis and occur when the arm is taken sideways away from the body (abduction) and returned from such a position to the side of the body (adduction).