PITCHING MECHANICAL EVALUATION FORM

Based on biomechanical data collected at the American Sports Medicine Institute
Birmingham, Alabama 1999

- Provides quality objective feedback
- Helps detect mechanical flaws which may lead to injury or decreased performance
- Simple to complete - requires only a camcorder!

EVALUATION DETAILS:

Pitcher's name:_____
Date of test: _____
Age: _____
Team/Park: _____
Average radar gun/speed: _____
Evaluator: _____

HOW TO FILM YOUR PITCHER:

Anterior View:
Right-handed pitcher
Three metres (10 feet) behind the right-handed batter's box.

Left -handed pitcher:
Three metres (10 feet) behind the left-handed batter's box.

Lateral View:
Right-handed pitcher
On the home-thirdbase line at a point 90 degrees to the pitching rubber.

Left-handed pitcher:
On the home-firstbase line at a point 90 degrees to the pitching rubber.

Posterior View:
Right-handed pitcher
Halfway between the centre of the pitching rubber and second base.

Left-handed pitcher:
Halfway between the centre of the pitching rubber and second base.

Place the camera on a tripod. Zoom in to fill as much of the view as possible with the pitcher, allowing for stride length.
Use the highest possible shutter speed to minimise blur.
Record at least 3 trials per view (anterior, lateral, posterior)

COMPLETING THE EVALUATION

- Using the recommended view, watch the pitcher frame by frame for 3 or more trials per variable, before making a judgement.
- Distinguish between the movement of clothing and that of joints or body segments.
- Check one box only per section.
- Ideal mechanics are shown in italics.
- Explanatory medical notes are provided, marked with ⓘ
- Comments and recommendations can be made on the Summary page.

PITCHING MECHANICS CHECKLIST

(I) PREPARATION

1) Initial Movements - Windup:

☐ *The pitcher takes a small step back. The hips and shoulders turn 90 degrees to the target as the pivot foot is aligned with the rubber.*
☐ The initial movements cause the pitcher to be unbalanced.
☐ The head does not remain positioned over the pivot foot.

ⓘInstability and lack of rhythm in the pivot causes unreliable pitch location and poor transfer of force from the lower body to the arm.

2)Balance Position

☐ *The pitcher is balanced at maximum knee-lift: the trunk is upright over a slightly flexed rear knee, the head is over the rear knee and has not travelled toward home-plate before the stride knee descends.*
☐ The pitcher's lower body moves prematurely toward home-plate.
☐ The pitcher leans backwards or toward second base during knee-lift.

ⓘPremature movement toward the plate causes the stride hip to open early. Inappropriate lean indicates incorrect positin of the hands, or excessive flexion of the supprt knee.

3) Hand Separation

☐ *From a position close to the chest, the hands move apart only as the stride hip moves towards the target. The throwing hand breaks from the glove in a downward, backward and upward motion. Fingers remain on top of the ball.*
☐ The hands separate early and disrupt smooth down-back-up movement.
☐ The hands separate late and disrupt smooth down-back-up movement.

ⓘExcessive arm swing behind the body increases stress on the shoulder during arm cocking. Insufficient downward/backward movement affect the position of the arm at foot contact. The throwing hand should break down and back before moving rapidly up so that the upper arm is horizontal and the hand

(II)STRIDE

4. Movement of Stride Hip

☐ *The stride leg descends directly toward the target. The lateral aspect of the lead hip faces the plate until just before foot contact.*

☐ The stride leg is flexed but placed down close to the pitcher's support leg as the hands separate.
☐ The stride leg is flexed but swings open as the foot begins downward movement.

ⓘAs the hands move apart, the lateral hip and heel of the stride leg move toward the batter, ensuring hip rotation does not occur prematurely and leave the arm behind at foot contact.

5)Stride Length

☐ *The pitcher lands on the ball of the foot. Measured from the rubber to the front ankle, the stride length is 80-90% of the pitcher's height.*
☐ Stride length is substantially less than the pitcher's height. The head is positioned toward the front foot.
☐ Stride length exceeds the pitcher's height . The back foot pulls off the rubber.

ⓘStride length significantly affects the motion of the trunk - incorrect stride length may cause the body weight to prematurely move forward., or block hip rotation and the use of the trunk to propel the ball forward.

6) Knee Flexion and Weight Distribution at foot contact

☐ *The angle behind the stride knee is 120-145 degrees when the stride foot makes full contact with the mound. The head forms an even triangle with the feet.*
☐ The stride knee is too straight. The head has moved too far forward.
☐ The stride knee is too flexed.

ⓘA semi-flexed knee at contact allows rotation of the hips without dissipating the energy generated by winup through blocking hip rotation or causing...

(IIa) FOOT PLACEMENT

7) Stride Offset

☐ *The stride foot is grounded within 10cm (4 inches) of an imaginary line from the instep of the pivot foot to homeplate.*
☐ The stride is too closed (foot placed across the body/toward third base for a right-handed
☐ pitcher RHP)
☐ The stride is too open (placed toward first base for RHP)

ⓘIf the stride offset is open, the hips have prematurely rotated toward the target and left the arm behind, increasing stress on the shoulder as the trunk rotates. An excessively closed offset does not permit complete hip rotation to assist the arm during acceleration.

8.Foot Angle at Contact

☐ *The toes of the stride foot (when in complete contact with the mound) are rotated slightly inward.*
☐ The front foot angle is too closed (turned toward third base RHP)
☐ The front foot angle is too open (turned toward first base RHP)

ⓘOpen angle of the lead foot indicates the pitcher's hips have prematurely rotated towards the target. A closed foor angle compromises hip rotation.

(III) ARM PATH

9. Arm Cocking

☐ *The throwing hand breaks from the glove and moves down, back and up into a cocked position the shoulder.*
☐ The hand moves back and up without moving down
☐ The hand swings back too far behind the pitcher's body.

ⓘThe "down" movement of the hand coordinates the arm with the motion of the stride hip so the arm is correctly placed at foot contact and during trunk rotation. Excessive arm swing behind the body creates stress at the shoulder and elbow as the trunk rotates and rapidly reverses the direction of trunk travel.

10) Arm Position at Foot Contact:

☐ *The throwing arm is level with, or slightly behind the body. The throwing hand is directed to shortstop (RHP), forearm is vertical and fingers are on top of the ball.*
☐ The arm does not reach a point directly behind the body and forearm is directed toward the open side.
☐ The throwing arm swings significantly behind the body and forearm is directed to the closed side (first base for RHP)

ⓘExcessive arm swing behind the body creates stress stress at shoulder and elbow as arm is left behind while the trunk rotates to face the hitter. An inadequate arm path limits the range of motion through which the pitcher can impart force to the ball.

11) Shoulder Abduction at Foot Contact

☐ *The throwing elbow is level with the line of the shoulders at foot contact - the abducted arms and the trunk of the pitcher form a "T".*
☐ The throwing elbow is below the line of the shoulders.
☐ The throwing elbow is significantly higher than the shoulder line.

ⓘAn improperly positioned elbow substantially increases the stress on the throwing shoulder and elbow throughout acceleration. The "T" position provides optimal stability for the rotating arm.

12) Elbow flexion at Foot Contact

☐ *The throwing elbow is flexed to approximately 90 degrees as the lead foot contacts the mound.*
☐ The throwing elbow is flexed toward the pitcher's head.
☐ The throwing elbow is too straight.

ⓘA straight elbow decreases the ability of the elbow to generate velocity when extending toward ball release. Excessive elbow flexion may cause the arm to "fly open" with great force and cause elbow injury as the trunk rotates.

(IV) ACCELERATION
(IVa) TRUNK MECHANICS

13. Timing of Hip/Shoulder Rotation:
☐ *The pelvis rotates shortly after the foot is grounded, and rotates toward the target before the shoulders (the front shoulder remains closed to the target until the hips have rotated).*
☐ The pelvis rotates toward the target *after* the shoulders.
☐ The pelvis and shoulders appear to rotate toward the target *simultaneously*.

ⓘThe shoulders rotating after the hips allows greater energy to be stored. Thus greater angular velocity of the upper trunk can be transferred to the arm.

14) Trunk Arching and Drive:

☐ *From the first contact of the stride foot, the trunk is held back. The trunk is hyperextended as the shoulders rotate toward the hitter.*
☐ The trunk remains in a neutral alignment as the shoulders rotate.
☐ The weight has moved forward early; the truk flexes further as shoulders rotate.

ⓘHolding the trunk back as long as possible allows maximum energy from the hips to be stored and imparted to the arm at ball release. Arching the back prestretches the muscles of the abdomen, allowing the trunk to move toward the plate with greater velocity at release.

15) Use of Glove Arm:

☐ *The glove is at the level of the non-throwing elbow and pulled back close to the body as the pitcher's shoulders rotate toward the plate.*
☐ The glove arm remains extended in front of the pitcher.
☐ The glove hand hangs by the pitcher's non-throwing side.

v By actively moving toward the body, the non-throwing arm contributes to the

(IVb) ARM MECHANICS

16) Maximum Elbow Flexion During Cocking/Acceleration:

☐ *The throwing elbow does not flex beyond 70-90 degrees as the upper torso rotates toward the hitter.*
☐ The throwing elbow collapes inward toward the pitcher's head.
☐ The throwing elbow is too straight.

ⓘA straighter elbow increases the stress on the joint during acceleration due to a longer level arm. Excessive flexion may jam of the posterior aspect of the elbow if the arm "flies open" during the acceleration phase.

17) Maximum External Rotation:

☐ *The forearm is parallel with the ground as the trunk faces the hitter.*
☐ The throwing arm does not rotate back far enough.
☐ The throwing arm reaches maximum significantly before (or after) the trunk faces the hitter.

ⓘSequential opening of the hips and shoulders places the arm in a "laid-back" position prior to elbow extension and ball-release. External rotation stores energy to be imparted to the arm during acceleration, but places high demand on the elbow.

(V) BALL RELEASE
(Va) LOWER BODY MECHANICS

18) Knee Flexion at Ball Release

☐ *The stride knee is straighter at ball release than at foot contact (see #6- knee should be about 145 degrees at initial foot contact)*
☐ The stride knee is too straight
☐ The stride knee is too flexed

ⓘA relatively straight knee indicates the pitcher may be rushing or using a short stride which allows his trunk to flex early and forces the stride knee to straighten. A flexed stride knee may indicate the trunk is collapsing forward at ball release.

19) Lateral Trunk Tilt at Ball Release:

☐ *The trunk is tilted approximately 20 degrees toward the non-pitching side.*
☐ The trunk is too upright
☐ The trunk is tilted too far and the chin is not aligned over the stride knee

ⓘLateral trunk tilt directs the body and arm in deceleration. Improper lateral tilt can place the arm in a poor position at ball release and during follow-through, and lead to shoulder injury or decreased control of pitch location.

20) Trunk Flexion at Ball Release

☐ *The trunk is flexed forward approximately 60 degrees at release*
☐ The trunk is too upright
☐ The trunk is too flexed

ⓘExcessive trunk flexion dissipates the stored energy of the trunk and leaves the arm behind. Insufficient trunk flexion will also stress the arm as the trunk is not transferring the energy from the lower body.

(Vb) ARM POSITION

21) Trunk-Arm Alignment at Ball Release

☐ *The upper arm is approximately level with the body-line at release*
☐ The arm is too far behind the line of the trunk
☐ The arm is too far ahead of the trunk - the pitcher leads with the elbow.

ⓘThe arm should only be slightly in front of the trunk, allowing for the final whip of the forearm and hand to impart velocity and spin to the ball.

22) Shoulder Abduction at Ball release

☐ *The elbow is at, or slightly above, the line of the shoulders at ball release*
☐ The elbow is too far below the shoulders
☐ The elbow is too far above the shoulders

ⓘAn excessively high or low elbow at release may damage the shoulder - a high compressive force is generated which may jam, grind or tear internal structures. Location and control of the pitch may also be affected.

23) Elbow Flexion at Ball Release:

☐ *The elbow is flexed approximately 20 degrees as the ball leaves the pitcher's hand.*
☐ The elbow is too flexed
☐ The elbow is straight or hyperextended

ⓘA straight elbow (long lever arm) increases stress on the jont as the arm is forcefully rotated at ball release. Excessive flexion increases the stress on the posterior aspect of the joint after ball release as the elbow continues to extend, the posterior elbow may be jammed.

(VI) DECELERATION

24) Follow-Through

☐ *The trunk is horizontal when the throwing hand is farthest from the trunk. The hand is outside the extended lead leg. The back of the shoulder is visible.*
☐ The trunk is too upright and the hand does not finish outside the leg.
☐ Trunk flexion is poorly directed, and causes the pitcher to overbalance.

ⓘThe continued flexion of the trunk during follow-through allows the large muscles of the trunk and legs to absorb the energy of the arm and protect the posterior shoulder and elbow. A well-directed follow-through leaves the pitcher

SUMMARY

Good pitching mechanics can improve performance and reduce the risk of injury.
Pitching is a complex motion. The action of the lower body and trunk profoundly influence the position and timing of the arm path.
Technical faults and injury are often a result of *combinations* of joint actions.
(tick one box only)