

# The Impact of a Pre-Shot Routine on a Bowler's Psychophysiology

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In the April installment of Slowinski at-large, I explore the impact of breathing on target accuracy. Specifically, I present a research project I completed recently which illustrates the effectiveness of a specific breathing technique on performance. Slowinski at-large The Impact of a Pre-Shot Routine on a Bowler's Psychophysiology In this month's issue, I present a study I conducted at the Kegel Training Center in February 2011 to measure the impact of a two-tiered pre-shot routine on shot execution consistency. The two-tiered process includes an elongated breathing technique as well as an effective, established and proven targeting process. This complete process was designed after a review of research on psychophysiology, the study of the interrelationship between physiological response and psychological aspects of a player.

With the pre-shot breathing protocol added, C.A.T.S. revealed a significant improvement in a bowler's ability to execute more consistent shots. Specifically, six of seven bowlers in the study improved their break point consistency by an average of 4.4 boards more consistency over ten shots with three of the bowlers improving their consistency by over 5 boards down the lane, where it matters most. These bowlers were much more consistent with less errant shots. Six of the seven study participants improved their accuracy in the front part of the lane, with an average improvement in consistency of .79 boards at 15 feet. Finally, five of the bowlers improved or equaled their speed consistency suggesting that the adding breathing technique helped to reduce body and hand tension as well as grip pressure.

## Background

From a literature review on psychophysiology, there is a significant difference in the breathing patterns and body tension of elite athletes as compared with both experienced athletes and novices. These difference comprise heart rate deceleration, heart beat averages as well as body tension levels. To illustrate, Table 1 presents the findings of a study of the breathing patterns of golfers of varying abilities and experience. In this research, Neumann and Thomas (2009) explored the relationship of the respiratory system on peak performance in golf putting. From the study, it was revealed that the breathing pattern of elite golfers is different than experienced and novice golfers

Table 1. Respiratory Pattern of Golfers Immediately Prior to Contact

NOVICE	EXPERIENCED	ELITE	INHALATION	69%	25%	17%	HOLDING	25%	31%	11%	EXHALATION	6%	44%	72%
Neuman & Thomas, 2009														

As the table data demonstrate, heart rate deceleration was substantially different between the elite and other golfers. Seventy-two percent of elite golfers exhibited exhalation patterns in their respiratory pattern. In elite golfers, heart rate deceleration started sooner and was greatest at the point of contact with the ball. The overall heart rate of the elite golfers (mean/average beats per minute) was less than the novices or experienced golfers. Heart rate deceleration has also been linked to tennis performance quality.

Carlstedt (2001) studied the relationship of heart rate deceleration on performance of an elite tennis player. During a winning match, in which the player won 6-4, 6-1, there were 283 decelerating heart-beat intervals preceding 51 action phases (5.55 decelerations per pre-action). Compare this with 112 decelerations prior to 27 action phases in a losing set 6-0,6-1 (4.15 decelerations per pre-action). Clearly, the tennis player had more heart rate deceleration in the winning effort. In addition to breathing differences, elite world-class athletes have less physical tension when executing in their sport. Janson et al. studied one hundred and six athletes (106) who were international, national or club level athletes in technically demanding sports (20 archers, 50 golfers, 17 ski marksmen, 10 min-golfers, 6 rifle marksmen, 2 discus throwers and 1 boxer). In this study, researchers found that elite athletes had less overall tension as well as pre-release tension. Pre-release tension of the international athletes was significantly lower than national or club athletes. Overall tension was lower in international athletes than national or club athletes. Specifically, when the researchers measured the flexor digitorum and the extensor digitorum, the national and club athletes had unnecessary muscle tension while the

international elite athletes had less tension. This was particularly true in the analysis of the golfers, archers and marksmen. The flexor digitorum and the extensor digitorum are located in the forearm to hand and control finger movement back and forth. This, of course, would indicate the level of tension directly related to movement of the hand, wrist and forearm. Tension is increased with the introduction of stress.

Stressful situations are the key to understanding the importance of psychophysiology. When stress or anxiety is introduced, the physical game of athletes can change, impacting the quality of execution during critical competition moments, in particular. Specifically, when one is stressed, the physiological response is shallower breathing. Yoshifumi and Hiroshi (2010) released a study of six male professional golfers and five male novice golfers this past December. These researchers explored baseline putting under normal conditions as well as the physiological changes brought on by the introduction of competition anxiety. Stress was induced by adding a small audience and a monetary reward for performance. The addition of stress provoked a reduction on the height of the backswing for the golfers. Moreover, forward club speed decreased for both amateurs and professionals in the pressure situation. Finally, heart rate averages under stress increased by 10 beats per minute as compared with the normal baseline. From these studies, it is clear that anxiety causes changes in body tension as well as breathing patterns. Moreover, elite athletes have breathing patterns that emulate a heart rate deceleration prior to action. And, heart rate deceleration is linked to performance quality.

### STUDY FOCUS

To improve one's physical execution, the importance of breathing can't be over-stated. Moreover, breathing and physical execution quality is impacted negatively with the introduction of a stressful situation. Accordingly, a purposeful breathing protocol added to the three-point targeting process will dramatically improve accuracy and repletion quality by keeping the individual bowler more focused, reducing body tension and promote hear rate deceleration.

### STUDY PARTICIPANTS

Eight men from the Webber International University bowling program participated in the study. Each player has been trained in the 3-point targeting with quiet eye system and utilizes this as part of their targeting process.

### STUDY PROCEDURE

#### Warm-up

Each bowler was instructed to warm-up until they perceived themselves to be ready to throw ten consecutive consistent shots. Most bowlers took approximately ten shots to warm-up. After the completion of warming-up, the bowlers completed a full ten shots on C.A.T.S. without moving their feet or their eyes. After the ten shots, C.A.T.S. reports were printed and labeled.

#### Instructions

After the eight bowlers completed C.A.T.S., I instructed them on the process they would utilize in their second set of C.A.T.S. Bowlers were told to:

1. Look at the focal point and take a long deep breath. Hold the breath for a full second. Exhale fully.
2. After the exhale, move your eyes to the front target (arrows, dots or foul line). Take another breath while you are looking at the front target.
3. Keep your eyes on the visual front target and go.
4. As you throw, you will exhale.

#### Lane Pattern

The U.S. Open pattern was used in this study. The U.S. Open pattern is a flat 1-to-1 ratio lane pattern and one of the most difficult ever designed.

### STUDY RESULTS

Table 2 presents data illustrating the impact of the pre-shot breathing process. The data represents the specific improvement in consistency of boards and angles. A higher number represents a larger improvement while a negative number reflecting a decrease in improvement.

Table 2. C.A.T.S. Improvement in Consistency of Positional and Angular Accuracy

BOWLER	BALL SPEED CONSISTENCY	in MILES PER HOUR	TARGET ACCURACY @ 15'	in BOARDS	IMPROVEMENT IN CONSISTENCY	Target Accuracy @ Break Point#	of Boards	Improvement in Consistency	Launch Angle Consistency	In Degrees	Entry Angle Consistency	In Degrees
1	0.10	985.06	1.10	4	2	-0.2	0.57	1.9	0.3	0.2	3	-
0.1	.823	.73	0.4	1.4	4	0.1	1.32	5.61	0.8	-1	6	.2
.93	6.01	0	-.04	7	0	-0.25	4.3	.3	.2	5	0.7	0.13
-1.11	0.9	1.1	5*	0.71	0.08	0.26	0.9	1.1				

\* The second set of information for Bowler 5 included consistency over nine shots for illustrative purposes. One shot skewed his results significantly for consistency at 15' as well as the break point.

As you can see from the table, the breathing process helped the bowlers see immediate improvement in consistency, especially down the lane at the break point. The data represents the consistency difference from before as compared with the utilization of the pre-shot breathing process. A positive value represents an improvement in consistency by a number of boards or angle. The biggest improvement area, with utilization of the new pre-shot breathing and targeting process, was break point consistency with an average of 4.4 boards of improved consistency over ten shots. Six of the seven improved their accuracy in the front part of the lane, with an average improvement in consistency of .79 boards at 15 feet.

In addition, here are quotes from the bowlers.

When asked what felt different, the bowlers replied:

- "Before, without this, I was not consistent. This adds something to my pre-shot routine. Now, I can execute the same way each time." (Bowler 1)
- "It allowed me not to rush my shot like I always used to do." (Bowler 2)
- "I felt like I was zoned in on my target." (Bowler 4)
- "I felt more relaxed and confident I could keep my speed more consistent." (Bowler 5)
- "It got my heart rate in rhythm with what I wanted to do. I felt my heart beat slow. In the past, I used to tell myself to go slow but couldn't." (Bowler 6)

## DISCUSSION

The extended breathing protocol obviously aids in reducing the bowler's heart rate while exhaling when throwing mirrors what elite athletes do in regard to heart rate deceleration as well as reduced tension just before and through the point of execution. Finally, taking the deep breathes while targeting the focal point and front target also ensures that the bowler employs a quiet eye. You see this in the bowlers' comments who participated in the study. Heart rate deceleration, reduced body tension during execution and an enhanced quiet eye are contributing factors to excellence in shot-making. When a bowler has a pre-shot routine, with breathing described above, it will improve the likelihood that the bowler will make a better quality shot when it matters most. Specifically, when stress and anxiety associated with a key moment lead to shallow breathing, heart rate increases and physical game tension, this extended process will help bowlers execute better shots, time after time.

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