

Chapter 3

LOWER BODY THROWING FUNDAMENTALS

The legs are the shot. The legs are aim, accuracy, angularity, verticality and velocity.

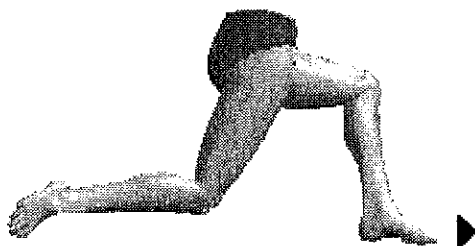


- 1. Point Left Foot, Pivot**
- 2. Right Leg Straight Back**
- 3. Snap-In the Right Foot**
- 4. Rotate the Right Hip**
- 5. Vertical Back**
- 6. Crunch the Abs**
- 7. Elevation**
- 8. Elevate, Rotate, Crunch Abs**
- 9. Weight Transfer**
- 10. Balance**

The legs throw the ball. The water polo player's throwing motion is dominated by the lower body: the hips, legs, and feet. The shot or pass is the legs. The shot or pass is leg positioning and footwork. The shot or pass is hip positioning and hip rotation. The shooter's legs are aim, accuracy, verticality and ball velocity. For example, a shot that hits the goalie in the stomach; flies over the top of the goal; or is a weak shot are the result of weak legs and poor leg positioning. Too much emphasis is placed on right arm motion and release. The legs are the shot.

The shot starts in the toes and ends in the fingertips with the toes being more important than the fingertips. The shooter's legs create aim by pointing the left foot. Accuracy is created by strong legs that provide a stable base. Verticality, a vertical back, is the result of a strong leg kick. The power of the shot comes from the legs. The legs and hips are fifty-percent of the power for the shot. The right arm does not aim the ball, create accuracy, verticality and provides only 25-percent of the throwing power. Truly, the legs are the throwing motion. The lower body fundamentals are based on ten rules.

1. POINT THE LEFT FOOT AND PIVOT

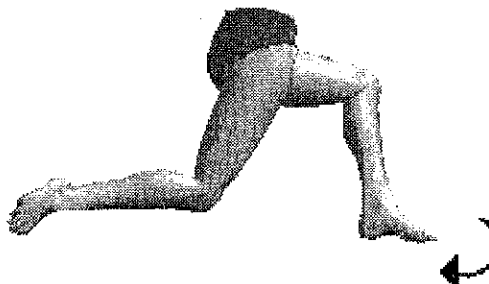


3.1 Shooter's left foot points at corner.

The shooter's left foot must be pointed at the target (goal) as a pointer or gun sight. The second use of the left foot is as a pivot point to rotate the body around. Accuracy and corner selection is determined by where the left foot points. Without a fixed point to rotate backward to cock the body and arm and to rotate forward to release the ball there is no power for the shot. The right hand follows the left foot's direction when throwing the ball (see Fig. 3.1).

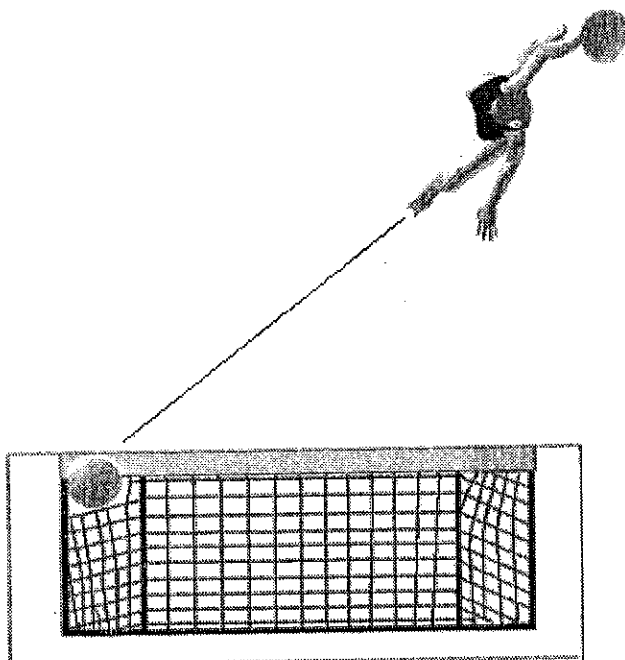
The rules: **Wherever the left foot points, is where the ball goes; and no point, no pivot.**

The left foot point is also a fixed point for the body to rotate and pivot. The left foot is like the end of the top that allows the body to rotate around it. The rotation of the shooter's body is dependent on the left foot forward position. The shooter cannot rotate if the feet are square (parallel) to the goal. For example, the ballerina and ice figure skater spin around a pointed foot (see Fig. 3.2).



3.2 Left foot is a pivot point for rotation.

Mistakes in accuracy, such as wide-of-the-goal shots, are the result of the shooter not pointing the left foot at the corner of the goal when throwing the ball. The right hand follows where the left foot points. For example, the shooter with the left foot pointed at right corner of the goal throws the ball at the right corner. He or she cannot shoot at the left corner or center cage across the left foot (see Fig. 3.3).



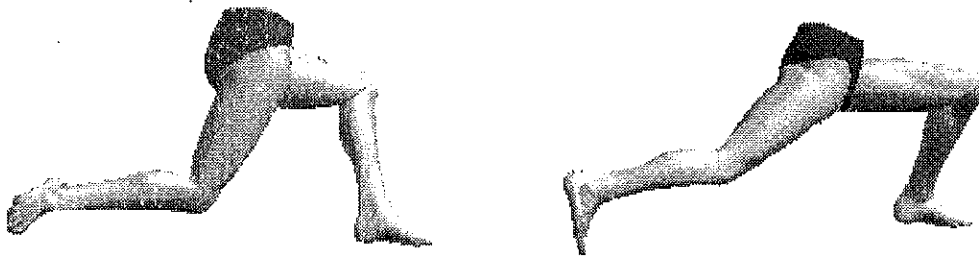
3.3 Cross-cage shoots aims left foot at right corner.

When the cross-cage shooter shoots at the right corner and hits the goalie at center cage, the solution is to move the left foot over and point it at the right corner.

SCIENCE OF SHOOTING

Boys miss the left corner because of over-rotation of the hips. Over-rotation moves the shooter's left foot to the outside of the cage. The boy shooter needs to aim the left foot deeper into the left corner to compensate for the left foot moving 6-inches (15-centimeters) to the left with the rotation of the hips. All shooters need to practice medicine ball tosses side to side to strengthen the hip rotator muscles to increase hip speed and to stabilize hip motion.

The majority of shooters do not have a cross-cage shot to the left because they do not understand the left foot aims the ball or cannot control their hips. The left foot as pointer and pivot foot are the basics of aiming and throwing the ball and should be used with every shot.



3.4 Right leg back, knee bent, foot rotates. Right leg extend and right foot snaps in.

A demonstration to prove this principle of pointing is to have the player point the left foot forward on the deck or in the water and attempt to move the right hand passed the left foot; it cannot be done. To shoot to the left, the left foot is moved first to the left, then the right hand points at the left corner of the goal. The right hand is not a pointer but a follower.

2. RIGHT LEG STRAIGHT BACK

The shooter's right leg is positioned so it is straight back and almost horizontal with the surface of the water. The straight back leg position provides tremendous leverage for the shooter. This position allows the right foot to snap inward and rotate the whole body of the shooter for maximum force. The right leg straight back helps the player in catching the ball, being balanced and remaining vertical. When the right leg is back, the torso is tilted forward at 15-degrees. The ball is caught the player's hand and the torso straightens to the vertical. The right straight back leg acts as a tripod to balance out the player's body. The force of the ball forces the forward leaning torso back to the vertical (see Fig. 3.4).

In addition, the right leg straight-back-position places the right foot in the correct spot in the water for the foot to snap-in as part of a rotational kick to begin the throwing motion. The shooter cannot scissor kick the legs together and continue to pump faking. When right leg positioning mistakes are made, the shooter's leg positioning is square-to-the-goal, legs under the hips and using a scissor kick (both legs slap together). A square-legged shooter with both legs together has little stability and balance, and falls over when catching the ball.

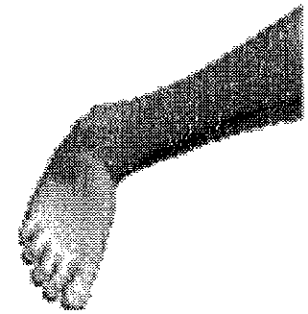
SCIENCE OF SHOOTING

When the shooter is using a scissor kick, the sideways force of the scissor kick knocks the shooter to the left and causes the ball to veer to the left. The right foot rotational kick is right foot snapping inward to begin the shot. The rotational kick provides for better stability. On the other hand, the scissor kick where the legs slap together moves the shooter sideways. For example, the young square shooter is throwing the ball at the left corner, scissor kicks, and the ball is wide of the left goal post.

3. SNAP-IN THE RIGHT FOOT

The snap-in is the right foot rotating inward that begins the throwing sequence to release the ball. The snap-in is the last kick of the shooter. The right foot throws the ball (by beginning the throwing sequence).

Rotating the right foot rotates the whole body of the shooter. When the right foot snaps-in, the body begins the link-by-link sequential process (legs, hips, torso, and right arm) to release the ball for a pass or shot (see **Figure 3.5**).



3.5 Right foot snap-in begins the shot.

The shooter, in reality, shoots the ball with his or her right foot. The rule: No right foot snap-in= no shot. The throwing motion starts with the right foot snap-in and transfers force up the through the body into the legs, hips, torso and right arm. For the right foot snap-in to be most effective, the shooter has to extend the right leg straight back for the foot to be its greatest mechanical advantage. The shot starts in the toes and ends in the fingertips.

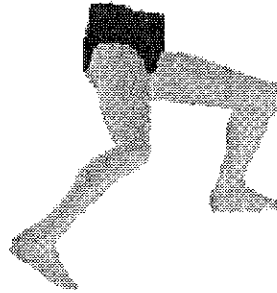
In baseball pitching we see a perfect above the water picture of right foot snap-in beginning the throw. The pitcher moves the weight of the body onto the right foot. He then uses the right foot as a pivot point to rotate the body. Then he pushes off with the right foot produce the forward motion for the pitcher's body to throw the ball. The pitcher never pitches the baseball without first using the legs, and, without the right foot snapping-in to begin the pitch.

Likewise, in the water polo shot the shot starts in the legs. The right leg that is straight back and slightly bent kicks back to straighten out, rotate inward the right foot and then pushes back with the foot. Both foot motions are the same. It is just easier to see it visually with the pitcher.

4. ROTATE THE RIGHT HIP



3.6 Right hip rotates to right to cock the ball and body.



3.7 Right hip rotates to left to shoot.

The right hip controls the rotation of the shooter. The right hip when rotated backward allows the right leg to be fully extended. When the right hip is fully rotated back the whole body of the shooter is cocked. When the right hip rotates forward or accelerates forward, the ball is shot. Right hip rotation creates the shooter's left shoulder point, left foot point, right leg extension and length of the leg extension and the length of the arm cock and the forward throwing motion (see Figs. 3.6, 3.7).

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The right hip creates the shooter's left shoulder point, left foot point, right leg extension, the length of the leg extension and the length of the arm cock. For example, when the right hip is partially rotated backward, the arm cock/arm extension is short; and the hip is fully rotated to the right a long arm cock/arm extension is created. The right hip rotates forward to accelerate the whole body forward to throw the ball.

The mistake frequently made by the young shooter is to have square hips that do not allow for body rotation to the right to catch and cock the ball and to rotate the body forward to the left to shoot the ball. Without a cocked right hip for hip acceleration there is little power to throw the ball. Hip rotation is the shot. Many girls have a square hip position and cannot rotate their body for a high-speed shot. The young shooter must carefully watch their hip positioning so he or she can throw the ball properly.

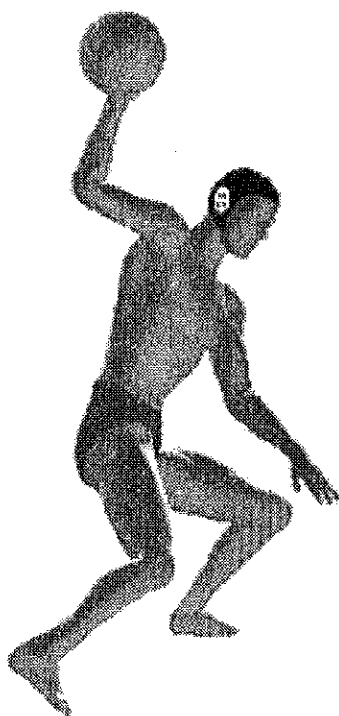
5. VERTICAL BACK

The back or torso of the shooter must be vertical. The shooter cannot elevate out of the water if they are not vertical in the water. The elements that make the shooter's back vertical are: the right leg straight back for balance, strong legs to keep the player upright and a short to medium arm cock that does not tip the player over. When these elements are in place, crunching the abs and weight transfer can occur.

The young shooter is likely to be horizontal. The horizontal throwing position creates grave problems for the shooter. If the shooter is not vertical, s/he cannot rotate the hips. A top cannot spin lying on its side. Part of the cause of falling backward is the shooter's weak legs. But also is the shooter's lack of effort. A weak-legged shooter is always horizontal; an undisciplined shooter is always horizontal. To improve verticality the shooter must work the legs hard in eggbeater drills and be aware of the position of their back at all times.

6. CRUNCH THE ABS

A third of the motion of the shooter is snapping the torso forward (crunch) to throw the ball. Half of the body's weight moving forward comes from the torso motion. The torso is the heaviest part of the shooter's body. For the highest velocity shot, the torso (abs, back and chest) must fully accelerate forward as fast as possible (see Fig. 3.8).



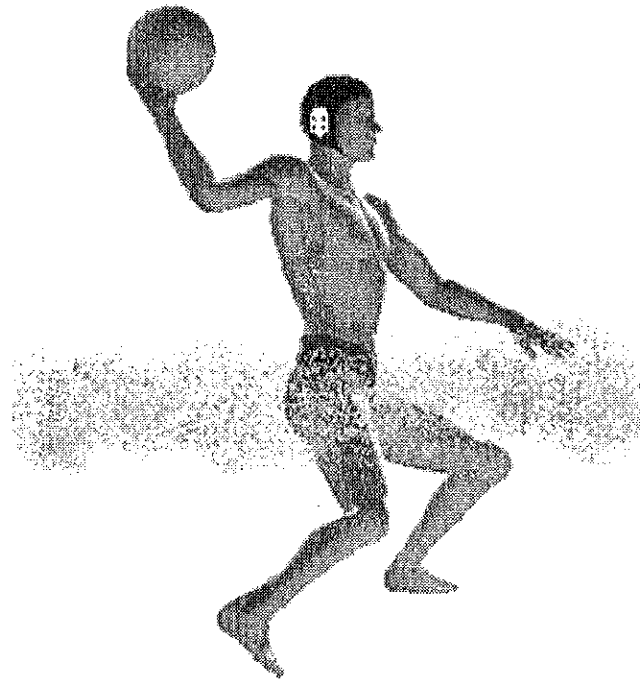
3.8 Crunch the abs.

The shooter's body must move forward to throw the ball correctly. The shooter's torso cannot fall backward as the arm accelerates forward. Countermotion is created as the shooter's major body parts move in two opposite directions. Correct motion has all of the shooter's body moving forward.

The shooter's abdominal muscles crunch and snap the torso forward creating great power. In a 200-pound shooter, the torso is approximately 100-pounds of shooter's weight. Crunching the abs snaps the torso forward with power. This is only possible when the shooter is vertical in the water.

The horizontal shooter uses the ab crunch to lift the weight of the heavy torso against gravity to get the body back to the vertical. There is little ab strength left to snap the torso forward to shoot. The lying-on-the-back position places the shooter at a huge mechanical disadvantage. It eliminates 25-percent of the power shooter's total power. Kick hard and stay high is the rule.

7. ELEVATION



3.9 Elevate with the legs.

Elevation is the number one criteria for evaluating the ability of a shooter. The greatest shooters get the highest out of the water; the weakest shooters do not get their chins out of the water.

The higher the shooter can get out of the water the greater the leverage of the body and the harder and more accurate the shot (see Fig. 3.9).

The center of the shooter's hand must be at least 30-inches out of the water. In this high hand position, the hand is aiming the ball at the center of the high corner of the goal that is 30-inches high. Low hand elevation creates a low corner shot.

The lazy shooter on the other hand does not want to kick high and hard with the legs and consequently is very low in the water with a wet chin and is forced to shoot low.

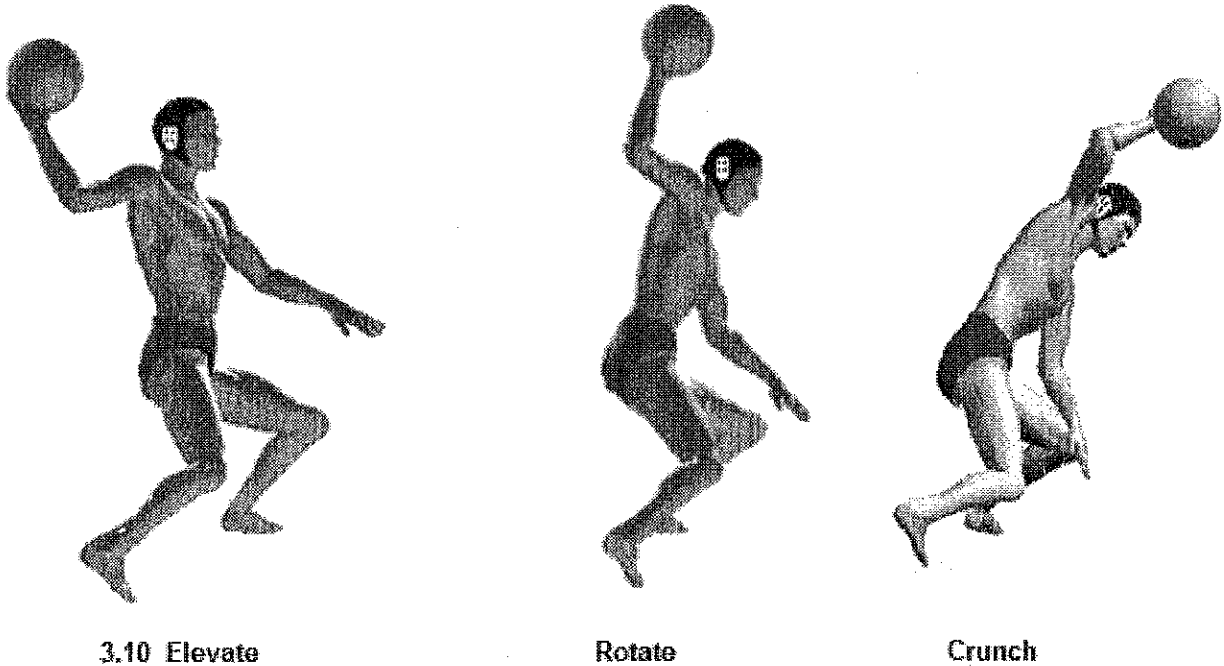
A completely submerged shooter can barely throw the ball against the resistance of the water, generates little power and has such a low release point that all of his or her low shots and passes are easily blocked. The low elevation player must use their legs to get higher out of the water to become a successful shooter.

The preferred shooter elevation for the high school player is to show the belly button. For the elite high school male athlete, several inches below the belly button or the top of the trunks must be visible. For elite high school women the upper hip and thigh must be above the surface of the water. Girls can get higher out of the water than the boys because of their shorter and lighter torso; do not be fooled because of the gender.

Elevation is one of the few things that the player can do, or the coach can demand, that makes a significant difference in the shot. Every player can kick harder with the legs and gain at least 6-inches (centimeters) more of vertical height out of the water. The latest research shows the best water polo players can jump high and sustain the height out of the water for three seconds or more. To leap high out of the water and then immediately catch the ball and fall over is not the answer. High elevation and a sustained height is what makes a good shooter.

8. ELEVATE, ROTATE AND CRUNCH

The shot is a three-part motion: **elevate** to clear the water from the hips, **rotate** the hips and **crunch** the abs to snap the torso forward. The shooter must first elevate as high out of the water as possible. Elevation clears the water away from the shooter's chest, abs and most of the hip area. Water is 600 times more than dense than air. Rotating and crunching the body is four times faster in the air than underwater due to drastic reduction in drag.



Without high elevation, there is not fast hip rotation or a quick ab crunch. The drier the shooter, the faster is the body and arm motion. The ball is not thrown efficiently unless the shooter's body is out of the water and able to elevate, rotate and crunch (**see Fig. 3.10**).

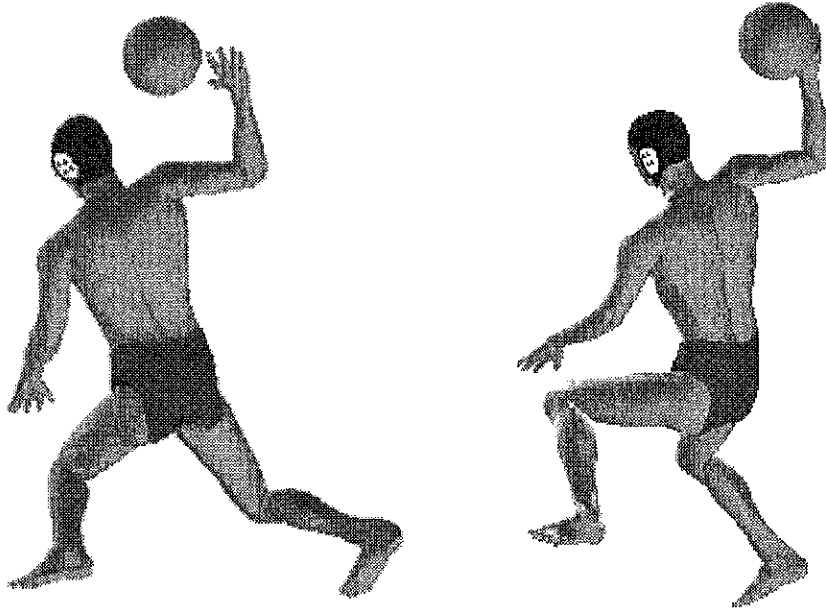
When the shooter's body is elevated out of the water, the hips can rotate quickly without the drag and friction of the water. The hip rotation must occur first before the abdominal muscles can flex (crunch) forward. It is a quick 1-2-3 motion of elevation, hip rotation and crunching the abs.

This extremely quick hip rotation and forward ab movement creates a quick whole body throwing motion for the shooter. The quick shot is not solely a quick right arm motion. The quick shot is a quick leg, hip, and ab motion. A quick arm motion comes from a quickly moving body of the shooter. The quick wrist shot does not exist. It is part of a quick whole body shot.

SCIENCE OF SHOOTING

The young or lazy shooter may not want to kick high and hard with legs, elevate, rotate and crunch the abs to throw the ball hard. It takes a lot of effort and discipline for the shooter to do the 1-2-3. It takes a lot of effort to elevate to slam-dunk a basketball, and the basketball player puts out the effort. The shooter must attack the goal like a fighter and not act like a submarine.

9. WEIGHT TRANSFER



3.11 Weight transfer onto left foot to shoot. 3.12 Weight transfer onto right foot to cock ball.

Weight transfer is the shifting of the shooter's right foot when catching and cocking the ball and then shifting the body weight to the left foot to throw the ball (see Figs. 3.11, 3.12).

The football quarterback has the same weight shifting mechanics as the water polo player. The quarterback steps back on his right foot to cock his arm and body and then steps forward to his left foot to throw the football. Weight transfer and balance are common problems with all shooters. When the water polo player has weak legs and a poor sense of balance all of the shooter's weight stays on the right foot.

This incorrect action causes the shooter to fall over as the right arm accelerates forward to shoot the ball. When all of the weight is on the right foot, the shooter's hand is angled back at an extreme angle and the ball is aimed high above the goal. A heavy right foot by the shooter, caused by the lack of weight transfer onto the left foot, forces the ball to fly over the top of the goal. The proper weight forward transfer by the shooter onto the left foot makes the hand vertical and aims the ball at the goal. Weight transfer controls the hand angle and accuracy.

10. BALANCE

Balance is controlling weight transference when catching, cocking the ball and accelerating the ball. The rule is: no balance, no shot. The shooter must have balance, achieved by maintaining a vertical posture in the water, when catching and throwing the ball while controlling weight shift from the right leg to the left leg (see Figs 3.11, 3.12).

The player creates balance from the brain and the legs: weight on right leg for catching and cocking; weight on the left foot for throwing. Leg positioning creates the vertical back, proper hip rotation and proper weight transfer. Balance is the combination of the shooter's leg motions balancing out the legs and the brain sensing the vertical.

When the shooter throws the ball with the proper balance there is correct weight transference. The shooter's weight shifts from the back leg for cocking the ball and to the front leg for throwing the ball. The shooter remains upright and balanced during the weight shift, which creates the great shot.

The unbalanced shooter has all of his or her weight on the right leg and never shifts the weight onto the left leg. Shooting is balance. An unbalanced shooter with poor weight transference can never throw the ball correctly. The goal of the shooter is to remain balanced during the cocking and the acceleration stages of the throw. The young shooter incorrectly uses the water to balance out his or her body by falling over onto the water. Being flat on the back in the water is not a balanced body position and creates the bad pass and bad shot.

Balance is a brain/body ability of being able to sense the vertical and keep the player's back vertical. The player learns balance in the water by performing catching and throwing exercises with a vertical back, perfect right leg technique and leg strengthening exercises. Balance in the water is the most difficult of all the fundamentals to learn.

In an age group player, the lack of balance is the first thing one sees. The young player with a poor sense of balance and weak legs catches the ball and falls over or the passer falls over while throwing. Balance, however, is a trainable quality if the legs are strengthened and the player is taught to have a vertical back at all times. For example, balance many times is a right leg positioning problem. A player falling over always has the right leg under the hips instead of straight back. Other times the young player assumes that the water is his/her friend and falls over because it is easier to catch and shoot in the horizontal than to kick hard and remain vertical.

SCIENCE OF SHOOTING

The coach should **never** allow a player at any age level to fall over when catching or shooting the ball because this movement will wrongly train the young athlete's brain and back to believe that the horizontal is the vertical. Then after these bad habits are learned, they become the most difficult to root-out later in the player's career.

In conclusion, the legs are the shot. The position of the left foot aims and pivots the body. Before the ball is thrown, the shooter's feet and legs must set up the shot. The legs are responsible for the power of the shot, the accuracy of the shot and balance. The shooter's legs transfer power into the shooter's torso and right arm for the shot. The shooter with great legs, good balance and correct lower body mechanics is a well-trained shooter.



Chapter 4

UPPER BODY THROWING FUNDAMENTALS

Control, spin and trajectory are the elements of upper body throwing.

The upper body of the shooter releases the ball. The upper body is the shooter's arms and torso. The upper body controls the arm and hand, places spin on the ball, determines the trajectory of the ball, high and low corner placement and changes the speed of the ball. All of the duties of the upper body directly affect the water polo ball.

UPPER BODY FUNDAMENTALS



1. Head Positioning
2. Point Left Shoulder, L. Hand pulls
3. Level Shoulders
4. Long, Medium, Short Arm Cocks
5. High Elbow
6. Cradle or Pinch Grip
7. 2 or 3-Finger Release
8. Release Point
9. Ball Spin
10. Follow-Through, Slap the Water

The position of the shooter's head, left shoulder point, hand point, levelness of the shoulders, length of the arm cock/arm extension, and position of the elbow and the right and left hands are the key elements of the upper body throwing motion. The final elements for hand mechanics are: the type of grip, height of the release point, what fingers release the ball (2, 3, 5-fingers), and the spin on the ball and the follow-through where the body stops after the shot (see Fig. 4.1).

SCIENCE OF SHOOTING

The most the power for the throwing motion is created in the shooter's lower body. The shooter's upper body controls the upper body throwing motion. Force and control are the basics of throwing. The shooter's upper body uses the force and speed of the lower body and transfers it into arm speed to deliver all of the force in a controlled manner into the hand and onto the ball. Many problems in the release of the ball are loss of control in the right arm; other times the cause of the problem is loss of control and stability in the legs and torso.

The speed of the ball is the speed of the hand releasing the ball. However, it not only the speed of the shooter's hand; it is the speed of the shooter's whole body movement accelerating in speed throughout the body until it reaches maximum velocity in the hand. For example, the ball starts in the legs at 30 MPH (48 KPH), the hips 35 MPH (56 KPH), the torso increases the speed to 40 MPH (64 KPH) and the arm moves at 45 MPH (72 KPH) to release the ball from the hand for a 45 MPH shot.

In the upper body throwing fundamentals, the release of the ball is of the greatest importance. The release, ball spin, ball trajectory, and high or low corner are determined by the shooter's right hand and upper body mechanics. All of these elements require the shooter to have complete control of the upper body when throwing the ball.



4.1 Nose, left hand and foot aim ball.

1. HEAD POSITIONING

Wherever the nose points the ball follows. The head position is part of the aiming mechanism of the shooter, i.e., head, left shoulder, hand and foot. The head position of the shooter can drastically affect the shot if not properly pointed at the target. The shooter's head and nose point controls the left foot/left shoulder point. For example, the center cage positioned shooter moves his/her head 90-degrees to the right and the left foot/shoulder point are moved 8-inches(20-centimeters) to the right with the ball aimed at the right corner of the goal (see Fig. 4.1).

Many younger players are perplexed when they aim their right hand and ball at one corner and find that ball goes to the middle of the goal. If the shooter aimed the ball at the left corner but their nose (and left foot/hand/shoulder) is aimed at center cage, the ball is thrown at center cage. The shooter's head is part of the aiming mechanism of the body. Wherever the nose points is where the ball goes. There is sound technique reasoning behind the saying, "Look at the corner you are throwing at."

SCIENCE OF SHOOTING

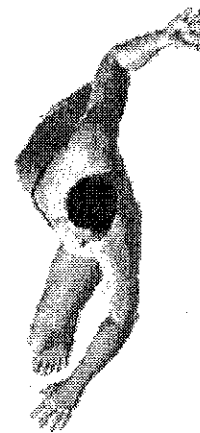
The correct head position is for the shooter's head to be facing the goal with the eyes looking at the cage. When the ball is about to be released, the natural rotation of the body will turn the head slightly to the left. The shooter keeps the head steady and the eyes glued on the spot in the goal where the ball is to be thrown. Many coaches will tell the player to look somewhere else when shooting. What the coach really means is to aim the eyes at the goalie's forehead so the corner where the shot is to be thrown is not telegraphed to the goalie and there is no left foot movement away from the that corner. Catching the ball is the same technique. The head sees the ball and then the hand catches the ball. The shooter's head remains facing the goal as the arm moves back with the ball.

When catching the ball the player must not turn the head to watch the arm cock the ball. The shooter's head turns excessively, the hips rotate excessively and shooter's left foot is no longer pointing at the goal. The body follows the direction of the head. In addition, the shooter must not try to snap the head to the left to help accelerate the ball. This action unbalances the equilibrium of the shooter and causes a wild shot. The head does not throw the ball. The head aims the ball with the eyes. Any sudden snapping of the head interferes with the vision of the shooter. It causes the shooter to lose visual focus on the goal and ruins hand-eye coordination. In a young shooter, he or she may fall over with the catch.

2. POINT LEFT SHOULDER, LEFT HAND AND PULL

Wherever the left shoulder point and left hand points is where the ball is thrown. The shooter's left shoulder/hand point is controlled by the left foot point. Both the left shoulder and left foot point at the corner of the goal the ball is going to be thrown (see Fig. 4.2).

The left foot forward position creates the sharp left shoulder point of the shooter by rotating the left shoulder forward. When the shooter's right hand hits the water, it is in the spot where the left hand was once pointing. In addition, the left hand is used to pull downward in the water to assist in elevating the body and pulling the torso forward.



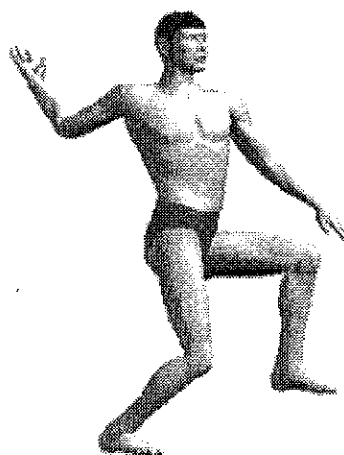
4.2 Left hand and foot point and pivot the shooter.

An inexperienced shooter misses the goal because the left shoulder and left hand do not point at the target. The ball is thrown in the general direction of the goal by aiming the left shoulder and hand. The left hand must pull down for elevation for the high corner shot or pass. In addition, the left hand may need to pull sideways to catch the ball.

3. LEVEL SHOULDERS

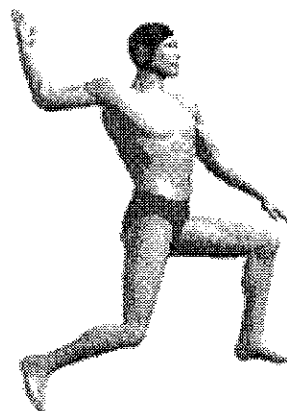
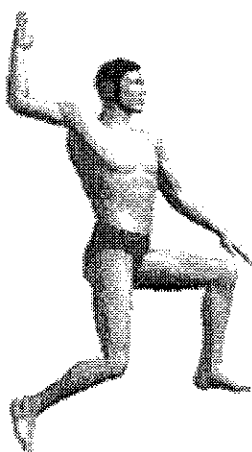
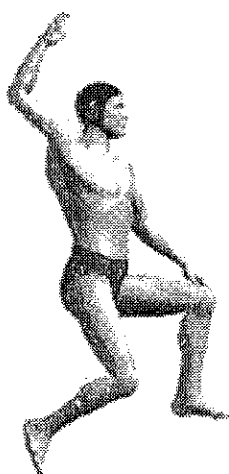
The shooter must have the shoulders level when throwing the ball. The shoulders of the shooter must be level and parallel to the surface of the water for maximum power and accuracy when shooting (see Fig. 4.3).

The best method for keeping the shoulders level is to increase the sculling power of the left hand and to kick harder with the left leg. There is no reason to drop the left shoulder when getting high out of the water. Many shooters will reduce the left hand sculling and reduce the left leg eggbeater kick when shooting. The result of this low power production on the left side of the shooter is the left side of the body sinks low in the water. A good drill to cure this problem is to have the player put the feet in the gutter and hand scull strongly for 20-seconds or more.



4.3 Shooter has level shoulders.

4. LONG, MEDIUM, SHORT ARM COCKS



4.4 Short arm and leg extension Medium arm and leg extension Long arm and leg extension

Short Arm Cock--quick wrist shot, low ball speed

Medium Arm Cock--medium ball speed and medium quickness

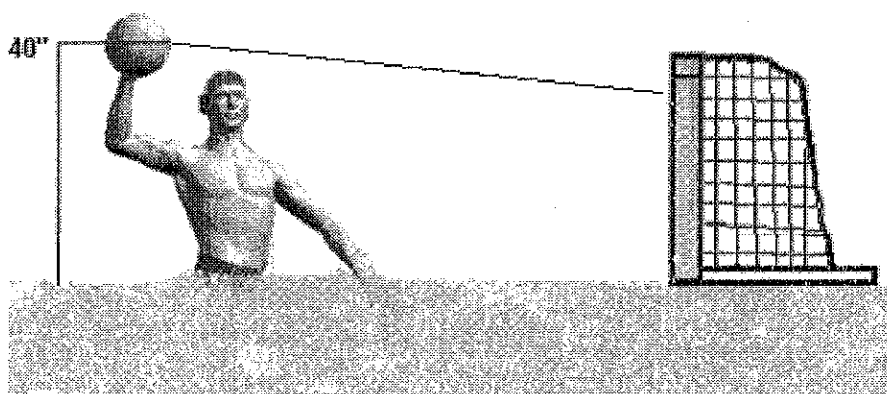
Long Arm Cock--power shot, slower arm motion

The arm cock is defined as the shooter's right arm extended back passed the ear and shoulder of the shooter to cock the ball. The arm cock/arm extension is what cocks the arm so it can accelerate forward. A comparison would be an archer pulling back the string of the bow to cock the arrow. There are three types of arm cocks: short, medium and long (see Fig. 4.4).

SCIENCE OF SHOOTING

The short arm cock is used for quick shots, the medium arm cock for intermediate speed shots and the long arm cock for power shots. The short arm cock has the ball positioned 6-inches behind the ear with a short hip rotation and short leg extension. The medium arm cock has the arm positioned 12-inches (30.5-centimeters) behind the ear, medium hip rotation and medium leg extension. The long arm cock has the ball positioned 24-inches (61-centimeters) behind the ear with a fully cocked hip and a long leg extension. The right leg determines the length of the shooter's right arm cock/arm extension. For example, a short leg extension means the shooter has a short arm extension; a long leg extension creates a long arm extension to cock the ball for a power shot.

5. HIGH ELBOW



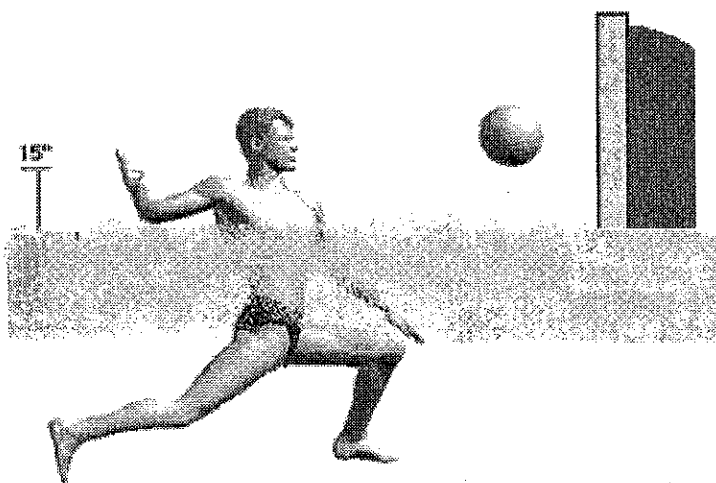
4.5 High release point of 40" shoots ball down at the goal.

The shooter's high elbow/high hand combination aims the ball at the high corner of the goal. The shooter's elbow is 30-inches (76-centimeters) high with a 40-inch (101-centimeters) release point and the shooter is shooting down at the cage for best possible shot. Elite shooters have the elbow high so the release point of the hand is 50 to 55-inches (127 to 140-centimeters) above the water. A great player can touch his elbow on the crossbar (see Fig. 4.5).

When the well-trained shooter's elbow is high, the hand and ball are high and are set up for the accurate high corner shot. For the greatest advantage, the higher the shooter's elbow is above the water, the more accurate the shot. It is easier to shoot down at the goal than try to be perfectly level and release the ball at 30-inches above the water. If the shooter's hand is at 25-inches, the ball is thrown at a slight upward angle at the 30-inch center of the high corner and the ball bounces off the crossbar.

HIGH ELBOW

The inexperienced shooter drags his elbow in the water with a wet elbow and a low 15-inch (38-centimeters) high release point that is blocked by the goalie. This problem is usually a male shooting problem. It is an avoidable mistake. One of the main faults of the shooter dragging the elbow in the water is the ball is aimed at the goalie's arms. The shooter is too lazy to elevate up with the legs and lift the ball high over the head for the proper high corner shot. The elbow must be above the eyes of the shooter to be the correct distance above the water. This is the result of the shooter's weak legs and inattention to the mechanics of the throwing motion is a bad shot (see Fig. 4.6).

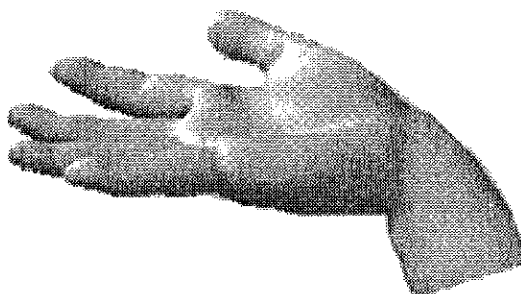


4.6 Shooter drags the elbow and shoots at mid-cage.

Anyone, with a little effort, can lift the ball up in the air and get the elbow out of the water. Many inexperienced male shooters also drag the elbow in the water when pump faking. The goalie sees the low elbow fake or low elbow shot and knows the only possible shot is a mid to low corner shot. The low elbow shot is blocked before the ball leaves the shooter's hand.

6. CRADLE GRIP, PINCH GRIP

The hand of the shooter is either horizontal and loosely holding the ball in a cradle grip or vertical and pinching the ball with all of the fingers in a pinch grip (see 4.7).

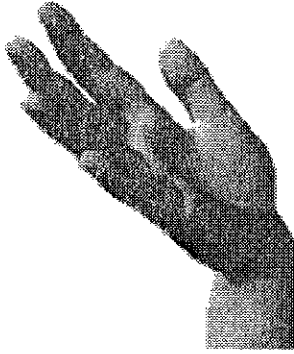


4.7 Cradle uses a horizontal hand to hold the ball.

The cradle grip is the first grip taught. The player has the ball rest in the palm of the hand with the fingers lightly touching the back of the ball. When the shooter's arm is moves forward, the wrist angles upward and makes a vertical hand at the release. The fingers of the hand do not slide up to the center of the ball. The fingertips spin the ball. The hand is already in the center of the ball.

SCIENCE OF SHOOTING

At the release, the fingertips spin the center of ball as it leaves the hand. The hand is never on top of the ball as commonly taught. The ball's rising problem occurs because the fingers are underneath the ball at the release. The properly thrown ball has to have the fingertips release the ball at its center.



4.8 Pinch grip uses a vertical hand.

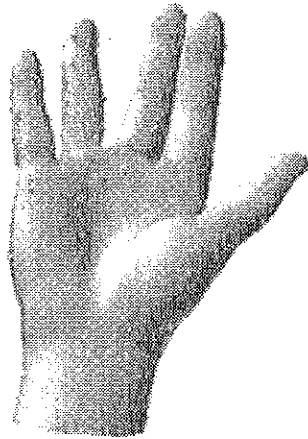
The pinch grip is the grip used internationally, in college, and in elite high school play. The ball is pinched firmly by all five of the shooter's fingers. The shooter's hand is almost vertical and cocked. The player should not pinch the ball with the hand horizontal. The release is a 2-finger or 3-finger release. The ball leaves the shooter's fingertips evenly with a flat and straight ball trajectory in the illustration below.

The tendency for the shooter using a pinch grip is to hold onto the ball too long causing the ball to rise on the release and hit the cross bar. The shooter must develop finger sensitivity by lightly rubbing a tennis ball and running the fingers over a new water polo ball so the fingertips learn to release the ball properly (see Fig. 4.8).

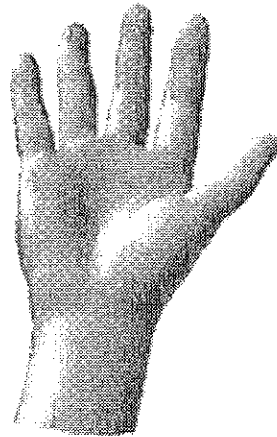
When the shooter has stone hands (hard, insensitive fingers) do not use a pinch grip. Great touch is required when using a pinch grip to use the correct amount of pressure on the ball when it is released. The release from a cradle grip prevents the fingers from gripping the ball. The ball slides off the fingertips without the need for fingertip control.

The stone hand shooter grips the ball as hard as possible and has no fingertip sensitivity. The lighter the pinch grip the better the release. There can be no control of the ball without a highly developed sense of touch. Drills to develop touch are to close the eyes and use the fingertip to feel the fuzz on the ball, trace all of the lines on the ball, hold the ball for hours, and feel the fuzz on a tennis ball. Have the player throwing a tennis ball against the crease between the wall and ground and have it bounce back to the hand for 5 minutes. A great drill for visual acuity.

7. 2-FINGER RELEASE, 3-FINGER RELEASE



4.9 2-finger release



4.10 3-finger release

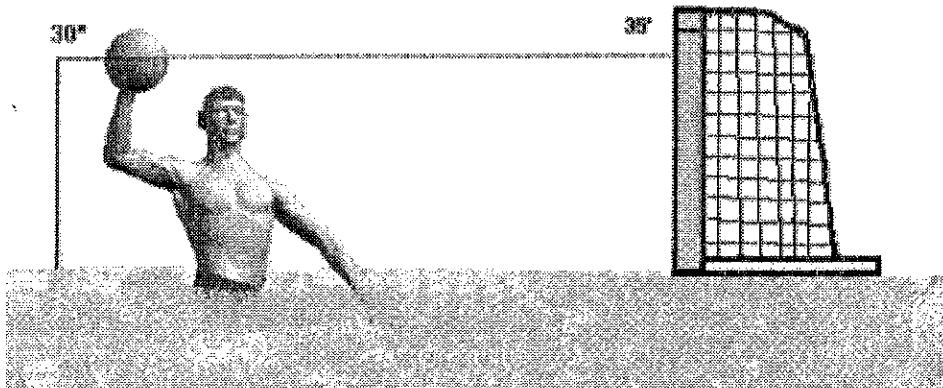
When the cradle grip is used by the shooter, the 3-finger release is also used. It is called a 3-finger release because the middle three fingers are the last three fingers to contact the ball on the release. When a pinch grip is used by the shooter either a 2-finger release or 3-finger release is used (see **Figs. 4.9, 4.10**).

The 2-finger release is the superior release. The index finger and middle finger are together with the other fingers are spread apart. The 2-finger release provides a much more stable release due to the two fingers supporting each other. In addition, the 2-finger release has a much quicker release because one less finger is used to release the ball.

The shooter needs to increase the amount of ball speed by sliding the fingertips on the ball to increase the ball spin. Increased ball rotation is necessary to skip the ball so it does not hit the surface of the water and stop. And increased ball spin is necessary for managing the drop on the lob. The more ball spin the higher the lob ball arc and subsequently the greater the ball drop. When the lob shot drops down and hits the crossbar the answer is more ball spin. When only two fingers are used there is one less finger to spin the ball and therefore less ball spin so the lob shooter has to spin the ball harder off the fingertips. Women need to concentrate more on ball spin than men because of reduced arm strength. Men, on the other hand, put too much spin on the ball and the ball flies over the goal.

A precaution is applied to the shooter with bad hands. He or she should not use a 2-finger release. This is an advanced release which requires sensitive hands. All age group, fresh/soph players and most high school varsity players should stick with the standard and simple 3-finger release as it requires less hand skill and control.

8. RELEASE POINT



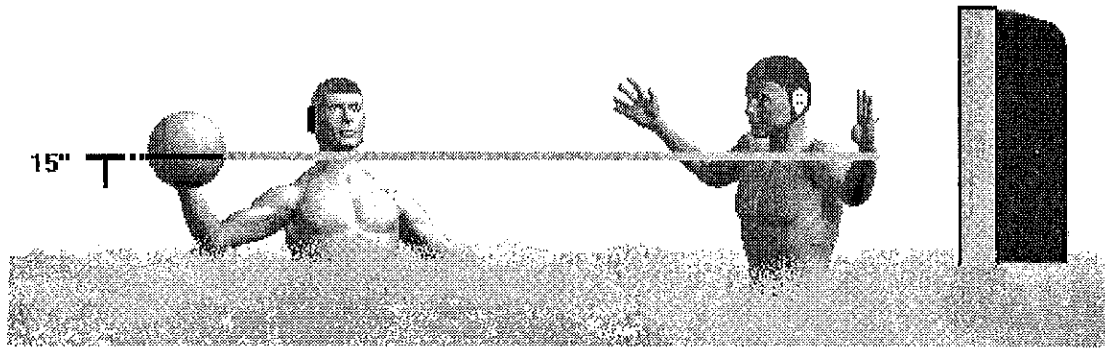
4.11 High release point of 30-inches creates a high corner shot.

The release point is the air where the ball is released by the hand. The hand releases the ball a foot and a half in front of the face, at a 60-degree angle with the center of the hand 30-inches (76-centimeters) above the water. To get the shooter's hand to that proper release point required is a high elbow position, the center of the palm of 30-inches high (76-centimeters), for a high corner shot. The geometry of the high corner shot is shown. The center of the shooter's palm is 30-inches (76-centimeters) above the water. The radius of the ball is 4½-inches (11.4-centimeters), measured from the top of the ball to the center. The top of the ball is 34.5-inches (88-centimeters) above the water. The underside of the cross bar is 35.2-inches (89-centimeters). The ball, thrown at 30-inches (76-centimeters) above the water, clears the bottom of the crossbar by half of an inch (1.25-centimeters). The elite shooter's ball may scrape the underside of the crossbar as it goes into the goal (see Fig. 4.11).

The precise high release point creates a precise high corner shot. When the shooter's legs are strong and stable and the effort is the same, the ball consistently clears the cross bar by half an inch (1.25-centimeters) each and every time the ball is thrown... On rare occasions, the ball hits the edge of the crossbar and bounces downward in what is called a bar-down shot. A bar-down shot occurs when the ball is thrown from above the cage and nicks the crossbar's edge on its way down into the goal

The accurate and repeated high corner score is not the result of luck. The well-trained shooter scores as many high corner shots as he or she does low corner shots. The inexperienced shooter cannot score any high corner goals. The difference between the two shooters, as described above, is based on precision, strong legs and discipline. The shooter no matter how tired maintains his or her discipline, kicks up hard, has the right hand at 30-inches and throws the ball in a straight line with the ball evenly leaving the fingertips. The accurate high corner shot is a simple shot.

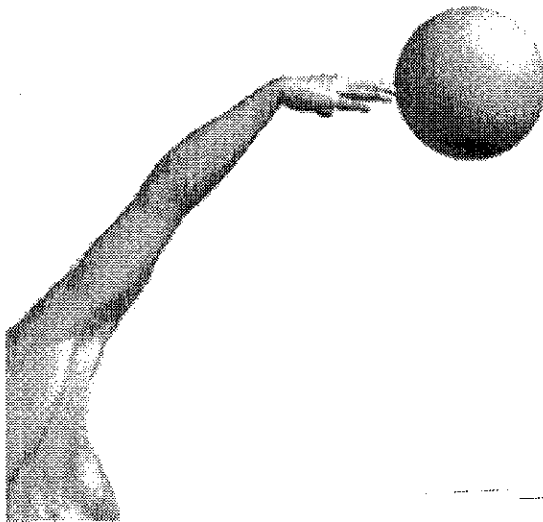
RELEASE



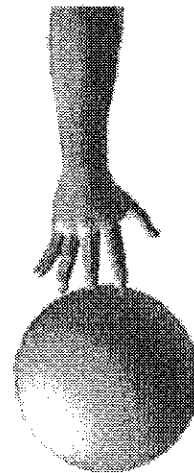
4.12 Shooter has low elbow and release point with the ball aimed at the goalie's arm.

The shooter's elbow is in the water for a low 15-inch release point and the low shot is blocked by goalie's arm at the 15-inch level (38-centimeters). Goalies are taught to position the arms at a mid-cage level of 15-18-inches (38-46-centimeters) above the water to block the ball. Goalies use this mid-goal arm height of 15-18-inches because the majority of shooters have a low elbow and a low release point and shoot at the middle of the goal most of the time (see Fig. 4.12).

9. BALL SPIN



4.13 Fingers release the ball in the center.



4.14 Middle three fingers make final contact.

The shooter's fingertips place spin on the center of the ball. The correct spin has a black stripe appearing down the middle of a fast spinning ball. All of the black stripes of the ball must be vertical when the ball is spinning out of the hand of the shooter. Most shooters never examine the ball spin. The ball spin is the end result of the entire body throwing the ball. It is the signature of the shooter (see Figs. 4.13, 4.14).

SCIENCE OF SHOOTING

The ball spin is the key to the throwing mechanics of the shooters. When the release or whole body mechanics are incorrect, the ball spin is also incorrect. The ball should leave the three middle fingertips evenly for the correct vertical stripe ball spin. The shooter's three fingertips release the ball at its center for the perfect spin.

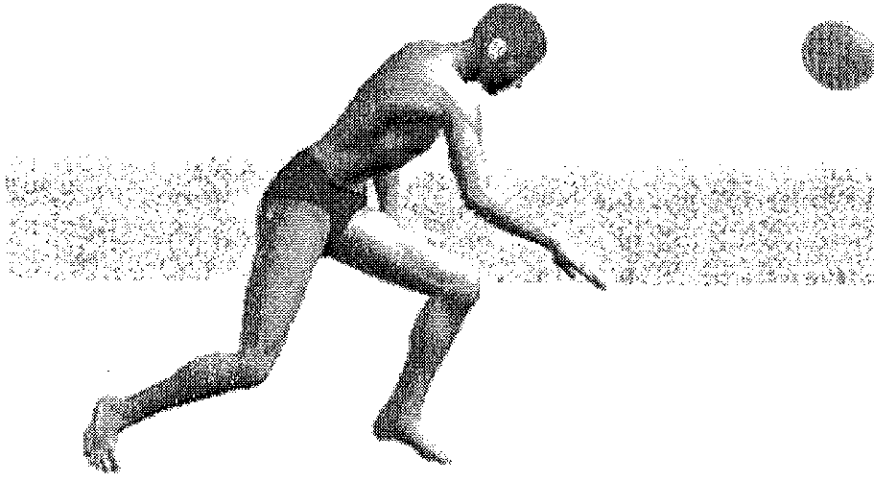
There are quite a few misunderstandings about the release of the ball from the hand. The first myth is shooter's hand is on top of the ball to keep the ball down. Actually, the shooter's fingertips should be in the **center of the ball** at the release. When the ball goes high over the goal, the correction is not to place the hand on top of the ball. Instead, the shooter has placed the hand too far **under the ball** and has pushed the ball upward for a high shot. To correct this, release the ball with the fingers in the center of the ball so the trajectory is flat and straight.

Next, the fingertip pressure on the ball must be even. Water polo coaches ignore unequal fingertip pressure on the ball. The pitcher's whole career is based on how precise his or her fingertip pressure is placed on the baseball or softball. A ball that curves to the right or the left is the result of a release mistake, a finger pressure mistake. When the shooter's ring finger pushes the ball, the ball moves to the left with the stripes of the ball angled to the left. When the shooter's index finger pushes the ball, it moves to the right with the stripes angled right.

Ninety-five-percent of all of the high school players have never learned to throw a ball with the correct finger pressure. They have never produced a ball with the correct end-over-end ball strip backspin. The coach at any age group or high school practice with boys or girls will rarely see the ball with the correct spin on it. In addition, a bad ball spin causes the ball to curve to the left or right and hit other players passing the ball. It is not an exaggeration that many players have never thrown a correctly released ball.

The cause of the bad ball spin is not found in the fingers but usually in the low elbow of the shooter. The shooter's low elbow position causes the ball to veer to the left. The low elbow causes the ring finger and little finger to turn inward on the release and push the ball to the left. Other players throw a side-spinning ball. The ball stripes are spinning horizontally because of a low elbow that twists the hand sideways to the left. The fingertips must snap down with equal pressure for the proper release and ball spin with the wrist flexing downward.

10. FOLLOW-THROUGH, SLAP THE WATER



4.15 The follow-through turns the shooter's body to the left.

The follow-through stops the throwing motion. The follow-through begins immediately after the ball leaves the shooter's hand with the hand pronating and turning to the right. The body moves the right arm and torso to the extreme left, the right leg moves forward, with left arm, back, hips and legs tensing up to prevent the shooter's body and right arm from continuing forward. The follow-through is an automatic action made by the shooter's body (see Fig. 4.15).

The follow-through's function is to reduce injury to the shooter's throwing arm and shoulder by slowing down the speed of the body. It does this by increasing the stopping distance before the hand hits the water by rotating the body as far as possible to the left. The square shooter is unable do the follow-through rotation correctly; the angled shooter rotates to the left naturally

Another value of the follow-through is it gives information on the speed of the shooter's right arm. The shooter's hand must slap the water hard on the follow-through for the coach to know the release of the ball is correct. The speed of the hand slapping the water is a good indicator of overall body speed and hip rotational speed.

Many girls are unaware of throwing mechanics and do not snap their hips hard and consequently their wrist hard on the release. Consequently, the hand softly hits the water without much force or splash. When girls do know, they become equally or even more dynamic shooters than many of the boys. Throwing is a genderless motion that rewards good form. Technique and not physique is the shot. Technique is more important than gender.

SCIENCE OF SHOOTING

When the shooter's hand hits the water softly, it is an indication that the shooter's hips are not rotating and are generating little whole body speed. A hard hand snap is the result of a hard hip snap. Seventy-five percent of the force of the shot comes from the legs, hips and torso. The right arm contributes 25-percent of the power. A soft hand slap is the result of a boy or girl only using the right arm to throw the ball.

The coach may incorrectly believe that the problem is a hand speed problem and not a body/hip speed problem. This coach teaches the girls a useless drill to slap their hands against the water to improve arm speed. Performance of this drill does not change the speed of the release or increase in ball speed but results in many sore hands. The hand slap is an effect and is not the cause of the soft release. The coach must treat the cause (hip speed) and not the effect (hand speed) to solve the problem.

Many girl shooters are square shouldered and square-footed to the goal (parallel) and are unable to rotate their shoulders and hips hard to produce power to throw the ball. When the girl points her left shoulder and left foot, she can rotate the hips and torso and create a high-speed body and a high-speed arm that hits the water with great force.

Conclusion

The shooter follows the upper body fundamentals precisely to throw the ball with control, proper ball spin and ball trajectory. The upper body mechanics is based on controlling the throwing motion and not in increasing the throwing velocity. The upper body mechanics are not, however, the entire throwing motion. Mistakes made as the ball leaves the hand are irreversible. Mistakes made by the legs are also irreversible. The totality of the throwing motion is what is important for the shooter. The throwing motion is not limited to right arm movement.

Throwing requires the mechanically perfect shot be correct all the way from the shooter's toes to the fingertips. The shooter must be fundamentally sound with the correct upper body mechanics and lower body mechanics functioning together for the correct release of the ball. The shot is the sum of all of the parts of body, the lower body and upper body, creating the perfect throwing motion and a champion's technique.



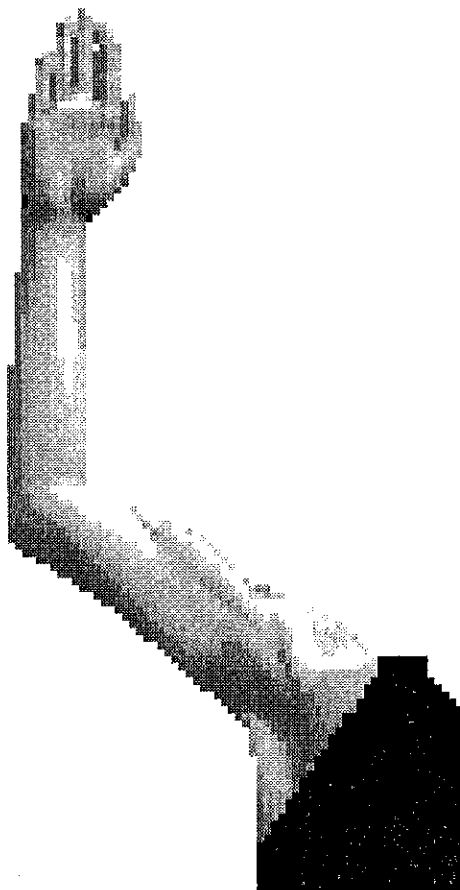
Chapter 5

FUNDAMENTAL CONCEPTS

It is a thought before a shot, a theory before a throw.

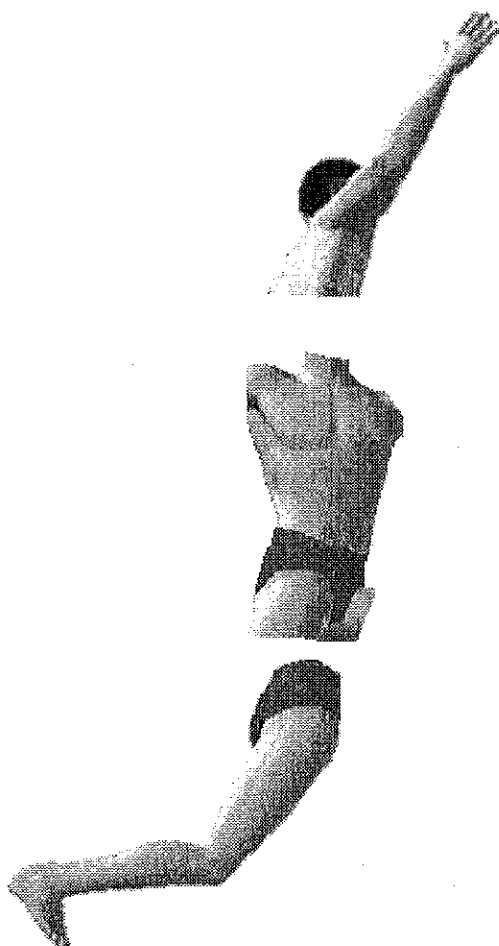
The player must understand that there is a logical system of concepts for shooting that governs the throwing of the ball. The fundamental concepts compose the theory of shooting. The throwing motion is not a wild, reckless, blast from the arm. The shooter's whole body throws the ball and not the right arm. The throwing motion is a disciplined set of rules.

The shooter's mind rules the throwing motion, not his or her emotion. The shooter must develop the mental game. It is a thought before it is a shot. The shooter memorizes the thirteen concepts of the throwing system that guides the shooter while throwing.



1. **The Whole Body Throws the Ball**
2. **Shot Starts in Toes, Ends in fingertips**
3. **Five Stages of Throwing**
4. **Catching, Cocking and Shooting**
5. **The Right Hip is Supreme**
6. **Cocking and Acceleration**
7. **Deceleration**
8. **Motion: Rotation, Flexion, Extension**
9. **The Whip**
10. **Verticality and Elevation**
11. **The Spin is Supreme**
12. **Preparatory Stage**
13. **Counter-motion**

1. WHOLE BODY THROWS THE BALL



**5.1 Elevate, rotate, crunch and release.
The whole body throws the ball.**

The water polo ball is not thrown by the shooter's right arm. The whole body of the shooter throws the ball. There is no arm shot. The shooter's feet, calves, thighs, hips, abs, back, shoulder, upper arm, forearm and hand to combine to throw the ball. The entire weight of the shooter's body accelerates forward to create a high velocity body motion and high-speed ball. The legs, hips, abs, back, left arm and right arm move together upward link-after-link to create the throwing motion. The legs are aim, accuracy, angularity (pointing), verticality and velocity: the arm is control and spin. Together they make the shot.

In water polo, where only the right arm, head and left shoulder are visible, many players believe in the incorrect theory that only the right arm throws the ball. If this only-the-right-arm-throws-the-ball theory were true, the shooter's isolated right arm ball speed would only be 5-10 MPH (8-16 KPH). No one in baseball would say that only the pitcher's arm throws the ball; the water polo player should not believe otherwise (see Fig. 5.1).

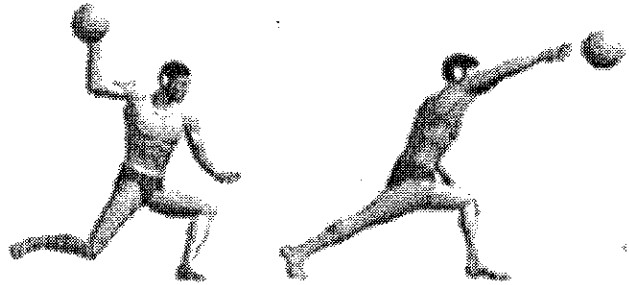
All major shots are whole body shots. The outside power shot is a whole body shot; the quick wrist shot is a whole body wrist motion shot. The drive-in shot is also as a whole body shot, as is the 2-meter shot. None of these four major shots is a pure arm shot. The pure arm shot or pure wrist shot is a myth. The ball needs the whole body to throw the ball.

2. SHOT STARTS IN TOES, ENDS IN THE FINGERTIPS

The shot is a whole body throw that starts in the toes and ends in the fingertips. The first movement begins with the quadriceps locking the knee, the calve kicks the foot down and the hips snap the foot inward. The second movement has the hips rotate inward, the abs snap the torso forward and the shoulders rotate. In the third movement the triceps extends the arm forward and locks the elbow, forearm flexors snap hand down to release the ball.

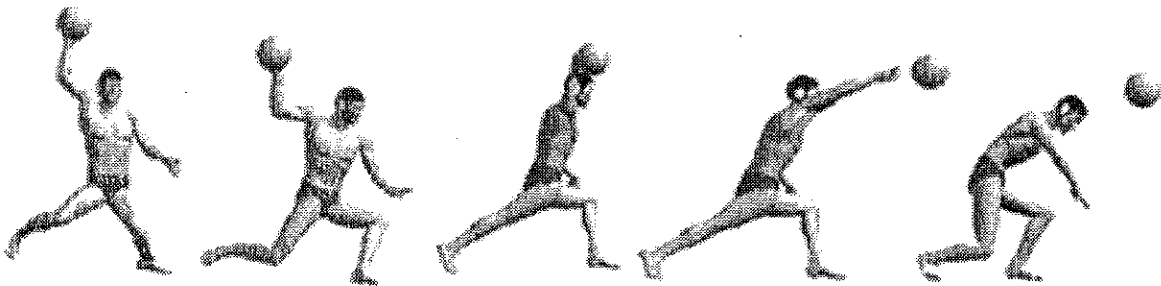
SCIENCE OF SHOOTING

The ball spins off the shooter's fingertips and flies toward the goal. Most of the shooter's power is created in the legs and hips and is transferred up through the body into the torso and right arm. Power and aim for the shot come from the legs. The right hand's duties are to control and release the ball for a straight trajectory and the correct ball spin (see Fig. 5.2).



5.2 Shot starts in the toes and ends in the fingertips.

3. STAGES OF THROWING



5.3 Stage 1 Catch Stage 2 Cocked Stage 3 Acceleration Stage 4 Release Stage 5 Follow-Through

I. Catching

II. Cocking

III. Acceleration

IV. Release

V. Follow-through

There are five stages to the throwing motion: **catching, cocking, acceleration, release and the follow-through**. The ball is caught in the Stage I. In Stage II-cocking, the shooter's whole body: the legs, hips, torso and arm are cocked. Stage III-whole body acceleration, the whole body accelerates forward. Stage IV is the release. Stage V is the follow-through where the body stops in the water (see Fig. 5.3).

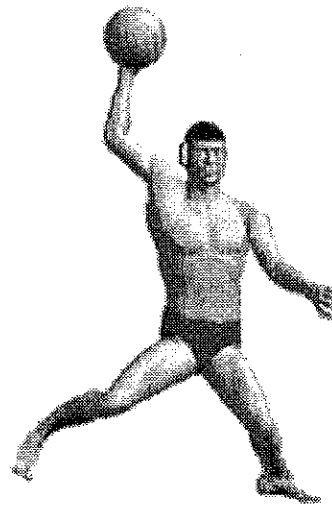
Three stages and most of the fourth stage are completed before the shooter's hand releases the ball. The fifth stage, the follow-through, is the automatic arm splash where the shooter's whole body stiffens and turns to the left to stop the forward motion of the body and right arm, The shooter can make mistakes in any of the first four stages and cause the ball to go astray.

SCIENCE OF SHOOTING

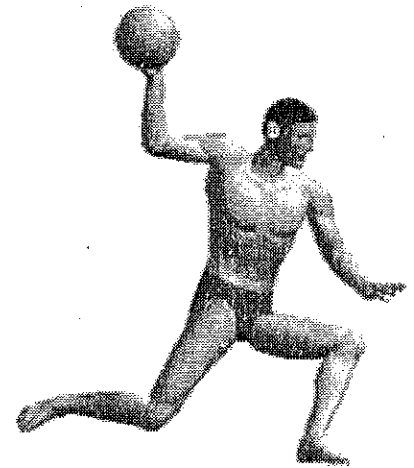
In the follow-through stage, however, is where injury occurs. The player is not injured during the acceleration stage but in the stopping stage. It takes 225-percent more strength to stop the shooter's body than to accelerate the body. The part of the body most injured is the rotator cuff of the right shoulder: the supraspinatus, infraspinatus, subscapularis and teres minor.

4. CATCHING AND COCKING "C & C"

Most mistakes in throwing are made in the first two stages: catching and cocking. In the acceleration stage of throwing weak effort with the legs, hips and abs greatly slows the right arm motion. Weakness in the forearm can cause the wrist to break (turn) and the ball veers away from the goal. The player and coach must carefully analyze the shot to see where the mistake occurs.



5.4 Stage I Catch



5.5 Stage II Cocking

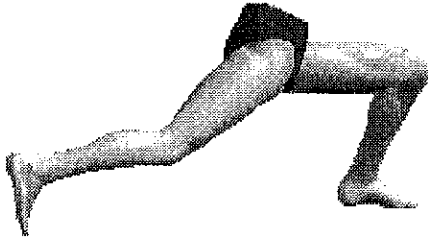
The throwing motion may have five parts technically. The first two motions of catching the ball and cocking the ball are the most important. These are where most of the problems in the shot are found. When the ball is caught and cocked correctly the shot will be thrown correctly. The good shooter catches the ball well and brings the ball back so it is properly cocked with the left leg forward, right leg back and the torso vertical. A good catch has a vertical back that remains vertical as the right arm, back and legs move backward (see Figs. 5.4, 5.5).

Mistakes made in the C & C affect the rest of the throwing stages. Mistakes in the throwing motion occur most of the time in the catching and cocking stages of the shot. It only appears that something was wrong in the right hand at the release. When the ball is caught correctly, the ball hits the player's hand and the momentum of the ball rotates the arm and body of the shooter into the perfect cocked position.

Forward acceleration of the body and right arm are simple straightforward parts of the throwing motion. Catching and cocking are the major causes of throwing mistakes. A bad release by the shooter's hand is an effect from the shooter's poor catching and cocking. Coaches must concentrate on the first mistake, the cause-catching and cocking. The coach should not focus on the last mistake, the effect-the right hand, to fix the problem.

The player who incorrectly catches the ball by stepping forward with the right foot tries to meet the ball with the hand in front of the face. This player becomes a square-to-the-goal shooter (parallel to the goal) with major problems. The shooter's body cannot rotate backward to cock the ball when square; nor move forward very well to shoot the ball. The right foot forward/right hand forward also creates a hard hand that drops the ball.

5. THE RIGHT HIP IS SUPREME



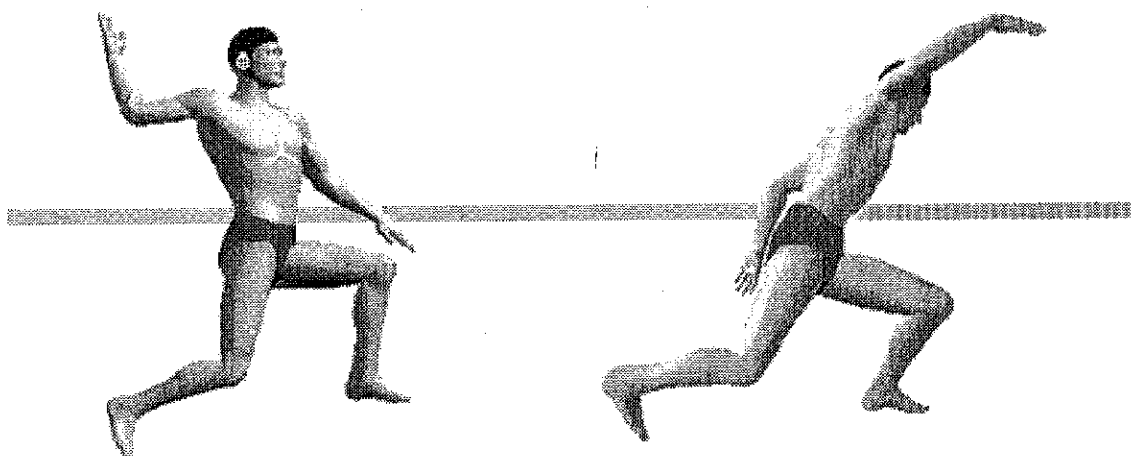
5.6 Right hip rotates to accelerate the body.

The hips throw the ball. The hips rotate the body. The hips create the semi-circular eggbeater kick. Hip rotation produces half the power of the shot. The right hip has the most feeling so the shooter focuses on its movement. The right hip rotates back creating a sharp left shoulder point, long arm cock and a long leg extension (see Fig. 5.6).

When the shooter's right hip rotates forward, the ball is shot or passed. Catching the ball rotates the hip backward. The great shooters have great hip rotation; the bad shooters have no hip rotation. For the shooter's hips to be cocked, the left foot must be forward to serve as a pivot point to rotate around. For the hips to accelerate forward, the left foot must be forward to serve as a pivot point. A young shooter has his or her hips square-to-the-goal. This square hip position is neutral and uncocked and produces little power. The body must be angled and rotated to cock or throw the ball. It is a powerless hip position for the shooter. Many women and age group players have square hips. They do not realize that the hips and hip rotation is the majority of the throwing motion.

The Hungarians believe the right hip is supreme. The Hungarians are the best shooters in water polo and have won three men's gold medals in the last three Olympic Games. What is meant by this statement is the major motion in throwing the water polo ball is rotation. The hips provide the main rotation for the body. Strong hips make a strong shot. The strengthening of the hips is of critical importance to the throwing motion. The hip strength is more important than arm strength. The motion of rotation is more important than the motion of extension of the right arm forward. For hip rotation to take place the shooter's body has to be angled with the left leg forward and the right leg back and the body elevated high out of the water. The hips cannot rotate well with the shooter's body horizontal. Nor can the hips rotate strongly if the hips are two-feet (61-centimeters) underwater. Correct body position in the water allows the shooter's hips to rotate fully and strongly to create the high-speed shot.

4. COCKING AND ACCELERATION



5.7 Right arm, torso, hip and leg is cocked. 5.8 Whole body accelerates forward for shot.

The shot breaks down into two fundamental parts: cocking the body and accelerating the body. The ball is cocked. The body accelerates and releases the ball. All throwing motions are composed of these two parts. All mistakes in throwing occur in the cocking stage or acceleration stage (see Figs. 5.7, 5.8).

The shooter may not understand the five stages of the throwing but the shooter understands that the ball is cocked and the ball is shot. Cocking is the act of positioning the body to be ready to throw the ball (pulling back the bowstring). Acceleration is the forward motion of the body and arm to release the ball. No ball is thrown (accelerated forward) without first being cocked.

The first two phases of throwing, catching and cocking, are blended into one stage, **cocking**. The third and fourth stages, acceleration of the whole body and the release, are combined into one stage called **acceleration**. Cocking and acceleration are the throwing motion. The great shooter understands that the good shot requires a great cocking motion and acceleration motion. When the shooter's body is not cocked, there little power to throw the ball. The bowstring not cocked is powerless to shoot an arrow unless pulled back. The shooter's muscles can contract but there is not much force without a cocked arm, hip and right leg (pulled bowstring). Cocking is a whole body effort. See the rules below.

Foot is cocked to right, right leg bends, right hip is rotated backward

Torso and shoulders rotate to right

Right arm is extended back, elbow bends and the wrist is angled

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The second part of throwing is acceleration. Whole body accelerates for the throw and the release. The whole body snaps forward and fires the four parts of the shooter's body: the legs, hips, torso and right arm.

The poor shooter who does not understand cocking does not understand acceleration. He or she believes the ball throws itself. The acceleration stage starts with a strong kick. If the leg kick is weak, the shot is weak. Next is a hard hip rotation and ab snap. Weak hip and ab motion contributes to a slow and inaccurate shot. The right arm does not accelerate by itself. The right arm takes the power transferred from the body into the arm to throw the ball. Weak acceleration in the rest of the body creates a weak right arm motion and a slow shot.

7. DECELERATION

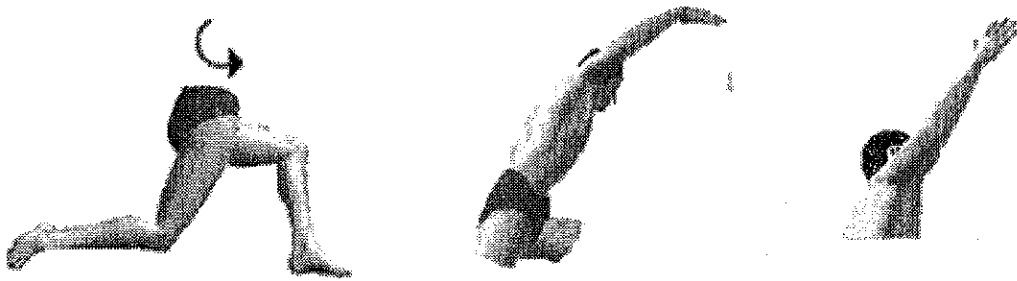
Deceleration is the act of stopping the shooter's body in the water. Deceleration occurs during the follow-through stage and while using the hesitation fake (a series of short abrupt fakes). In the follow-through stage the shooter stops his or her body using the left hand, snapping the left knee up, moving the right leg forward, tucking the legs under the hips, bending and widening the legs and rotating the body to the left. In the hesie fake, a series of short, sharp and abrupt stopping of the shooter's arm, the body stops the right arm. The faker's right arm will continue forward unless the whole body stops the arm. The hesie fake is not an arm fake, it is a whole body fake. There has never been a pure right arm fake.

Most players believe in the follow-through stage that the water stops the arm. This is incorrect. The water, for example, does not stop the diver from hitting the bottom of the pool. Unless the diver bends his/her back upon entering the water the water does very little to stop the forward motion of the diver. When the baseball pitcher throws the ball, the air does not stop the pitcher's arm from hitting the ground. The pitcher's whole body arches back, stiffens, and rotates to the extreme left to stop the forward motion of the right arm. The right arm does nothing to stop its motion. The right arm does not start the acceleration and the right arm is not involved with deceleration. The shooter's whole body starts and stops the throwing motion.

In the hesie fake, a series of sharp short and abrupt arm and torso fakes. The faker's body accelerates forward at a high speed. And then shooter's whole body suddenly stops, restarts, stops again and then shoots the ball. The muscles of the shooter's body must be strong to stop the forward motion. Deceleration requires strong muscles to stop the shooter's body abruptly.

The gradual, slow, long stroke arm motion of the pump fake is not used for the rapid and abrupt stop-and-go hesie faking motion. The right arm movement in the hesie is controlled and decelerated by **the whole body of the shooter**. When the body stops, the right arm also stops.

8. THE MOTION: ROTATION, FLEXION AND EXTENSION



5.9 Shooter rotate the hips, flexes the torso and wrist and extends the back and arm.

What exactly is the “motion” or the throwing motion of the shooter? The motion has never been described in water polo. The three major motions of the throwing motion are rotation, flexion and extension. Rotation is the semi-circular motion of the player’s hips, torso and shoulders. Flexion is bending. The right arm is flexed to cock the ball. The torso flexes forward to throw the ball. Extension is straightening. The shooter’s elbow straightens to release the ball, the knee and leg also straightens out, and the back becomes vertical (see Figs. 5.9).

All throwing mistakes occur in rotation, flexion or extension. The average shooter has never heard of any of these three everyday body motions. The water polo player must become aware that the three motions occur with every step or arm movement of the athlete on dry land or in the water. If the shooter knows the motion, he or she understands the shot. The motion is the shot. There are specific muscles associated with each movement. Rotation is the motion of the shoulders, the torso by the spinal rotator muscles of the back and the gluteus muscles in the hips. Flexion muscles are the abdominal muscles that contract and snap the torso forward. Extension is the back muscles, erector spinae, arching torso backward to catch the ball and to cock the torso or the extension muscles such as the triceps muscle extending the arm forward to lock the elbow to release the ball.

The average shooter cannot feel his or her body. He or she does not know the “motion” or knows the names of the movements or the muscles involved. The poor shooter “just throws the ball” without any idea of what is happening in the body. Sometimes the shooter does not even open their eyes to look at the goal! This shooter’s ball scores only by luck. He or she thinks the ball flies over the goal because of bad luck. In reality, the ball scores because the shooter has the correct throwing motion. Luck has nothing to do with scoring. The ball veers off or goes over the top of the goal because the shooter has a poor throwing motion. Skill, not luck, scores goals. All three movements and muscular actions occur during the throwing motion. If the shooter wants to have a stronger throwing motion, s/he must strengthen these flexion, extension and rotational muscles and have perfect technique. Strengthening the right arm is not enough. The throwing motion is not the right arm it is the strong motion of the shooter's whole body.

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9. THE WHIP

The shooter's body is a whip, like a chain-reaction shot. The whip is cocked and the whip is snapped. The whip has four parts, a handle, the base of the whip, middle of the whip and the tip of the whip. The shooter has the same four parts: legs, hips, torso and right arm. Power is created in the legs and hips, travels through the torso and into the right arm for the ball to be released. The legs are the handle of the whip. The tip of the whip is the right arm. Successful shooter fires each one of the four parts sequentially, one link after another link to produce a whip-like action. Power increases from the legs, hips and torso until it reaches the right hand.

The greatest shooters look like a whip as they snap their body forward. The unbalanced shooter falls over and does not transfer the power from the legs into the right arm and has a 15-20 MPH (24-32 KPH) loss of ball speed. The worse shooters look like a wet noodle with breaks in the chain. The poor shooter must have a balanced body to snap the body and to improve his shot.

10. VERTICALITY AND ELEVATION

The player must be vertical to elevate. Verticality is the most difficult part of shooting. The shooter must work very hard to remain vertical in the water. Once the player is vertical in the water, the player must elevate the chest, torso, stomach and hips high out of the water to reduce drag, increase accuracy and leverage, and place the release point above the goal so the shooter is throwing down at high corner of the goal.

Verticality allows the shooter to elevate. A shooter who is flat on his/her back cannot elevate. The more vertical the shooter's back, the higher out of the water the shooter can elevate. The higher the shooter's elevation the higher the release point. The shooter's release point should be from 30-55-inches (76-140-centimeters) above the water. The higher the shooter's release point the more accurate the shot. The top cross bar of the goal is 39-inches (99-centimeters) above the water.

In basketball, the best evaluation tool of a player's ability is the height of the player's vertical jump. High elevation places the ball above the rim for the slam-dunk. No basketball player tries to slam-dunk without jumping high in the air. In water polo, the greatest water polo players have the highest elevation out of the water. They are shooting down at the goal with the center of the ball 8-16-inches above the top of the cross bar creating a high release point 47-55-inches (119-140-centimeters) above the water.

The number one difference between a high school shooter and a college shooter is vertical height out of the water. For the shooter to have great elevation and a vertical back the shooter must have strong legs and use them! The shooter's legs must be explosive to lift the shooter high out of the water. So often, the young player lies on the back, has weak legs and does not want to kick hard.

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The horizontal player does not realize the reason he or she is a poor shooter is because of their failure to follow the verticality and elevation rules. The horizontal lying-on-the-back shooter throws the ball over the goal. Ninety percent of what makes a great shooter is being vertical and elevating high out of the water. Of all the fundamentals, being vertical and elevating, have the greatest effect on the shot. They are also the hardest two fundamentals to master.

11. THE SPIN IS SUPREME

1. Backspin
2. Topspin
3. No spin
4. Sidespin
5. Diagonal spin to right
6. Diagonal spin to left



The spin is the shot. The correct spin on the ball creates a straight level trajectory to the goal. Any incorrect spin causes the ball to rise, veer to the right, veer to the left or drop downward. The backspin is the universal spin placed on the center of the ball with the fingertips placing a backward rotation (spin) on the ball. A topspin shot has a forward spin. A no-spin ball does not have ball rotation. Sidespin has horizontal ball spin; diagonal spin has the stripes angled to the right or left on the ball. Sidespin and diagonal spin ball are usually defective ball rotations, which cause the ball to veer off-course. When a high school or age group player throws a no spin ball it is because of a deflective release.

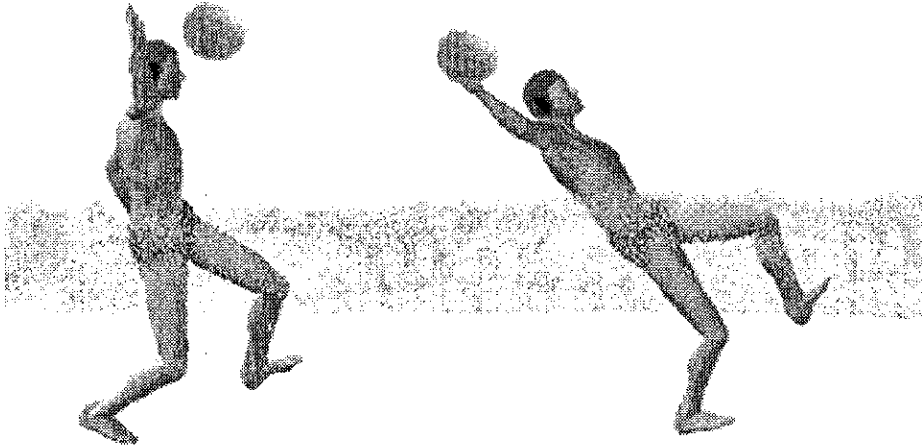
After the various types of ball spin are learned, the shooter must then use precise hand mechanics for the fingertips to create spin on the ball. The shooter must realize the spin of the ball is the essence of throwing. Any spin errors on the ball, the ball lifts up or veers to the right or left.

The properly thrown water polo ball has the black stripes of the ball spinning vertically in the air. The ball evenly leaves the three middle fingers, the index, middle and ring finger, and spins end-over-end, without a mild curve and with a flat trajectory (flight). The ball leaves the shorter thumb and little finger rolls on to the middle three fingers for the final part of the release. The longest finger, the middle finger, is last finger to make contact with the ball. The thumb and little fingers are grippers of the ball; the middle three fingers are the (ball) spinners. Another release theory is the thumb and little finger grip the ball, the index and ring finger hold the ball and the middle finger is the director.

Improper finger release leads to an improper ball spin. An improper ball spin with slanted stripes is the result of the index finger pushing the ball to the right or the ring finger pushing the ball to the left. The young player cannot feel their fingers on the ball. The shooter does not watch the spin on the ball and has no idea why the ball veered away from the goal.

Fingertip pressure must be equal when using a 3-finger release. For the ball spin to be correct, the positioning of the shooter's body must be correct. The fingertips produce spin but correct body positioning creates correct spin. For example, if the shooter's elbow drops the hand turns inward (supination), a diagonal spin is created, and the ball veers to the left.

12. PREPARATORY STAGE



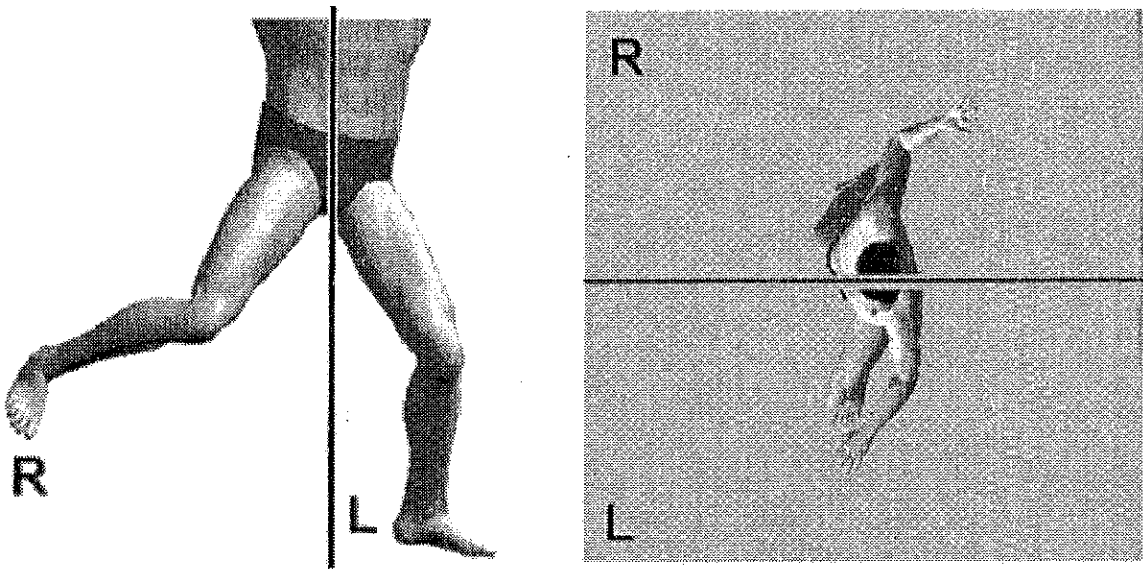
5.10 Square shooter is knocked over on his back.

The poor prep throwing example above is the square-to-the-passer eggbeater water polo player who catches the ball and falls flat on his back. The incorrectly positioned player has the shoulders and hips square (parallel) to the passer. As the ball is caught, the square player falls over on the back because the legs are under the hips or in front (see **Fig. 5.10**).

The preparatory stage is the pre-catch stage before the ball is caught. The correctly positioned prep stage player points the left shoulder and left foot, catches the ball and remains vertical. The prep stage occurs before the ball touches the player's hand. The correctly positioned player points the left shoulder and left foot as the ball is arriving so as to rotate the shoulders, torso and hips backward on the catch and cock the arm. The result: the player remains vertical.

Before the ball ever arrives in the player's hand, all of the future stages of the shooter catching, cocking, and releasing the ball are ruined. The ball caught by the flat-on-the-back player when shot, flies over the cage due to the unbalanced and horizontal position. The player must mentally know that to be square to the ball before the catch destroys the throwing motion.

13. LEFT SIDE, RIGHT SIDE SHOOTING



5.11 Shooter's left side is fixed, is pivot point and points. Right side is mobile and shoots.

Each side of the shooter's body has separate duties to perform during the throwing motion. The left side is fixed, pivots around the left foot and points the shooter's body at the corner. The right side of the shooter's body is mobile, uses the right leg to balance out the shooter and shoots the ball by snapping in the right foot to begin the shot. Both sides of the shooter's body work together to make the complete shot (see Fig. 5.11).

13. NINE COUNTERMOTIONS

1. Square shoulders to goal
2. Falling on back
3. Dragging the elbow
4. Shooting while sinking on the down-kick
5. Falling on side
6. Breaking the wrist to left
7. Breaking the wrist to right
8. Pump fake without hip rotation
9. Female: Dropping the elbow while throwing

The greatest error in the shooter's throwing mechanics is countermotion. Countermotion destroys the shot. Countermotion is the body moving in two opposing directions when the ball is being released. The nine countermotions slow ball speed, curve the ball or lift the ball over the goal.

1. Square-to-the-goal shooter

The square shooter body is square to the goal, with feet, hips and shoulders parallel the goal. To throw the ball the shot requires the body to be angled body. The shooter's left foot is forward and the right leg back so the body can rotate. The square player is knocked flat on the back when catching the ball (see Fig. 5.12).

The problem arises when the square eggbeater player is waiting on the perimeter where it is perfectly correct to eggbeater and is square but not when the ball arrives. The square catcher catches the ball, cannot rotate and falls over on the back.

Because women float they developed a unique catch and shooting style. The girl or woman shooter catches the ball and fall flat on her back. She then scissor kicks up to the vertical with the shoulders, hips and feet square to the goal and throws a weak shot. Males could not use this catch and throwing technique because they sink two feet (61-centimeters) underwater.

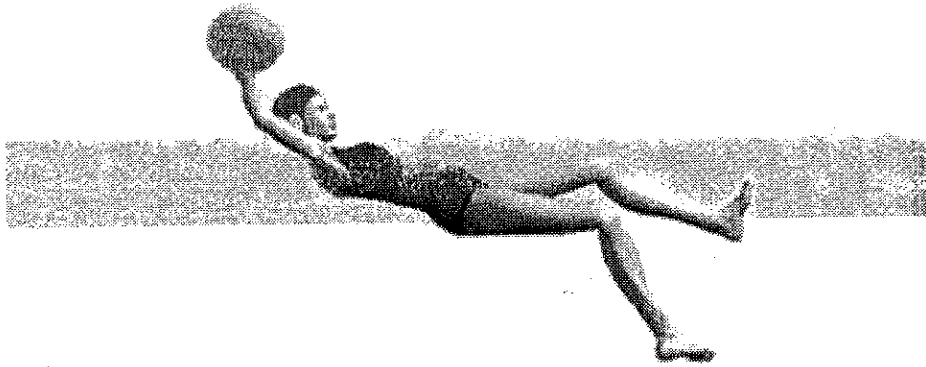
Square shooters are found among females of all ages and in a lot of age group boys. The female's square position in the water is because of their wide hips and buoyant legs. Females have a tendency to keep their legs in front of their hips and high in the water which makes their body square. The female must make a conscious effort to keep the right leg down and straight back behind her hips and to have the left leg forward for proper catching and throwing posture.

Age group boys, on the other hand, have none of these physical traits that would predispose them to falling over. They are following the easy path to catch the ball by falling over on their back. The water is forgiving to the water polo player with poor catching technique. In baseball or softball if the player caught the ball and fell over every time he or she would soon be injured. Whether it is biological or laziness, the water polo player must follow the rules governing the mechanics of the catch and the throwing motion.



5.12 Square: square feet, hips and shoudlers.

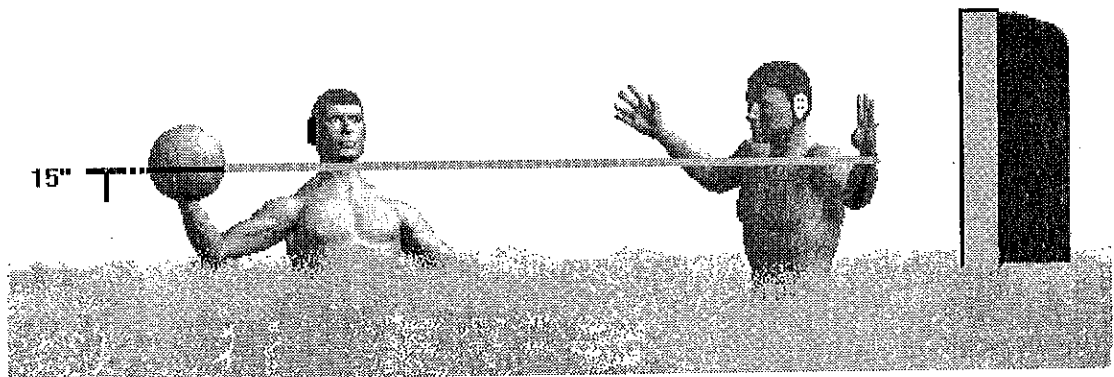
2. Falling on the back



5.13 The shooter falls over on her back and throws high pass or shot.

The player throws a bad pass or poor shot due to the horizontal body position. The player should have a vertical posture. Girls may use an out-date shooting technique where the shooter catches the ball, falls over, scissors kick up and throws the ball with the body square to the goal. Boys may be vertical when catching the ball but fall over on the back due to weak legs that cannot keep the player upright after catching the ball (see Fig. 5.13).

3. Dragging the elbow



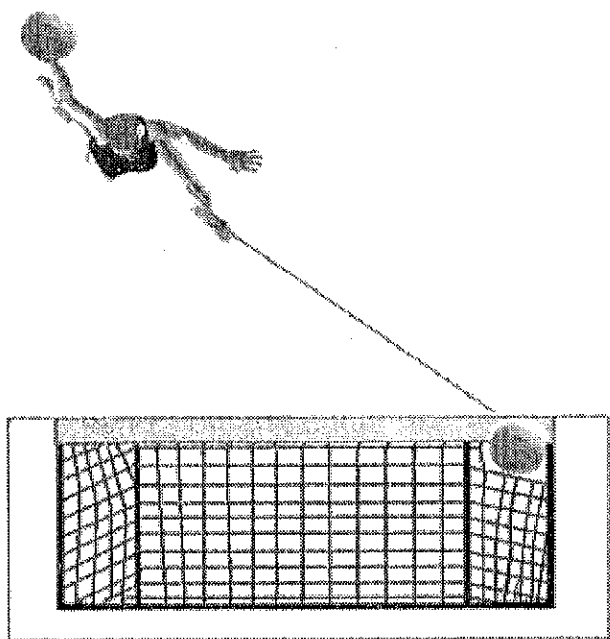
5.14 Shooter has low elbow/release point and aims the ball at the goalie's arm.

The shooter drags the elbow in the water is another example of countermotion and results in a loss of 3 MPH (5 KPH) from the shot because the arm extension is shortened. The longer arm has a greater distance to apply force to the ball and a high ball velocity. Most of these shooters, usually males, are forced to shoot at the low corners of the goal. The goalie reads the low elbow shot and waits to block the ball every time (see Fig. 5.14).

4. Shooting on the down-kick

Sinking is countermotion by the shooter. This action is called shooting on the down-kick. The shooter instead of kicking up to maximum elevation and releasing the ball at the apex of the power curve, waits until he or she is sinking. The down-kick shooter holds the ball too long, sinks down a foot or two and shoots the ball as his or her elbow hits the water. The down-kick shot is thrown weakly at the low corner of the goal because there is no momentum or power left to throw the ball. The shooter must shoot when the right foot snaps down and lifts up the shooter. Many young players are afraid to shoot and hesitate and are sinking when the ball is released.

5. Breaking wrist wide to left of the goal



5.15 Left foot aims the ball at the left corner.

The wide left shot from the point is caused by the shooter's low elbow that causes the hand to turn to the extreme left. The biceps muscle is a flexor (bends) and a rotator. When the elbow drops it automatically turns the shooter's wrist and hand inward so the ball goes left. The inexperienced shooter drops his or her elbow below eye level and into the water due to lazy legs and poor awareness of right elbow positioning (see Fig. 5.15).

Another wide left shot mistake is a cross-cage shot thrown from the above the right post to the left corner. This mistake is caused by the shooter not pointing the left foot at the left corner but to the outside of the left goal post. It is a common mistake

for shooters to make when shooting from the right to the left to over compensate and shoot wide. The shooter did not move the left foot over enough to point at the left corner and hits the goalie at center cage.

Most high school shooters cannot shoot accurately cross-cage due to improper placement of the left foot. The shooter's left foot points the right arm. The ball goes where the left foot points. The same wide left mistake may be caused by over-rotation of the shooter's body. This throwing error occurs in many varsity boys who suddenly, through a growth spurt, have stronger hips and a weaker upper body.

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The shooter's hip rotation is so strong that it over-rotates the torso and the body rotates the left foot from pointing at the left corner of the goal to the outside of the goal. The ball misses the cage by a foot to the left.

The shooter corrects the wide left mistake by pointing the left foot deeper inside the left corner to compensate for excessive hip rotation to the left. When the shooter's hips over-rotate, the left foot is moved a foot to the left. The left foot should be pointing at the exact spot in the cage to score a left corner goal. Shooters may also stiffen the left arm to freeze the torso so it cannot move very much to the left when the hips over-rotate. If the shooter's torso (chest, abs) does not move, the left foot point is unchanged.

6. Falling-on-the-side



5.16 Shooter lies on her side to shoot cross-cage from right wing.

Falling-on-side is the last example of counter-motion. The shooter refuses to be vertical when shooting. The lying-on-the-side shooter has a loss of power, the ball veering sharply wide left, with the shot telegraphed to the goalie. Often, the shooter falling on the side mistake occurs when the shooter is shooting cross-cage from above the right post. The shooter, instead of moving the left foot to point at the left corner, falls on his or her side to shoot the ball at the goal. The shooter incorrectly believes the only way to shoot a cross-cage shot from the right wing is to lie on the side (see Fig. 5.16).

7. Breaking the wrist to the right

When the shooter (usually male) snaps the wrist down the wrist rotates to the right instead of forward. The shooter's weak biceps and pronator muscles that control the hand rotation fail and the hand turns to the extreme right. The ball is thrown wide right of the goal. The right outward wrist-turning situation is corrected by weightlifting. The player performs biceps curls for strengthening the biceps and supinator muscles and dumbbell wrist twists for the pronators to stabilize the wrist. An inexpensive weight device is to tie a 12-inch (30-centimeters) rope around a 2-5 lb (.9 to 2.2-kilos) and around a wooden handle. The breaking the wrist and throwing the ball the right is a strength problem and not a technique problem.

8. Pump fake without hip rotation

The poorly performed pump fake is the result of lack of hip and shoulder rotation. The shooter is square to the goal with both feet parallel creating a very short pump fake arm stroke. The player's left foot must be forward with the right leg straight back so body can rotate. No body rotation = no pump fake.

9. Dropping the elbow in the middle of the shot

This is a girl problem. Due to the angling inward of the girl's elbows she is prone to drop the elbow in the middle of the throw. This countermotion is caused by the girl not having the proper body position with the left foot forward and the right leg straight back. When the shooter is square the elbow drops in the middle of the throw and the ball turns into a lob or a power shot with a curving arc. This is a common problem with young female throwers and must be addressed by the coach and player.

In conclusion, the player must learn the thirteen concepts that govern the throwing mechanics of shooting and the nine countermotions. These are mental concepts that the player must memorize and follow for every shot. The shooter analyzes every bad pass and bad shot to see where the mistake was made. Special attention is paid to the spin of the ball so the pass or shot is accurate. The common mental mistakes made are to think that only the arm throws the ball, that elevation does not matter, that the hips are of no consequence, and that cocking and ball spin are not important.

Each gender has specific mistakes it must avoid. Girls need to catch the ball and rotate backward by pointing the left foot forward and having the right leg straight back for balance to avoid falling on the back, becoming square and subsequently dropping the elbow during the shot. Boys need to lift the elbow high out of the water and also not fall on the back due to weak legs.

SCIENCE OF SHOOTING

The great player eliminates all nine countermotions from his or her throwing motion. Countermotion is the death of the shot. The disciplined shooter remains vertical at all times, points the left shoulder and left foot so the shooter is angled to the goal and is not square, has a high elbow, and shoots on the up-kick and releases the ball at maximum elevation.

When the shooter does not concentrate on the concepts, which govern the throwing mechanics, the shooter's shot becomes slower and inaccurate. Knowing these thirteen concepts strengthens the shooter's throwing motion as does avoiding the nine countermotions. The perfect throwing motion is the physical manifestation of the proper mental image in the shooter's mind. It is a thought before it is a shot. The ball is in the goal before the ball leaves the shooter's hand when the mechanics and the mind are correct.

