

No Lift Delivery

INTRODUCTION

There are many variations of the delivery currently being employed by players across the world. We suggest that the entry level curler use the flat footed, no lift delivery.



LEARNING PROGRESSION

The curling delivery is a complex activity that requires the coordination of a number of different body movements. To correctly develop the delivery, every curler should divide the skill into specific phases of development:

- | | |
|------------|---|
| Delivery A | Stance, forward slide from the hack (without a stone). |
| Delivery B | Entire pullback and forward motion combined with the forward slide (initially without a stone and then with a stone). |
| Delivery C | Entire delivery motion (with a stone) including grip, turns, release and line of delivery. |

Flat Foot Slide

The flat-footed slide is the recommended method of delivery because it provides for optimum balance by allowing the weight of the body to be distributed over the entire under-surface of the sliding foot. The flat foot slide places less stress on the knee than do a number of other deliveries.

No Lift Delivery

New curlers and experienced curlers alike, will find that balance and timing problems are reduced when they do not have to concentrate on swinging a 40 pound granite stone off the ice.

Line of delivery problems are also frequently reduced with a no lift delivery. The stone is placed on the line of delivery during the stance and it should stay on this line during the press, pullback motion, forward slide and the release. This approach makes consistently hitting the target brush at the far end much easier to attain.

DELIVERY LESSON A

Delivery Lesson A introduces the stance, hip elevation and the forward slide.

STANCE

The initial positioning of the body in the hack prior to the delivery is commonly referred to as stance, and is of primary importance if the delivery is to be successful.

Proper stance involves:

- placement of hack and sliding foot
- positioning of knees, hips and thighs
- position of throwing arm and brush arm

Hack Foot (Figure 2-1)



Figure 2-1

One of the keys to the line of delivery in the slide is the placement of the gripper foot in the hack. Always step into the hack from behind. While stepping into the hack, ensure that the foot is pointing to the target. Place the ball of the foot firmly and squarely against the back of the hack.

Sliding Foot (Figure 2-2)

The sliding foot is positioned flat on the ice, parallel to but slightly ahead of the hack foot. The heel of the sliding foot is approximately adjacent to the toe of the hack foot. Body type may impact the positioning slightly for each curler. It is necessary to have some body weight on



Figure 2-2

both feet, so that both legs can assist in elevating the hips.

The sliding foot needs to be parallel to the hack foot and placed so that during the pullback and back-step motions the foot can move straight back.

Position of Hack Thigh (Figure 2-3)

When the curler assumes the stance position, both thighs should be parallel with the line of delivery.

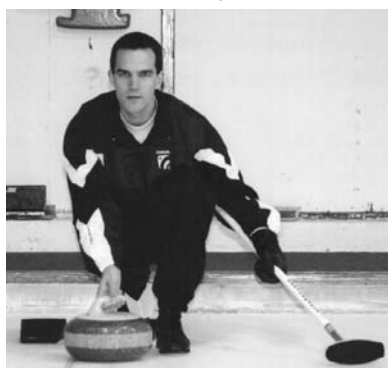


Figure 2-3

Keeping the thighs parallel to the line of delivery helps keep the hips square to the target.

Upper Body (Figure 2-4)

The knee of the hack foot is kept off the ice, enabling the trunk, head and shoulders to maintain a fairly upright position. The shoulders must be level and square. The head should be erect with the eyes concentrated on the target.



Figure 2-4

Delivery Arm (Figures 2-5 and 2-6)

The throwing arm must be comfortably extended at all times, without rigidity or tension. The arm is in front of the body, elbow down and hand in a handshake position. The stone is placed just far enough forward to allow for the comfortable extension of the arm. During the Delivery Lesson A, you will deliver without a stone. When the stone is introduced later, the stone will be placed directly on the line of delivery.



Figure 2-5



The line of delivery extends from the target at the far end to the middle of the hack foot.

Figure 2-6

Balance Arm (Figure 2-7)

The major sources for balance in the stance position are the positioning of the hack foot and the sliding foot. However, positioning of the balance arm during the stance and forward slide is also important. There are at least three positions for the balance arm that will assist with balance.

1. Stretch the brush arm out comfortably from the body with the brush handle extending under the arm toward the back.

The head of the brush should be resting lightly on the ice, slightly ahead of the sliding foot. The brush head is inverted so that the brush head is facing up and the wooden/plastic part of the brush is resting on the ice. The wooden/plastic side of the brush head sliding on the ice produces less friction than if the brush head was in contact with the ice.

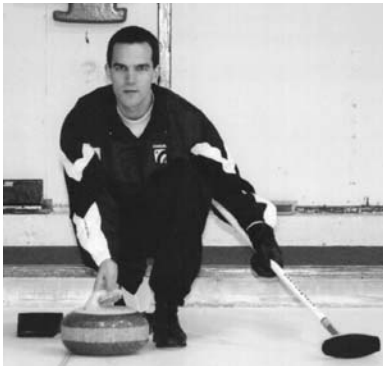


Figure 2-7

2. Curlers who have difficulty keeping the brush handle against their back during the forward slide should bend the arm slightly so that the upper arm may be used to hold the brush handle tightly against the back to assist in achieving stability.
3. Some curlers prefer to have the brush flat on the ice. This method will assist with stability but in many cases it forces the upper part of the curler's body to be very low. An adaptation to the brush flat on the ice is to use a throwing device such as "The Crutch" or "The Stabilizer". The top bar of these delivery aids is the same height as the stone handle. They therefore assist the curler to keep the

upper body erect and their shoulders level. (Figure 2-8)



Figure 2-8

Stance Review

- Step into the hack from the rear.
- Line up hack foot with the target.
- Place ball of the gripper foot firmly against the back of the hack.
- Place sliding foot slightly ahead and parallel to the hack foot.
- Ensure both thighs are parallel to the line of delivery.
- Position shoulders level and square to the line of delivery.
- Position the upper body in an erect position with eyes looking at the target.
- Place the stone directly on the line of delivery.
- Ensure your balance arm is correctly positioned.

FORWARD SLIDE

The key to a successful curling delivery is to develop a smooth, balanced forward slide. From a balanced position it will be easier to accomplish the consistent line of delivery and release motion needed to make shots.

Sliding Foot Position

The key to balance in the delivery is the position of the sliding foot. The sliding foot should be positioned under the body's vertical axis between the chest and the abdomen during the entire sliding motion. The sliding foot is flat on the ice with the weight of the body distributed over the sole and heel. The sliding foot should be turned out slightly to increase the surface base and therefore enhance the stability of the slide. (Figure 2-9)



Figure 2-9

Balance Arm Position

As the body comes forward from the hack, the brush should be positioned with the handle extending toward the small of the back and the brush head resting along the top of the ice. The brush head must be positioned ahead of the sliding foot during the entire sliding motion (Figure 2-10). A brush head, even with or behind the sliding foot, may have a tendency to turn the curler's shoulders off line. Curlers using a sliding device also need to keep the hand position slightly ahead of the sliding foot.

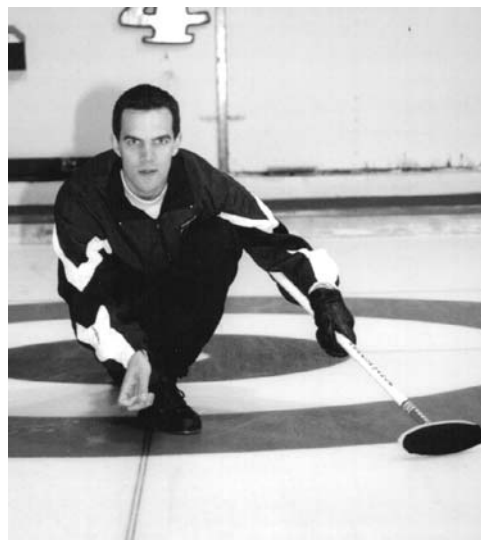


Figure 2-10

Delivery Arm

The throwing arm and hand should remain comfortably extended in front of the curler, with the hand off the ice surface once balance has been achieved. (Figure 2-11)



Figure 2-11

Trailing Leg

The trailing leg and foot should be extended behind the body as far as possible during the forward slide. The position is initially accomplished by flipping the hack foot back into the hack as leg drive reaches completion, thus providing a complete extension of the trailing leg. In most cases, this motion turns the trailing foot over into one of 3 desirable positions:

1. Turned over and slightly in (Figure 2-12)
2. Straight up and down (Figure 2-13)
3. Turned slightly out. The heel should not be in contact with the ice surface. (Figure 2-14)

Note: Curlers may find that the resistance on the trailing foot may be reduced with the application of sliding tape.



Figure 2-13

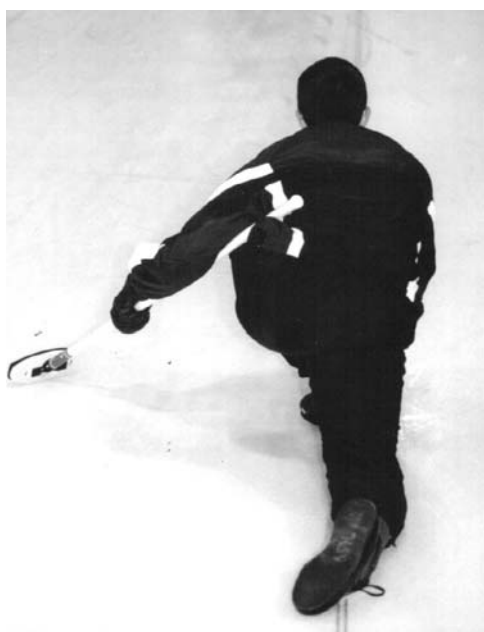


Figure 2-12

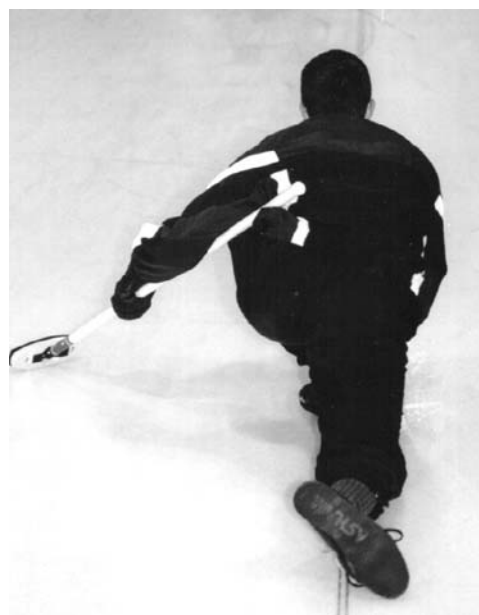


Figure 2-14

Upper Body Position

A fairly upright position is preferred as it allows a correct grip and a high wrist position over the handle of the stone to produce a consistent release of the stone. The shoulders should remain level and square to the skip's brush. (Figures 2-15, 2-16, 2-17)



Figure 2-15



Figure 2-16



Figure 2-17

Forward Slide Review

- Sliding foot flat on the ice under the centre axis of the body.
- Sliding foot slightly toed out to provide a wider base for balance.
- Trailing leg extended out behind – preferably toed in or straight.
- Upper body erect, hips low.
- Shoulders and hips square to the line of delivery.
- Brush head resting lightly on the ice, slightly ahead of the sliding foot.

Delivery Lesson A – On Ice

Note: Make sure to step onto the ice surface with the gripper foot first.

DEVELOPMENT DRILL #1

- Find a position along the sideboards.
- Place your brush on the side boards.
- Slowly stretch out into a final slide position while holding on to the boards with both hands. (Figure 2-18)



Figure 2-18

No Lift Delivery

- Check for a balanced position by trying to lift the delivery hand off the boards, directly in front of the body. Lift the balance arm, off the boards to the side.
- Check the slide foot and trail leg positions.
- Hold the slide position for 10 to 15 seconds and then stand up.

DEVELOPMENT DRILL #2

- Pick up your brush and turn around so that you face away from the side boards.
- Assume the stance position but with your brush flat on the ice, sideways in front of your body.
- Elevate your hips into a semi-crouch position and stretch out into the slide position using two hands on the brush handle for easier balance. (Figure 2-19)
- Add a small amount of leg drive after 3 or 4 stretches from the side boards.



Figure 2-19

DEVELOPMENT DRILL #3

Now that you have developed a certain comfort level with sliding with your brush on the ice in front of you, it is time to place your brush under your balance arm. (Fig. 2-20)



Figure 2-20

- Assume the correct stance position.
- You may now repeat Drill #2 from the side boards with the brush in the correct position. (Figure 2-21)



Figure 2-21



Figure 2-22

Each time you slide from the side boards, focus on one aspect of your slide. Since the key to balance is the sliding foot position, this is the primary focus of the drill. (Figure 2-22)

DEVELOPMENT DRILL #4

Once you have gained a comfort level sliding you can move to the hacks.

- You will now progress to performing the stance, hip elevation and slide from the hack.

Another drill may include:

- Stretching out into the slide position and grasping the brush handle of a second curler (wearing 2 grippers).
- The curler with the brush will then pull the curler in the slide position down the ice. (Figure 2-23)



Figure 2-23

DELIVERY LESSON B

This lesson adds the press, the pullback motion and the forward slide motion skills to the delivery.

This component teaches the sequencing (timing) and weight transfers necessary to perform the whole skill. Good technique and timing are essential to ensure that both stone and body movements are coordinated into a smooth, consistent execution.

Forward Press

The forward press is a slight forward motion of the upper body and arm, which causes the stone to move slightly along the line of delivery. This slight extension produces a small weight transfer from the hack foot to the sliding foot so that both legs may be utilized in elevating the hips. The forward press must be very small (2 to 3 inches at most) and must be directly along the line of delivery. (Figure 2-24)



Figure 2-24

Pull Back Motion

As both legs begin to elevate the hips into a semi-crouch position, the stone is pulled back on the line of delivery. The line of delivery is a line travelling from the target brush at the far end to the middle of the hack foot. During the hip elevation into the semi-crouch position both legs are supporting the body weight.



Figure 2-25

Once this hip elevation has occurred, the sliding foot begins to move straight back thus transferring the majority of your body weight onto your hack leg. The sliding foot should remain flat on the ice and continue to point toward the target. This straight back movement position assists with keeping the hips square to the line of delivery. (Fig. 2-25)

The sliding foot moves straight back beyond the heel of the hack foot and the body weight moves back with it. Once the sliding foot has moved into this back position, a large amount of the body weight is transferred to the sliding foot. At this point there is a very definite pause or stop in the motion. (Fig 2-26)



Figure 2-26

Pull Back Motion – Review

- Press - small forward motion with stone centered on line of delivery.
- Elevate hips into a semi-crouch position (hack knee bent about 90 degrees).
- Pull stone back directly on line of delivery.
- Move sliding foot straight back.
- Transfer body weight to the sliding foot.
- Definite pause or stop in the motion.

Forward Motion

At the completion of the pull back motion a substantial amount of body weight will have been transferred back on to the sliding foot. There will be a noticeable pause prior to initiating the forward motion. Commence the forward motion of the stone by shifting the body weight forward on to the hack foot while maintaining a semi-crouch position with the hack knee remaining bent at approximately 90 degrees (Fig. 2-27). As the transfer of the body weight proceeds, the upper body will continue to lean forward and gradually begin to drop down behind the stone. The forward movement of the sliding foot should be delayed slightly to allow the stone to get out in front of the body and to create space for its eventual position which will be behind the stone and under the chest. The sliding foot will now move gradually forward under the chest to provide balance and slowly in behind the stone in the direction of the target brush. As this is occurring the hack leg will provide the necessary leg drive to produce body and stone



momentum as the majority of body weight is transferred on to the sliding foot.

Figure 2-27

The sliding foot, after staying in the back position for so long, must move quickly forward to take its position under the body.

Once the sliding foot has moved forward, under the body, the body weight is transferred to the sliding foot. At this time, the hack leg provides the forward thrust from the hack. The leg drive should occur as the hack leg approaches the extended position.

Forward Motion – Review

- Transfer upper body weight forward.
- Move stone along line of delivery.
- Delay movement of sliding foot.
- Move sliding foot forward.
- Provide thrust with hack leg.

Delivery Lesson B – On Ice

You are now ready to add the pullback and forward motion to the basic forward slide. To complete these movements in the correct sequence a corresponding rhythm must take place. The basic drill that is used to teach the correct sequence of movements is: ROCK BACK – FOOT BACK – STOP – ROCK FORWARD – FOOT FORWARD – SLIDE – done to a set rhythm.

DEVELOPMENT DRILL #1

- Stand a few steps from the side boards. In a standing position (figure 2-28):

- Position feet as in the stance.

- Position balance arm as if in stance.

- Position throwing arm in front holding an imaginary stone.



Figure 2-28

- From this standing position perform the following sequence while repeating the cadence aloud:

*Rock back
Foot back
Stop
Rock forward
Foot forward
Slide*

DEVELOPMENT DRILL #2

- Take a position along the side boards (a few steps away from boards).
- Assume the correct stance position.
- Perform these movements: *rock back, foot back, stop, rock forward, foot forward, slide*, while trying to establish a rhythm. (Fig 2-29)



Figure 2-29

Cleaning the Stone

In order to ensure that stones travel consistently, the running surface must be cleaned prior to each delivery.

Turn the stone over and clean the running edge with the brush head. (Figure 2-30)



Figure 2-30

To ensure that the rim is clean, rub the fingers around the running edge. (Figure 2-31) On occasion, a small piece of debris may not be noticeable to the eye and may only be identified by feel. A small speck of foreign matter on the running edge may adversely affect the

stone's momentum and direction. Make certain that the slide path and the intended path of the stone are also clean. (Figure 2-32)



Figure 2-31



Figure 2-32

Some small curlers may have difficulty tipping the stone over with one hand. They may need to use 2 hands ensuring not to place their fingers between the stone and the ice.

No Lift Delivery

Repeat the pull back and forward slide drill from the hack with a stone. You should focus on the timing of the stone and sliding foot.

DELIVERY LESSON C – ON ICE

Grip, Turns, Release and Line of Delivery

This lesson completes the delivery instruction for the no lift delivery by adding the grip, turns, release and line of delivery.



Figure 2-33

The Grip

You should grip the handle of the curling stone firmly. The index finger and the thumb provide the major guiding force. Place the index finger close to the gooseneck (the front part of the handle) followed closely by the other fingers. The thumb presses firmly against the

other side of the handle and combines with the index finger to provide grip control. The "V" found between the thumb and the index finger should point to the opposite shoulder. The handle should rest on the second joint of the fingers. The wrist must be kept in a "high" position above the handle. The palm of the hand should not be in contact with the handle. (Figure 2-33)

Turns (Clockwise or In Turn for Right handed Curler)

In order to determine which direction a stone will bend or curl, you must apply a turn to the stone. For many new curlers, the terminology of in turn and out turn can be confusing. It may be easier to classify turns as either a clockwise rotation or a counterclockwise rotation. Using this terminology makes the turn the same for left handed curlers and right handed curlers.

For a clockwise rotation (commonly referred to as the in turn), place the handle while in the stance position so that the handle is slightly counter-rotated

(approximately 60 degrees) against the turn. (Figure 2-34)

The handle position must remain in the same position during the pull back and the forward slide.

(Figure 2A-35)

Approximately one meter before release, the handle is turned with a distinct



Figure 2-35

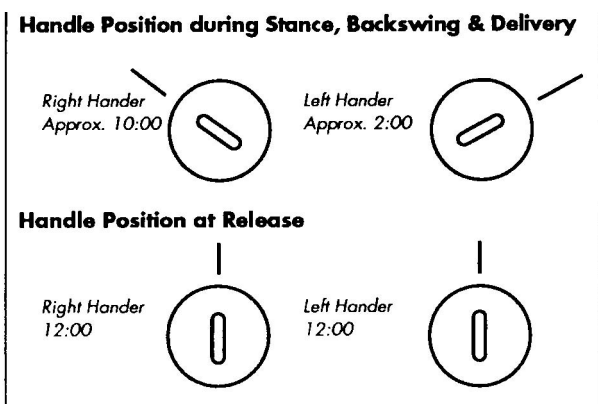
clockwise rotation of the wrist and forearm. (Figure 2-36)

This handshake position is used as a point of reference to allow the stone to be released in exactly the same manner every time. Some curlers may have difficulty in relating to the use of degrees to describe relative position. Another way to describe the turn is to relate to 12:00 being at the front of the stone. In the stance position



Figure 2-36

adjust the handle so that the gooseneck is positioned pointing at approximately 10:00. The handle remains at 10:00 during the pull back and forward slide. One metre prior to release, the handle is rotated in a positive manner to the 12:00 position (see diagram). The thumb and forefinger release the stone at the same time. This rotation will cause the stone to rotate in a clockwise direction. The stone should rotate 2 to 3 times as it travels the length of the sheet of ice on a



In-Turn handle adjustment and release

draw shot. A consistent release is necessary in order for the stone to react in a predictable manner. If there are too many rotations (a spinner) the stone will not curl. If the stone does not have a positive rotation it may lose its turn or act in an unpredictable manner.

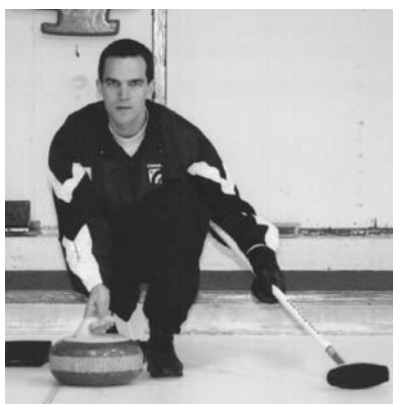


Figure 2-37

Counterclockwise or Out Turn for Right Handed Curler

It is desirable to use the same reference point at release for both turns, that is the handshake position. The counter-clockwise

turn (commonly referred to as the out turn) begins by adjusting the handle approximately 60 degrees against the turn. (Figure 2-37) This adjustment must be maintained during the pull back motion



Figure 2-38

(Figure 2-38) and

the forward slide (Figure 2-39). One metre prior to release, the counterclockwise turn (out turn) is applied by a distinct rotation of the wrist and forearm to the handshake position. (Figure 2-40)



Figure 2-39

To use the analogy of the clock again, the handle is positioned in the stance at 2:00 and one metre prior to release the handle is rotated to the 12:00 position (see diagram on previous page).



Figure 2-40

Position of the Throwing Arm

At the beginning of the forward slide, the throwing arm is comfortably extended. As the body moves forward from the hack, the throwing arm should develop a small bend at the elbow (hardly noticeable) (Figure 2-41). During the forward slide, the arm must remain in this position until just prior to release when the arm is extended slightly towards the skip's brush. This slight extension of the throwing arm assists in developing the correct release motion. Keep in mind that the controlled extension of the throwing arm during release is not a push.



Figure 2-41

Position of Body

As the body slides forward from the hack, the hips are fairly low. The upper body remains in a fairly upright position (Figure 2-42) allowing for a correct grip and a high wrist position over the handle of the stone.

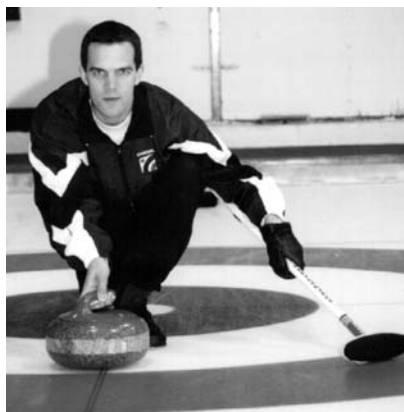


Figure 2-42

The upper body may lower gradually during the final release motion.

Release Point

The release point is that location on the ice when the stone leaves your hand. In actual fact, the release occurs over a distance of approximately one metre. (Figures 2-43 and 2-44)

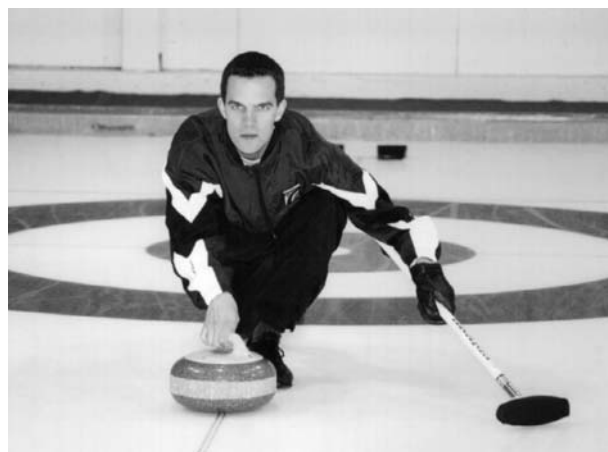


Figure 2-43

The release point will vary depending on the amount of forward momentum applied to the delivery. It is important that the point of release be relatively consistent. A curler releasing draw shots near the hog line and takeout shots near the tee line is not releasing in the preferred manner. The type of shot requested by the skip governs the speed at which the curler leaves the hack, whereas the release zone should remain relatively constant.

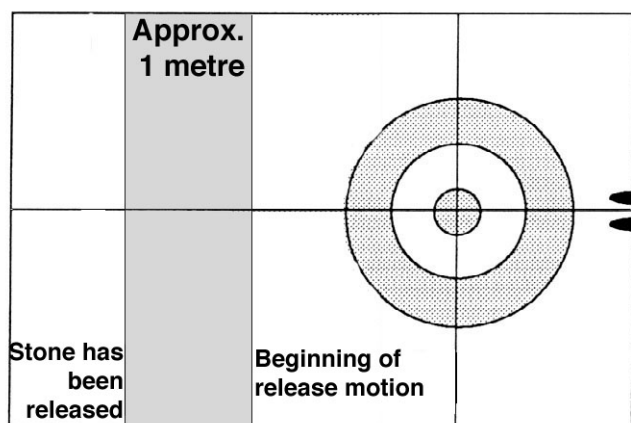


Figure 2-44

Curlers on competitive teams should strive to develop a similar release zone. When all four players release in the same manner and in the same zone their stones should react in a similar manner. It is much easier for the skip to determine the amount of ice required for specific shots when all four curlers' stones react in a similar manner. If one curler uses the same release motion but in a much earlier zone, their stones will have more time to curl. As a result of an early release they may require more ice.

To develop similar slides from the hack, the players should determine the ideal zone for their team (Figure 2-45). Factors that will influence how far you slide include: the force you push from the hack, the quickness of the slider and the amount of friction produced by the trailing foot.

The stone must be released before it reaches the hog line. You should develop a release point that is well back of the line. Occasionally a curler may drive too hard out of the hack and need this extra space in order to release without violating the hog line rule.



Area of Release

Figure 2-45

Follow Through

A proper follow through requires that the eyes concentrate on the skip's brush, the throwing arm reaches forward and the sliding motion continues behind the stone. The throwing arm, hand and fingers are still pointing along the line of delivery to the

brush until the stone is at least a metre away from the release point. (Figure 2-46)



Figure 2-46

Many shots may be unsuccessful as a result of an improper follow through. Actions such as quickly dropping the throwing hand or attempting to stand up immediately after release can affect a shot if they commence just prior to release. The throwing hand dropping to the ice after release often indicates a balance problem. A quick motion at follow through may make the release of the stone inconsistent.

Curlers are urged to allow the slide to come to a stop and to then stand up. Curlers who put their hands or knees on the ice at the end of their delivery may slightly melt the ice producing a flat spot. When a stone moves over a flat spot on the ice the direction and line may be affected. The stone will act as if there is a piece of debris under the stone.

Line of Delivery

The line of delivery is a line extending from the hack foot to the skip's brush or target at the playing end. During the course of a curling game, the target is moved across the sheet. You should visualize an imaginary line running from the target to the middle of your hack foot. To correctly deliver a stone at the target, you must also position the stone on this line.

DEVELOPMENT DRILLS

You and your partner can line up on both sides of the sheet, between the tee line and the hog line. The purpose of this drill is to practice grip, turn and release while pushing stones back and forth between partners (Fig 2-47).



Figure 2-47

DEVELOPMENT DRILL #1

- Curlers should position themselves in two rows, facing each other.
- A stone is provided to curlers on one sideline.
- Assume the stance and grip the stone.
- Signal for desired turn given by partner.
- Adjust the handle for a turn. Perform the pull back and slide the stone forward rotating the handle to the handshake position sliding the stone to the partner.
- Repeat the drill with both turns and each partner taking a turn as the thrower and the skip.

While you are performing the drill, you should focus on:

Grip: Thumb on side of handle.
Forefinger close to the gooseneck.
Fingers close together.
Wrist high, palm off the handle.

Turn: Handle counter-rotated 30 degrees in the stance.
Handle released at 12:00.

Drill #1 may be repeated from the hack. Curlers will execute deliveries with a target on center line at the top of the near house. You are encouraged to maintain the handle adjustment throughout the pull back and forward slide prior to applying the turn.

Line of delivery

The purpose of this drill is to learn how to direct the body and stone at the target (Figure 2-48).

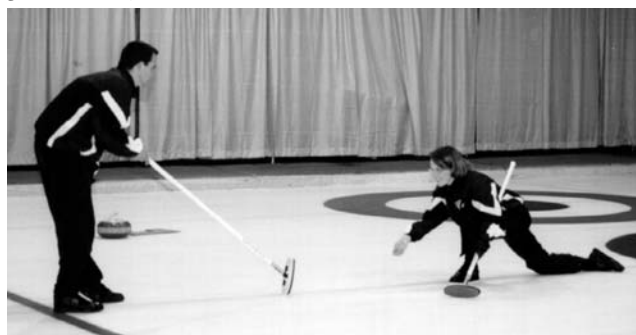


Figure 2-48

DEVELOPMENT DRILL #2

- Position an object, like a pencil, lengthwise on the ice at the front of the house and directly between the hack foot and a brush held between the near hog line and the top of the house.
- Slide at the target and attempt to hit the target with the sliding foot.
- Reposition the “target” at various points on the ice within the maximum line of delivery adjustments.

DEVELOPMENT DRILL #3

- Position target (paper cup) at near hog line or closer for curlers with a shorter slide.
- Slide at target without stone.
- Visualize line of delivery.
- Take stance, close eyes and repeat slide.
- Visualize line of delivery.

DEVELOPMENT DRILL #4

- Position a paper cup at near hog line on centre line.
- Deliver stones at the cup. When the line of delivery is accurate the stone will travel directly in a straight line and hit the cup.
- Execute deliveries with both turns.

- Reposition the target at various points on the ice within the maximum line of delivery adjustments.
- Deliver stones at target (paper cup) positioned 6 feet (2 metres) past near hog line.

Weight Control

It is important for curlers to understand how to control the weight (speed) of the curling stone relative to the shot requested. Weight control skills should be developed after you have spent time practicing line of delivery skills and the release of both turns.

Take-Out Weights

In order to increase weight (speed from the hack) for take-out shots, you must apply more thrust or leg drive. This can be accomplished by:

- Positioning the gripper foot higher in the hack.
- Transferring the body weight further back in the pullback motion.
- Transferring more body weight on to the sliding foot in the pull back motion.
- Delay sliding foot during forward movement.
- Increase leg drive from the hack.

The position of the hack foot will vary with the amount of momentum required to make the desired shot.

For draw shots on quick ice the hack foot may need to be placed lower in the hack. (Figure 2-49). With the foot lower in the hack the your ability to drive out of the hack will be reduced. For shots requiring increased momentum, leg drive can be increased by placing the ball of the gripper foot higher in the hack. This higher position will ensure that the ball of the foot has a solid foundation to push against. (Fig. 2-50)



Figure 2-49

During the pullback motion for takeout weights, the hips must remain low and



Figure 2-50

move further backward. As a result of the hips moving further back the sliding foot must move further back. (To support the weight of the hips, so that the body

doesn't tip over backward.) The sliding foot should move straight back. At all times, the sliding foot must remain pointing at the target. The hack foot may actually rock out of the hack as the body weight is transferred to the sliding foot (Figure 2-51).



Figure 2-51

At the beginning of the forward motion, both knees bend slightly. This knee bend causes the upper body to lean forward and starts the stone moving forward. The shoulders and upper body move forward. The sliding foot stays back as long as possible before beginning the forward motion. The longer the sliding foot stays in the back position the stronger the effect of weight transfer. Therefore, the heavier the desired weight, the longer the sliding foot remains back. The sliding foot, after staying behind the hack, quickly moves forward to take its position behind the stone. In order to move quickly enough on heavy weight hits, the foot may actually be lifted off the ice in order

to increase the speed of movement and to facilitate its positioning.

Weight Control – Draw Shots

The majority of stone momentum in the no-lift delivery is produced by leg drive and body weight transfer. The muscles that produce this forward momentum are part of large muscle groups. These large muscle groups are capable of producing stone and body momentum close to the desired weight. For finesse shots, close may not be good enough. To apply a finer control of draw weight, some curlers use smaller muscle groups to fine tune the control provided by large muscles. You may add small amounts of stone momentum by using either an arm extension, a shoulder drop or a gradual lowering of the upper body.

DEVELOPMENT DRILL #1

Takeout Weight or Draw Weight

- Position gripper foot appropriately in the hack.
- Slide from the hack without a stone.
- Allow the slide to come to a complete stop.
- Place a paper cup at the spot where the sliding foot came to rest.
- Experiment with gripper foot position.
- Repeat slide, transfer body weight further back.
- Observe where sliding foot came to rest.
- Repeat drill attempting to slide to predetermined spots.

DEVELOPMENT DRILL #2

Takeout Shots or Draw Shots

- Deliver a stone with predetermined weight.
- Allow slide to come to a stop.
- Mark spot where slide finished.
- Repeat delivery attempting to duplicate amount of momentum.

DEVELOPMENT DRILL #3

Takeout Shots or Draw Shots

- Deliver takeout shot.
- Partner will use a stopwatch to time stone from first hog line to tee line.
- Repeat delivery, attempting to deliver stones with the same travelling time.

Fine Tuning Mechanism

Finesse shots require a slightly different mechanism for adjusting the weight (speed)

of the stone. The large muscles of the throwing shoulder and arm and the leg drive from the hack are used to make major weight adjustments. The smaller muscles of the arm are used to make minor weight adjustments in draw weight. What do we mean by minor adjustments? A minor adjustment is perhaps the difference of 3 to 6 feet (1 to 2 metres). It is difficult to make minor adjustments with large muscle groups. To make small weight adjustments, curlers use a fine tuning mechanism. The two major methods to achieve fine tuning are using an arm extension or a lowering of the upper body. (Figure 2-52)



Figure 2-52

Using the arm extension method, you will develop a bend in the throwing elbow once balance has been achieved. As you approach the release area and apply the rotation on the handle, extend your arm. If the weight of the delivered stone is correct, you will extend your arm at the same speed as the stone is travelling. You have not applied any extra weight to the stone. If the you determine that the stone is not travelling quickly enough, you will extend your arm faster than the stone is travelling. This extension will add some weight to the stone. If you determine that the stone is travelling too quickly, you need to slide farther than normal and this extra distance will decrease the momentum of the stone. You would be well advised to develop a release zone that is well back from the hog line. Incorporating this extra room into the delivery allows you to occasionally slide farther if needed without fear of violating the hog line.

In order to use an arm extension as a fine tuning mechanism, you must keep the upper body high during the forward slide. A high upper body position also allows the wrist to be maintained in a high position so that the turn can be applied in a positive manner.

Another method used to add a small amount of weight is by gradually lowering your upper body. Slide forward with your upper body in a high position during the final release motion and gradually lower your upper body. If you determine that an additional amount of stone speed is required, lower your upper body faster than normal.

2.6 HACK DELIVERY

Some curlers, because of age or physical limitations are unable to execute the slide delivery. These curlers may wish to learn how to deliver the stone without leaving the hack and therefore do not require a slider.

Four key components of the hack delivery are:

1. Assume a semi-crouch position with the feet staggered to provide a stable base. (Figure 2-53)
2. Adding a backswing motion may assist with producing desired stone speed. (Figure 2-54)
3. An efficient forward stride into an extended body position will assist with both directional and weight control. (Figure 2-55)
4. Grips, turns and release are the same as for the slide delivery.



Figure 2-53



Figure 2-54



Figure 2-55

The Anatomy of the No Back Swing Delivery

by Bill Tschirhart
National Development Coach
Canadian Curling Association

No single technical change has so captured the imagination of the curling world than the **no back swing delivery** (which for the purpose of the remainder of this article shall be dubbed the "no bs delivery" [enough with the snickering]).

There have been videotapes made about this style of delivery and certainly it is an integral part of the curriculum in virtually every nation's instructional program. So why spend more time and web site space on this topic? It's what **hasn't** been said about the no bs delivery that concerns me so indulge me and let me get this off my chest. As those who know my words best would expect, first some history. Two events occurred in quick succession that gave rise to the no bs delivery.

First, ice technicians were provided with the equipment and expertise to make ice that was relatively faster and more consistent than ever before.

Second, juniors used their creativity and intellect to come up with a delivery that was the perfect complement to the "new and improved" ice surface. Many of these juniors had come through the "little rocks" programme at their local curling club. Most of the instructors cautioned the burgeoning curlers to keep the little rock on the ice at all times (more to protect the ice area around the hack I suspect) but it worked for a variety of reasons. It did keep the ice chips around the hacks to a minimum. It was safer. And, most importantly, it made the actual delivery much less complicated than the "industry standard" of the time, the much beloved *back swing delivery*.

It was the simplicity of the no bs delivery that encouraged those neophyte little rockers to stick with it when strength and experience gave them licence to enter the world of full size granite curling stones. It seemed logical to them that if at the point of release the athlete should be more or less behind the stone, why not position the stone in front of the body right in the hack? Great idea, but could one summon enough leg drive to propel that amount of granite at take out velocity? Aye, there's the rub! The answer, through participant observation was a resounding "yes"! But how?

So, we've touched upon the first pillar of the no bs delivery. Position the stone so that it is in front of the part of the body with which the athlete "targets" the brush (see "Eye Dominance: Fact or Fiction"). With due reverence for the aforementioned article, for most of us that means the stone should be positioned close to a spot in front of the hack in which the athlete's hack foot resides. Some coaches and instructors get very precise with this, demanding that all the athletes on the team place the stone so that it is directly in front of a particular toe of the hack foot. Once done, it means that the athlete, the stone and the target brush are on the same line (the line of delivery). Simple!

I'm not going to get into the grip as it's not the focus of this article, but suffice to say that a) the second finger pads should be on the bottom of the handle b) the side of the thumb should be on the side of the handle c) fingers should be together and d) the wrist should be high so that the fingers are approximately ninety degrees to the handle. This should position the hand so that the axis of rotation of the wrist is superimposed on the axis of the stone (directly above the bolt of the stone). Lastly, the gooseneck of the handle should be positioned so that it is at 10 o'clock for the clockwise rotation and 2 o'clock for the counter clockwise rotation so that the stone can be released with the gooseneck at the 12 o'clock position. Well, I guess I did get into the grip didn't I?

Place the ball of the hack foot on the sloped portion of the hack (see "Can You Hack It?") and the entire sole of the sliding foot in contact with the ice surface so that the weight of the body is more or less equally distributed on both feet. The heel of the sliding foot will be approximately beside

the toe of the hack foot. Now the kicker! There should be a space between the feet (about the width of the handle of a curling brush). Stay tuned for the reason.

Now let's look at the sliding device (see "What's With This Stabilizer Thing?"). If you're using a brush as your sliding device, it should be positioned so that the handle rests just above the hip with your hand on top of the handle and the head opposite the stone (throughout the entire delivery). That last part rolls off the lips of instructors and the keys of this computer very easily but it's extremely important and deserves attention. So many curlers hold the brush properly in the hack but by the time the stone is at the critical release point, the head of the brush is now well behind the position of the stone. A good test in practice is to become aware of your peripheral field of vision. If at the point of release, the head of the brush is not in your peripheral vision as you focus on the target, then you might wish to address this issue because when the brush head is not in your peripheral vision, it is going to have an effect (and not a good one) on the position of your body. Essentially, when the brush is not opposite the stone, the body (as noted by the shoulders) is twisted and no longer square to the target. Not good!!! Now that we have the hack position issue settled let's get that stone moving.

Some athletes will first move the stone forward slightly. This is the time honoured "forward press". It's clearly a preliminary movement much like the "wind up motion" that a baseball pitcher will employ prior to drawing the ball back. Our exercise physiologist expert, Dr. Al Reed of the University of Ottawa explains this press motion is a "trigger mechanism" to the delivery of the stone. It is my experience that modern curlers are about evenly divided on this press thing. As of this date (winter 2002) more and more athletes are dispensing with the press since the drawing of the stone back toward the hack accomplishes the same goal. For my part, when working with athletes I leave it entirely up to them. If they use it fine. If they don't, well, that's fine too!

Let's get one thing clear about the entire motion of the stone. Remember, the whole idea behind the no bs delivery is to keep the stone "on the line of delivery". So in all the motions of the stone, both forward and back that's imperative! So, regarding stone motion it may be a three stage event (press, back and forward) or a two stage process (back and forward). Whatever you choose, keep the stone on the line of delivery.

When we noticed so many athletes using this "new" delivery it was assumed that athletes would be able to draw the stone back and forward on the same line with relative ease. We were wrong! We noticed that many athletes were drawing the stone back on the line of delivery but there was a noticeable "bulge" as the stone began its forward motion. Usually this action was small and quick and by the time the athlete was in the slide (what we call "bottoming out") the stone was back on line once again. For my part, I would point it out, or better, the athlete would notice it on a taped delivery but when questioned about it, I would give it a cursory comment and leave it at that. I left it up to the athlete to make the adjustment. If an adjustment was deemed necessary by the athlete, I suggested that the "bulge" existed because the athlete was moving his/her body over the top of the stone. The downward pressure of the body on the stone caused the bulge. The change involved making sure that the stone is kept in front of the body.

Remember that sliding foot? As the stone moves back toward the hack foot, the sliding foot will move backward as well and if you employed that "silly little space" between the sliding foot and hack foot, you will be able to move the sliding foot backward in a straight line. A very good thing!!! Many curlers position the sliding foot in front of the hack foot. When they move the sliding foot backward it must move around the hack foot, usually to a position behind the hack foot. When the forward movement begins, the sliding foot now must move around the hack foot once again. The expectation of the athlete is to now slide straight but the part of the body upon which the athlete is about to attempt that straight slide (see "Straight, Simple, Silent") is following a curved path. Need I say more?

Using the space between sliding foot and hack foot is the best way to accomplish the straight movement of the sliding foot but not the only way. Some very good curlers set up as in the previous paragraph and move the sliding foot in that "C curve" motion but when the sliding foot comes forward around the hack foot, there is a distinct, albeit short, pause. Then the sliding foot

can move straight forward. Some, like Wayne Middaugh, wrap the sliding foot around behind the hack foot then step over the ankle of the hack foot and place the sliding foot back onto the ice to begin the forward motion. From an overhead view, Wayne's sliding foot does move straight. Part of its journey is off the ice.

Of the three methods of moving the sliding foot straight, I recommend the first. The second is OK and the third requires much practice. It's your choice!

We have been referring to the backward movement of the sliding foot but we're really talking about the movement of another body part, the hips. The area around the hips is where the center of the body's weight is housed. That's important to remember!

From that "draw back" position, the stone is moved forward and the sliding foot is moved (go to "Aids to Navigation" and check out the bungee cord aid) into such a position so that you can slide in a straight line with the stone to the release point where it is released with a positive rotation toward the skip's brush. Simple!

Now, about that rub to which I referred earlier and this is where the vaulted no bs delivery's star in the curling heavens dims slightly. First, another history lesson.

For this we need to return to the days of the back swing delivery. Even though this type of delivery is waning, it had some good aspects. There is nothing more natural in the physical world than a pendulum. It wasn't an accident that clocks ran accurately for centuries thanks to the reliability of the pendulum. In the back swing delivery, the delivery arm is nothing more than a pendulum with the stone being the weight on the end of the pendulum arm. Since the length of the arm does not change, the amount that the weight is drawn from its rest position determines how fast the weight moves (my gr. 11 physics teacher would be proud). When back swingers are asked how they change the momentum applied to the stone I often get the answer, "I drive harder out of the hack". That might be true but most likely the curler providing that response does so due to something else that gets changed and that's the length of the back swing. The extra drive from the hack simply allows the athlete to "follow the stone" (another phrase to recall later). Now, to be sure, some curlers with a back swing delivery do indeed control the momentum of the stone strictly through leg drive (with the length of the back swing remaining constant) while still others use a combination of the two. It's imperative that every curler knows how he/she does it since weight control is the most important skill in our game!

To this point, you might wonder why the back swing delivery has largely been replaced. Well, that great attribute just described was more than offset by the fact that when a back swing curler assumes the hack position, the stone will be positioned to the side of the athlete (close to the center line) to allow the stone to swing back on a straight line. When the stone swings forward, the curler had to move his/her body in behind the stone (not an easy feat). Essentially the entire body weight moved across the line of delivery and sometimes (much too often for the club curler) that body keeps moving in a lateral direction making the accurate delivery of the stone a real challenge to say the least! Now we're back to the no back swing delivery which removes that problem entirely. But, what to do about weight control without that pendulum?

This is the "meat and potatoes" of this article and a question I get asked constantly. The answer appears simple, leg drive! But that's not a good answer as it is not entirely accurate from my perspective. Allow me to explain.

Since there is no back swing, there must be something else that must change. Let's, for the sake of argument say that it's strictly leg drive. We have some interesting empirical data on this matter.

My friend Dr. Gavin Reid conducted a study with John Morris. The question examined was whether an elite athlete like John could drive out of the hack with the same force time after time. John was asked to place a very sophisticated insole device into his hack shoe. It measured the downward pressure on this foot. The data was then downloaded to a computer where the appropriate software displayed results for Dr. Reid. The conclusion was that John could not apply a force with his drive leg of equal magnitude in succession. Now, enter the amateur sleuth, yours

truly, to say that I think Dr. Gavin's standards were high to be sure and that the employment of a fine tuning mechanism (i.e. delivery arm extension) plus the brushing affect of two competent brushers more than makes up for a deficiency in leg drive reliability. Nonetheless, it's something to think about. But, back to our weight problem.

If we recall the back swing delivery, the further the weight of the pendulum is drawn from its rest position, the faster it moves (swings). In the no bs delivery, we have something to make up for that "pendulum weight". It's the weight of the body (centered at the hips). If we move it back further, then like the pendulum, we build up kinetic (potential) energy. In the back swing delivery, the release of that energy was easy as the stone's natural tendency was to return to its rest position but in the no bs delivery, we have to make it happen and as my friend from Saskatchewan (Gene Freisen) would say, "This is where the toboggan meets the tarmac!"

From this point on I'm going to use some terms that are now commonplace among instructors. That drawing back of the hips to a certain point is called the "park" position. When the athlete enters the full slide portion of the delivery, we call that "bottom out". The release is, tah dah, "release" (and don't forget "follow through" as the last step).

This is where I'm going to suggest that there is an important similarity (surprisingly enough) between the two types of delivery. In the back swing delivery, especially if the athlete used the length of the back swing as the primary mechanism for weight control, the stone describes an imaginary arc in the air. I suggest that in the no bs delivery, an imaginary arc is described as well but in the no bs delivery, the arc is described by the shoulders of the athlete. On other words, weight control with a no bs delivery is nothing more than a matter of time, the time taken from "park" to "bottom out".

As an example, let's assume that it takes one second for an athlete with a no bs delivery to go from park to bottom out. Assuming no fine-tuning mechanism, just a clean release, the stone will travel a certain distance down the ice. On the next shot, again assuming that all the other parameters of line, release, rotation and no fine-tuning are constant, the time from park to bottom out is 1.25 seconds, the stone will not travel as far. Conversely if the aforementioned parameters are once again constant, but park to bottom out time is now 0.8 seconds, the stone will travel further than either of the first two. Try it with a stopwatch. Stand beside the athlete. When the hips start forward, start the watch. When the hack foot leaves the hack, stop the watch. With a no bs delivery, this park to bottom out section is critical as it's the key to weight control. If you use more leg drive you are simply shortening the park to bottom out time and if you employ less leg drive then you lengthen that time. Look, every curler **MUST** be able to articulate how he/she varies the weight of the stone. The curler who can't is on thin ice indeed!

That's fine as far as it goes but what about the central question? How do I shorten the park to bottom out time sufficiently to generate full take out weight. Here's the "new stuff"!

Think of a large pane of glass positioned at the hacks. When you're in the hack position, part of you is in front of the pane of glass and part of you is behind. When you raise your hips to shoulder height (don't let the shoulders rise more than you have to) and draw them back to that "park" position, you are essentially "loading the gun". The movement of the weight of your body forward and down to the bottom out position is what really propels the stone forward. But, when you're behind the pane of glass, if you were to take the direction of most instructors and "push" you'll go **BACKWARD** since you are **BEHIND** the point where your pushing (hack) foot is located. No, the first motion forward is a **PULLLING** motion as you attempt to break that pane of glass. When you get the center of the weight of your body (hips) over the hack (i.e. breaking the glass), there is a transition from pull to **PUSH**. That transition is not a natural act for many curlers learning the no bs delivery, me included. Generating enough forward momentum then changing from pull to push and doing it seamlessly is no mean feat. Many curlers during initial attempts have a slight pause "at the glass" to be sure the weight of the body is in front of the hack so that push can begin. They literally waste the pull portion. As a result, they cannot summon enough force from the residual push to impart take out weight.

So, there's the key. Draw the hips back to "load the gun" (i.e. develop "kinetic or potential energy") then pull forward as hard as you can until the center of the body's weight moves slightly forward of the hack then push without pausing.

Thankfully, there is another source of power. It's the sliding foot. Essentially, if we get the sliding foot moving quickly, the whole body moves quickly. So, consider lifting the sliding foot from the surface of the ice to get it moving faster. Don't forget how important it is to move it forward as straight as possible. There was a time that we would have not suggested an athlete ever take the sliding foot from the ice surface but for take out weight in the no bs delivery, it's all but essential to do so.

Making the transition from pull to push is the aforementioned "rub" to which I initially referred. That's probably going to take some practice. Oh, practice, what a novel idea!

Stone Placement & It's Impact on Ice Reading By Gerry Peckham

*by Gerry Peckham,
Manger of High Performance,
Canadian Curling Association*

As a skip, coach or interested player, what is your perspective on ice reading as it pertains to the following three team-based situations?

- (1) All players have a no-backswing delivery but prefer different stone placements in the stance.
- (2) You have the combination of backswing and no-backswing deliveries and therefore different stone placements in the stance.
- (3) You have the combination of left handed and right handed no-backswing deliveries and therefore different stone placements in the stance.

These scenarios surface time and again at high-performance camps and coaching seminars across the country. They form a complex issue and anyone attempting to determine the potential impact on ice reading must take a number of factors into consideration before implementing a team approach.

At the root of the problem is the traditional hack that was, of course, designed for the backswing delivery and a centre-line-related stone placement. No-backswing players are at a slight disadvantage, given their preference to commence play with the stone positioned quite close to their hack foot and thus away from the centre line. The quick fix is the three-position hack which is slowly gaining acceptance.

The three-position hack, which is actually a single moveable hack with the added option of a centre-ice location, accommodates different styles of delivery by facilitating a centre-ice stone placement for all players. This "hack" technology hopefully will be standard in the near future and then this entire discussion virtually will disappear.

The main concern that relates to the three scenarios identified above is the impact that different stone placements in the hack have on brush placement at the target end of the ice sheet. Without question, the greater the consistency in stone placement from player to player, the easier it will be to read ice. However, the typical no-backswing delivery player generally places the stone two to six inches closer to his/her body than the backswing player. Most players who have gravitated to the no-backswing delivery on their own prefer a stone placement that approximates the centre of the stone being aligned with the centre line edge of the hack, directly in front of the delivering shoulder. Players who have developed the no-backswing delivery under the guidance of a

Canadian Curling Association certified coach would have received similar direction relative to stone placement.

From a historical perspective, the CCA is certainly not the inventor of the no-backswing delivery. It has been around for years. We have closely analyzed those who perform it at a high level and discussed with them at length the options of stone placement and its impact on ice reading. The general consensus within this group relative to stone placement is to have the individual player place the stone in the position that works best for him/her as opposed to the same position for all players. The impact of stone placement on ice reading does not seem to be a big item for the teams at the top level.

Numerous top-level players have made the transition to the no-backswing delivery in the past few years and in spite of the fact that many of them are playing with backswing teammates...most have arrived at a stone placement to the hack side of the centre line. In simple terms, they are more comfortable and believe they perform better with this setup.

The official CCA perspective on stone placement is quite flexible and often will be influenced by age, experience, strength, body-type and comfort level.

We provide these general guidelines to our course conductors and coaches. Beginning players of any age are encouraged to place the stone almost directly in front of the hack foot to assist them in keeping their stone, sliding foot and body on the line of delivery as the basic skills are being developed. The recommended stone placement for the majority of more experienced and competitive players is to place the centre of the stone on the same vertical line as the centre line edge of the hack and therefore under the delivering shoulder. On teams with both delivery types we encourage no-backswing players to move their hack foot and stone slightly closer to the centre line and thus closer to their backswing buddies. Individual players should not compromise their performance as a result of a change in their stone placement in the stance.

We must consider a number of other factors in attempting to determine the potential impact of a two-to six-inch variance in stone placement on ice reading for no-backswing players delivering with the same hand. We know without many exceptions that the main impact of the no-backswing delivery has been the virtual elimination of the c-curve relative to the path the stone travels during the forward slide. Entry-level players and those who have made the transition have been rewarded with a much straighter line of delivery as it pertains to the relationship of the stone and the body to the intended path [skip's brush].

The main reason for this great improvement in technique when compared to the backswing delivery is related to the great difficulty that exists in keeping the stone on the line of delivery throughout the backswing and forward swing motion. Most players struggle with the difficult skill of bringing the stone back to the ice in exactly the same position from which they picked it up. The tendency is to swing the stone in toward the centre of the body from the top of the backswing which often results in setting the stone down even more in front of the body and thus inside than the stone position and path that is recommend for the no-backswing delivery. Go figure.

This inward movement of the stone from the top of the backswing is the sole cause of the c-curve problem which has the potential to plague the backswing technique from "day one" through competitive play. In attempting a delivery down the centre line, most backswing players will place the stone directly on the centre line in the stance but very few will maintain this stone-centre line relationship during the first six-to-10 feet of the forward slide.

In 25 years of travelling the country adjusting backswing deliveries I have yet to encounter a top-level player right handed player who started the stone too far to their right but have observed hundreds who either start with the stone too far to their left in their stance or set it down too far to their left at the beginning of their forward slide. There are many very competitive backswing players who, when delivering a stone down the centre line, would not get the stone directly over the centre line during the forward slide until approximating their point of release.

This brings me to my main point relative to this issue. In reality, as validated by high speed film, the line of delivery is not straight and pure. It is influenced by two main factors; the body, [out weighing the stone by a considerable margin] which is also in motion in a "somewhat" parallel line to the stone and the release motion which, when performed correctly, often includes a fine-tuning mechanism which is utilized by top players to subtly influence the final path of the stone as it is released.

The lines we would be tempted to draw on the ice, from hack to brush, to reflect the path of the stone would be straight and pure, as if delivered by a mechanical pendulum-type arm. Enter the body —100-200 pounds in motion — about to follow the sliding foot that starts its own journey [in the stance] from a point at least 30 cm [1 foot] away from the straight line the stone is supposed to follow. Upon leaving the hack, the direction the body is traveling virtually takes over and has tremendous impact [often negative] on the path that the stone is hoping to travel. This is the main reason that the skill of directing the sliding foot in such a manner as not to negatively impact the path of the stone is emphasized throughout a player's career.

If you are still not convinced, ask yourself this question: With a brush held on the centre line at the far end as the target, how is it that player A who is left handed and player B who is right handed, start in the stance with their sliding feet at least 60 cm [2 feet] apart slide the entire length of the ice and both arrive at the far tee line with their respective sliding feet on the centre line, where they have been for well over half of the length of their total slide. Their slide paths would have been quite different from the hack to the near hog yet from the near hog line to the far tee line the heels of their respective sliding feet would virtually have been on the same path and traveling in a straight line.

You could not draw straight lines down the entire length of the sheet to reflect this actual path. The path of the slide foot/body has been manipulated along the way to produce the desired result. Because of its sheer weight, the body greatly influences the stone relative to its journey to the brush. When you add the influence of the fine-tuning positive release motion that occurs approximately eight meters from the hack to the influence of the body, how much difference in ice do you require with your backswing delivery that has a slight c-curve than do I with my centre-of-the-stone-to-inside-edge-of-the-hack, no-backswing delivery?

I suggest minimal if any adjustment is required. As a matter of fact the amount of ice required by each player is more apt to be influenced by variances in release as opposed to stone placement in the hack. We encourage players to work at making the path that the stone follows as straight and pure as possible but we all know the game is full of elite players who do not get the stone on the line of delivery until the point of release yet seem to produce consistent results.

Players with no-backswing deliveries who deliver from opposite hacks have a greater challenge to overcome and we suggest they move their respective hack feet and stones as close as possible to the centre line in their setup/stance. This will minimize the influence of stone placement and slide path on ice reading.

Players who can implement a centre-ice stone placement with a no-backswing delivery without compromising performance should never be discouraged from doing so.

As far as I am concerned, the individual performance benefits associated with starting the stone in slightly different positions far outweigh any "perceived" disadvantages. Players and coaches who feel this is still a concern and wish to address it should do so with the assistance of a video camera. It will help differentiate between "real and feel" in that often the difference in ice required, and I repeat, is the result of significant variations in the individual release motions or slide paths as opposed to initial stone placement. Believe me on this one !!

We will continue to analyze this complex issue, consult the game's top players and coaches, and keep you up to speed on any new approaches we encounter or develop.

Straight, Simple & Silent

*by Bill Tschirhart
National Development Coach
Canadian Curling Association*

One of the great delights in working with high performance curlers in Canada and around the world is the participant observations one can't help make. From a technical point of view, it is obvious to this observer that virtually all the best players of our game have three aspects of the delivery which are identical. Music has its "three tenors", comedy its "three stooges", literature the "three musketeers" and now curling has its three S's; **STRAIGHT**, **SIMPLE** and **SILENT**.

I am amazed at how "**straight**" elite curlers can slide. There is nary a hint of a drift in their slides. How do they do that? The key is the position and the movement of the sliding foot.

In the stance or hack position, balance (the real key to sliding straight) is achieved by placing one foot under one shoulder and the other foot under the other shoulder. The "hack foot" (yes, that's the one actually in the hack), will have the toe on the bottom of the hack and the ball on the sloped portion. The "sliding foot" (the slippery one) is flat on the ice with (now follow this) the heel of the sliding foot opposite the toe of the hack foot. Why? Balance!

But the key to all of this is what coaches who have taken N.C.C.P. technical course from me know as "the silly little space".

The space is the distance between the hack foot and the sliding foot while in the hack position. But, most curlers don't do that. Most curlers have the sliding foot on the ice overlapping or directly in front of the hack foot. They say it gives them better balance in the hack (the jury is out on that by the way). Good idea except for one small item. The sliding foot has to "move"! If your sliding foot is in front of the hack foot, you will have to move it around the hack foot in a pattern we call a "C" curve. Think bout this. You want to slide forward in a straight line and the only thing which connects you to the ice you move in a curved path. Hmmm! Bottom line, move the sliding foot as you will, but move it straight. How much the sliding foot moves is the topic of another article.

As the stone moves forward, the sliding foot moves behind the stone. And that's another key. Some players don't have their sliding foot directly behind the stone for a very good reason. It has to do with eye dominance. If you are right handed AND right eye dominant, it is unlikely that you will want to have the stone on the midline of your body. If you did, you wouldn't be seeing the target with your dominant eye, which is your right eye. You probably will shoot off your right shoulder. There was a time when as an instructor I might try to "correct" this fault but I know better now.

Before we leave this topic, let's discuss line of delivery. The athletes with whom I work ALL slide straight. You must do that if you have any hopes of playing this game at an elite level. A certified instructor can teach anyone to do that. It's strictly mechanics. But what's the sense of sliding straight if you slide straight off line most of the time. There is another ingredient which you must do each and every time you execute a shot. You must establish the line of delivery. I enjoy asking players what body part they use to line up in the hack. I get quite a variety of responses from hack foot, to hack knee, to hack thigh, to shoulders to... I rarely get the best answer. It's "hips". You see, the lower extremities can move around without the whole body actually changing direction. Shoulders can't turn much without affecting the entire body. But, move your hips and you move everything. Hips are the most reliable body part for alignment. As a result, I encourage curlers to stand slightly behind the hack, set the hips square to the intended line of delivery, get into the hack, then use some of the secondary body parts such as those listed above. Once you are lined up, forget that aspect of the delivery. If you can slide straight, it's over! Concentrate on the correct weight for the shot!

When I teach level I technical courses, I use a red center line ribbon to demonstrate the various lines of delivery to a new curler. I place one end at the hack and roll out the ribbon to various places in the house at the other end of the sheet.

No Lift Delivery

Now, as a player, I can't help but visualize my red ribbon as I line up behind the hack and reach forward with my hack foot on line with my red ribbon (pay attention to this seemingly useless bit of trivia as it is foreshadowing). By doing this you have established your line of delivery.

Where is the sliding foot during the slide? It should be directly below the base of the sternum (that long, narrow cartilaginous portion of one's anatomy in the breast area which connects most of the pairs of ribs). That's the balance point for most people!

Simple refers to all the movements in the course of the delivery. Extraneous movements can only detract from the purpose of the delivery, which is to propel the stone with the proper velocity on the desired line. Only by examining one's delivery on video tape can one determine if all the movements are required. You don't need an instructor for this. Just ask yourself "why" each time you see a body part move. If you can't come up with a reason for it, then you might get some help. In most cases you'll simply change or remove the movement.

Extraneous movement is a dead giveaway that a curler either does not practise or does not have access to a delivery clinician. Keep it simple! All the best curlers do. You should as well.

Silent, the last "S", is probably the most important. It refers to the release. If you have a million dollar delivery and a two cent release, you have a two cent delivery! It may seem strange that I would describe the release by volume. I really don't mean silent, as in the absence of sound, but rather that it is so smooth, it appears silent. We have all seen curlers whose release looks like an explosion with the hand literally flying off the handle (a noisy, inconsistent release to be sure).

A great release begins with the grip. The second finger pads are on the bottom of the handle. The side of the thumb is on the side of the handle. The wrist is high. This position promotes a smooth, silent delivery.

In the hack, with this grip, the handle is set at either 10 o'clock (for a clockwise rotation) or 2 o'clock (for a counterclockwise rotation). As you slide toward the release point, rotate the stone, with a positive rotation from the initial position (2 or 10 o'clock) through to 12 o'clock. Open your hand (it will now be in the "hand shake" position) and leave it there until the stone comes into your field of vision. Don't look down at the stone as it is released. Remember "simple" and the why question? That's one of the biggies. Why would you take your eyes off the target to watch the stone leave your hand? Is someone going to come out onto the ice and steal it from your hand? If all members of the team use this grip and release, the "look" is the same for all players on the team. Life then becomes so much simpler for your skip. The whole team benefits.

By the way, when was the last time you checked the distance from the start of your rotation until the actual release. It should not exceed the length of a brush handle. Have someone stand along the side line and drop one glove at the onset of rotation, and the other at the release point.

Another thing. As a team, does everyone release the stone at basically the same place? Take four cups and place the numerals 1 through 4 on the bottom of each. Place them at the release point of each player (the lead is 1, the second is 2, etc.) Be sure to check a variety of weights when you do this. If you discover that release points are all over the map, make some changes. This is a team sport.

Oh, by the way, please don't stifle (as Edith Bunker would have said) your follow through. Let your delivery come to its natural conclusion, all the while posing with that release hand. And when you do come to a stop, check to see if you're still on "my red ribbon"). You should be if you slid straight.

Here's a coaching hint. Try to impress upon your athletes that if they are to perfect a curling delivery, they first must understand it. Ask your athletes to describe their delivery in detail. You will be amazed how many struggle to do this. It's the "in detail" part that is the key. If one hitches his trousers or pulls on her panty hose, it should be in the description. If he hitches his panty

hose, you might want a gender test. Once you understand the biomechanics of the delivery, it is easier to examine one's own and then change it.

The three S's, are they evident in your delivery?

You Have the Power!

*by Bill Tschirhart
National Development Coach
Canadian Curling Association*

So you have that brand spanking new no back swing delivery? I'll bet you like it a lot and I'll also bet the ranch you're wondering how on earth you're going to summon enough "power" for full hit weight. You have come to the right place!

Most people have difficulty getting enough weight on their take-outs simple because they only use one or two sources of power from the EIGHT that are available. When they become aware of the other six or seven and choose to add one or two of them, problem solved with power to spare! Let's examine each of these power sources.

LEG DRIVE - Clearly this is the most obvious source of power. But before you engage that quadriceps bundle of muscles in your hack leg thigh, read the article on this web site entitled "*The Anatomy of the No Back Swing Delivery*". It explains when to engage this power source. Actually, everyone should go there right now and read that article before reading on here. I'll wait for you here. I'll deliver a few practice stones over there on sheet four while you're gone.

Interesting about that "pane of glass" analogy don't you think? So many curlers new to the no back swing delivery engage leg drive much too soon. It's important that you make sure the center of gravity of the body is forward of the hack before you push. Be careful that you avoid an excessive push with you hack foot. It can lead to a trailing leg fault. If this is of interest to you, go to the article called "*The Mystery of the Wayward Trail Leg*".

Note to seniors: in the off season, concentrate on strengthening your legs. It's one of the first things to go as we age and with some "care and feeding" those legs can remain strong!

MOVE HIPS BACK – The center of gravity of our body must get moving quicker. Most curlers pull back to a "park position" with the hips. This gives your body a chance to build up some momentum by the time you "break that pane of glass" so that when you "bottom out" in your slide, you're moving with sufficient velocity to execute full hit weight shots.

I caution curlers to be sure that the hips move straight back at shoulder height. Be careful not to raise the shoulders along with that backward movement of the hips. That can cause other problems.

MOVE SLIDING FOOT BACK – The above point cannot be accomplished without the sliding foot moving back as well. The hips must be supported. The spin off benefit is that the sliding foot has an opportunity to also build up speed by the time the curler "bottoms out". The result is more forward velocity.

LIFT YOUR SLIDING FOOT OFF THE ICE – There was a time not so long ago when no instructor would ever have suggested this but it's now commonplace as a reliable source of power. When you lift your sliding foot off the ice, you can move it forward more easily. When you lift your sliding foot off the ice, the height should be measured in single digit centimeters.

DELIVERY ARM EXTENSION – This too would have been mostly taboo not long ago because it sounds so much as though we're suggesting that you "push" the stone. Yikes, I used the "p"

word!!! All sarcasm aside, it really must be thought of as arm extension NOT push. The difference is in the follow-through. If you're going to extend your delivery arm, extend forward directly toward the target. This takes "practice", the other "p" word!

SHOULDER DROP – Along with arm extension, dropping the upper body forward, under control will provide more power. Al Hackner, the notable elite curler from Northern Ontario used this source with great success.

EARLY RELEASE – Think about this! The instant a curler leaves the hack, he/she begins to decelerate. You are moving more quickly at the back line than you are at the tee line, at the top of house, near the hog line until your slide eventually comes to its natural stop.

It stands to reason therefore that an earlier release will provide more power. I caution curlers to use this technique with care as you are going to also diminish the time you have to make adjustments in your slide prior to release.

HIGHER HACK FOOT POSITION – Most people place their hack foot into the hack so that the toe of that foot touches the flat portion of the hack with the ball of the foot on the sloped portion. When one pushes from the hack, the last part of the hack foot to leave the hack is the toe which for right-handed curlers using that popular left hack, can be well worn and smooth. For more power, place your hack foot in the hack so that no part of the hack foot touches that flat bottom portion. The entire hack foot is on the sloped portion. You will be amazed at the extra "push" you will get from this position. Many coaches insist that all shots be delivered from this elevated hack foot position to avoid slips.

Well, there they are! Eight sources for power for the no back swing delivery. No curler needs to engage all eight. Choose those that will work for you and don't forget that "p" word, PRACTICE!!!

It's About Time

by Bill Tschirhart
National Development Coach
Canadian Curling Association

There are many things I love about curling clubs. One of them is the old photographs of players who played this wonderful game many decades and in some cases a century or more ago.

I especially enjoy their attire and equipment. How did they play in a suit and tie? And about that kitchen broom, have you ever tried to sweep with one of those things? Hey, you juniors, that's sweep as in the verb "to clean"! But, one thing really puzzles me. How on earth did they ever get along without what is now standard issue for almost every curler, a stop watch?

Some curlers feel virtually naked without one. But, with all due respect, I also wonder how many know how to use one effectively? Exactly what is it they are timing? Let's take a closer look. It's about time!

There's some basic physics involved. If a stone requires a short period of time to travel down the ice, it requires a relatively significant amount of force. As a result it must be moving relatively quickly. We describe the ice as "slow".

Conversely, if the stone consumes a longer period of time to traverse the same amount of frozen real estate, it requires less force and is moving more slowly, therefore the ice is described as relatively "fast" or "keen".

We'll leave the reasons for this for another article. For now, besides the concept itself, the key to all of this is the adverb 'relatively'. It means everything to the determination and assessment of weight or velocity of the stone.

For all the decades the curlers in those photos used their good judgment to ascertain weight (and good judgment is still paramount), a chronometer (I've always wanted to use that word) would have made life somewhat easier. It provides empirical evidence that either supports or questions the brushers' judgment.

Before we launch into an examination of the various timing systems, let's make some points regarding any timing system.

A TIMING SYSTEM IS ONLY AS GOOD AS THE PERSON DOING THE TIMING.

Hold the watch in your hand so that the "bony" portion between the first and second finger pads of the index finger are on the start/stop button. The thumb is too fleshy and not accurate enough. Practice will make any timer better.

THE VALIDITY OF THE DATA HAS A POSITIVE CORRELATION TO THE AMOUNT OF DATA IN THE DATA BANK.

Time as many stones as possible, yours and those of the opposition.

TIMES BECOME MORE RELIABLE AS THE ICE BECOMES MORE CONSISTENT.

First end times in a given location on the ice will probably not be valid in the third and fifth ends.

STOP WATCH TIMES ARE JUST A GUIDE!

Your own good judgment should be trusted before any time on a stone.

In the early days of stone timing, stones were timed from the delivery hog line to the tee line. When the leading edge of the stone reaches the hog line the watch is started and when the stone comes to rest (hopefully on the tee line), the watch is stopped. Watch the handle. When a positively rotating handle stops rotating, the stone stops moving. Usually the degree of accuracy for this type of timing system is to the nearest whole second. The speed of stones on ice that was average in speed would have rendered a time of about 23 seconds. If the ice "keened up" the timers would perhaps notice that the time had changed to 24 or even 25 seconds. If, on the other hand, the pebble flattened out and the ice slowed down, the watch would report the change as 22 or 21 second ice. If you ever got a time in the single digits, you should stop throwing stones in the curling club lounge on the carpet!

In many parts of western Canada, curlers use a variation of this system. They time the stone from hog line to hog line. If you watch curling on TSN (and who doesn't?) the terrific triumvirate of television curling display the time on the screen from time to time (no pun intended). Average ice under this system reveals a hog-to-hog time of about 13-14 seconds.

I believe the adherents to this system feel that it may provide a somewhat truer reading since the stone is traveling freely at this point, and not under the control of the curler who, heaven forbid, might do some "funny things" to the stone in release. Now who would do such a thing? Of course as a brusher, when the watch is stopped at the "business hog line" some late brushing may be warranted (or it could be confirmed that one's spectator status is indeed prudent).

But a new and radically different system has swept (sorry) the curling world in the last few years. If you attend competitive events, you will notice that brushers are timing the stones from the back line to the near hog line. They call it interval or split timing

Compared to the other two systems, it's a relatively (there's that word again) short period of time. Can that short distance render meaningful data? This scribe firmly believes the answer to be yes!

Whereas the degree of accuracy for hog-to-stop and hog-to-hog is whole seconds, for interval timing it is five one-hundredths of a second. What that means simply is that average ice under interval timing is about 3.40 sec. Under excellent conditions, a practised timer/brusher can distinguish between 3.40 and 3.45 second ice.

No Lift Delivery

Interval timing had its birth some 10 years or more ago in the mind of a curler friend of mine from Kitchener (ziggy-zaggy-ziggy-zaggy, hoi, hoi, hoi, PROSIT!). Being the "animal" sweeper that he was (the body of Hulk Hogan and the intellect of a wood tick to hear Ron Meyers of Swift Current, SK describe him), after sweeping numerous perfectly good tee line draws to the back boards for his skip from London Ontario, Bruce Munro, he needed some help.

The traditional timing system of hog-to-stop could not help in the sweeping department. So, getting out from under the "wood tick" label, he set out to see if he could time an early portion of the stone's path. He tried many different intervals (touchdown to tee line, back line to tee line, tee line to hog line) before he settled on back line to hog line.

Playing on the Ontario cash circuit, he tested his new system in private, not even telling his sweeping mate, Bob Serviss, what he was doing. In fact, he played an entire season, timing stones from back line to hog line, keeping it a secret. Much to his surprise, the system seemed to work.

During the next season, he and his front end mate used the "interval system" (as he dubbed it) for their own shots. The "looks" the two of them got as they talked about 3.40 sec. and 3.45 sec. reflected the novelty of the system. But now there were two converts.

My friend knew he had something when, one day, skip Munro came to deliver a crucial draw. He asked the front end, "Heh you guys, what time are you getting on this shot?" Assuming he meant the traditional time, the reply was, "About 24 sec." "No, no, the interval time!", he retorted (a defining moment in the young life of interval timing).

My friend, now more confident, began sharing his new system. Soon other front ends on the Ontario cash circuit were using it. He also presented it at courses and clinics that he taught as an adjunct to the traditional systems. Today, most competitive teams use the system. It has arrived!

While the system was being developed in Ontario, Andre Ferland was developing the same system in la belle province, with one very interesting difference. In Andre's system, instead of starting the watch from 00.00 seconds at the back line and counting up to 3.40, or whatever the time might be, Andre had his athletes purchase "count down" watches. When the shot is called, his timer sets the watch to the estimated time. When the leading edge of the stone reaches the back line, the timer starts the watch which then counts down to 00.00 sec. At that point there is an audible "beep". If the "beep" occurs before the hog line, the timer knows the stone might be light. Conversely, if the stone reaches the hog line before the "beep", the stone might be heavy. This way, the athlete does not have to stop the watch or look at the time and interpret it. Good idea!

But, as media commentator Paul Harvey would say, now I'm going to tell you the rest of the story. Who would have thought that the greatest value of interval timing (either the Upper or Lower Canada version), and what makes it better, in my opinion, than the other systems, is in practice?

We have all been in the situation where we have some individual practice time and wish to practice draws. The only sheet of ice available has been sitting all day and the frost makes the sheet more like a gravel road than curling ice. What can one learn by delivering draws which have a vapor trail? With interval timing, and a friend with a stop watch, you can practice your 3.3's, 3.4's, 3.5's etc. Who cares where the stones end up? They might have only made it half way down the sheet. Conversely, your club might have very quick ice but your next competition is at a club where the ice is relatively slow (3.2 sec. or 3.1 sec.). Your shots will probably end up at the hack or near the backboards but again, who cares? The bottom line is that with interval timing, you can turn ice at your club into ice at anyone's ice.

In team practice, one of the drills I use at each and every practice is one that I simply call "Time of the Day". In this drill, we establish an interval time. For argument sake, let's say, 3.5 sec. Each player tries to deliver the stone, from back line to hog line, at 3.5 sec. The timer will confirm the success of the attempt. When the players get really good at this, I ask the player to estimate his/her time before the actual time is given. When the players internalize the interval times, then you know you're on the right track.

In pre-game practice, I like the players to do the same thing for at least part of the practice. That is to deliver draws and guess the interval time. There is a psychological component here though. If the player is anywhere close to the time he/she estimates, the confirmation is a hearty "thumbs up". I want the player to have a very positive attitude going into the game.

Regardless of the timing system you use, remember the parameters that are true for them all.

Speed Kils

by Bill Tschirhart
National Development Coach
Canadian Curling Association

When asked what the most important skill might be in curling, I quickly answer "weight control". To illustrate my answer in a high performance setting, I ask the skip of the team with whom I am working to do some role playing with me.

The situation is the search for a new player to fill a vacancy on the team. The dialogue goes something like this: (assume a female team)

Skip: "Bill, we need a player. Might you be able to help us?"

Bill: "As a matter of fact, I do have two players looking for a team."

Skip: "Great! Please tell me about them."

Bill: "Sally is a wonderful player. Her line of delivery is impeccable. She will never miss your brush. She is an arrow in her delivery. Now sometimes she may be a little heavy and on occasion light, but she will never miss your brush. Brenda on the other hand is always close to your target and will be right up the of your brush most of the time but I must admit that occasionally she will be a little "full" and sometimes might be a little "inside" but the most distinguishing feature of Brenda is her weight control. If you want top twelve foot weight, that's exactly what you get. If you need board weight, board weight it is. If it's a tight guard that is necessary, that's exactly what you will receive from her. It's your choice, you may have Sally or Brenda."

Skip: "What's Brenda's telephone number?"

I have done this countless times with teams, and Brenda is selected virtually every time. We innately know that weight control is the key to this game. For a skip to select Sally would be awfully self-serving. That skip must conclude that his/her brush is always in exactly the right place. I don't think so!

Weight control is the most important team skill and it involves more than just the team member playing the shot. It also involves the brushers and their ability to judge the shot and apply effective brushing if required.

When two teams take to the ice, if everything else is equal (mental preparation, physical preparation, game plan, etc.) the team with the superior weight control has a clear advantage. **Teams should spend more time on weight control drills than on any other type of drill over the course of the season.**

Recently, a new device was presented to the curling world by Mr. Bob Martin of Montreal. He calls it the "speed trap" and with apologies to Bob who would describe this invention more accurately than me, it is basically a sophisticated digital timer connected to a laser beam. The timer and the laser are contained in a one litre-sized, black metal box powered by two, 9 volt batteries. The companion piece of equipment is a reflector set at a right angle to a metal base. Both parts of the trap have "felt feet" to protect the ice surface. When the timer is activated and the reflector is situated in such a way as to reflect the laser back to the timer, the first object breaking the laser initiates the timing device and for as long as the beam is broken, the timer records the time in ten-thousandths of a second. When the beam is restored to the reflector, the timer ceases and the elapsed time is read on a liquid crystal display. The device, by the way, only times intervals equal to or less than 9999 ten-thousandths of a second.

If the timing device is placed at end of the hog line, with the reflector on the opposite side of the sheet, then a curling stone breaking the beam will reveal the speed of the stone as it passes through "the speed trap" (the faster the stone, the less time on the "speed trap"). Great, but what are the direct applications? At the National Training Centre (NTC) we use it in four ways.

Since this article is all about weight control, there must be a connection. With the device set up, I ask an athlete to deliver a stone focusing on the feel of the weight. The stone is delivered and the time on the “speed trap” noted. I ask the athlete to return to the hack immediately after his/her slide comes to a stop (without watching the stone as it makes its way down the ice). Then the athlete is challenged to repeat the shot (again without watching the course of the stone). The athlete is then asked to determine if the second shot was delivered with a) about the same weight as the first, b) more or c) less weight than the first. Given that the two stones are the same diameter (and the same stone could be delivered twice to remove the possibility of error in this regard), then we have precise proof that indeed the athlete did, or did not, deliver that second stone with the same weight.

Worthy of note at this point is the degree of accuracy for this device is so precise that it would be pure luck for one to deliver a stone the second time so that all four digits on the display would be the same as the first attempt. Therefore, at the NTC we “truncate” (I have always wanted to use that word) the last digit and use the first three (now measuring in milliseconds). Not only that, if the second stone is delivered within two digits on either side of the first time, then we consider the stone to have been delivered with the same weight.

Allow me an illustration of the previous paragraph. The time on the speed trap for a shot is 1238 ten-thousandths of a second. That time would be read as 123.8 milliseconds. By truncating the last digit, the time would be noted as 124. If, on the second attempt, the athlete delivered a stone anywhere between 122 and 126, that stone could be considered to have been delivered with “the same weight” as the first. When the athlete becomes proficient at this, you might make the degree of acceptable accuracy only one digit on either side of the truncated time (in this case 123 to 125). It would be wonderful if all the athletes could deliver stones with precisely the same weight but it is very valuable for an athlete, if he/she feels the second stone was not delivered with the same velocity, to know that it was heavy or light. When an athlete can do that, he/she is well on the way to achieving weight control. When using the trap in this way, athletes should attempt to duplicate weights at various speeds (i.e. Draw, guard, board, take out, peel, etc.) especially take out weight. It is this coach’s humble opinion that more take outs are missed due to wrong weight than line of delivery. My teams at the NTC ask to use the speed trap on a regular basis. Most make it an integral part of their practice sessions.

You will have noted perhaps that in the situations described above, I purposely asked the athlete to avoid watching the stones. This should be a clue regarding the second use to which we put the “speed trap”. By this time you have probably guessed that it would be useful for matching stones as one can now precisely measure the relative weights of the stones delivered. Stone matching is based upon the ability of the curler delivering the stones to apply the same weight to the stone being tested. The speed trap times are so reliable that differences in weight are readily detected. Two stones, delivered with equal force, should travel to the same spot on the ice. This is wonderful in theory but this theory can break down depending upon other factors, notably path, amount of rotation applied and release technique. Matching of stones could consume an entire article.

The third use to which we put the “speed trap” is to validate timing systems. For the purpose of this article, I will use “interval timing” (timing from the back line to the near hog line). For this test, let’s return to the first scenario (the one in which athletes attempted to deliver consecutive stones with the same weight). Now we inject an interval timer (equipment with the proverbial stopwatch). The timer times the stone on both attempts, then, after the athlete is questioned regarding the relative weight of the second attempt, the timer, based solely on his/her timing data, does the same. The “speed trap” will, of course, confirm or refute both athletes. In validating interval timing, tests so far have proven that interval timing is accurate 95% of the time. For those of you die hard “judgment” devotees out there, can your keen eyes judge the weight correctly 95% of the time? An obvious corollary to this timing test is to add a third person who uses only judgment.

The last use for the “speed trap” is in brushing. For this we return once again to the double delivery test. One stone is delivered “unbrushed” and the second with brushing. Hopefully the brushed stone, given normal ice conditions, will travel further than the unbrushed. It is helpful, in my opinion, for a team to have a database of distances so that they know just how far, on average, they can take a stone. A long distance can be both comforting as well as sobering because “gorillas” on the front end who can drag a stone 10 feet, hold in the ends of their brushes, the power for good or ill. Speed can kill!

For more information on the “speed trap”, you can contact Mr. Martin via e-mail at bob@rockscience.qc.ca or visit the website at www.rockscience.qc.ca