

Rick McKinney

The United States Archery Team - The Beginning Years-Part 2

The Elite Archer

In my last article I described the very first testing and training camp sponsored by the National Archery Association. With Dr. Charles Dillman, Dr. Topper Haggerman and Dr. Dan Landers, the archers were tested, prodded, and probed in order to understand the makings of an elite archer. The results were very slow to come back to us and it discouraged most of the archers. After all, we live in a society that wants immediate results and that “demand span” is becoming shorter and shorter every day. However, there were useful results and, the more I read them, the more I realized that most of the archers were looking for that magic result that would elevate them to a higher level. This was not to be the case. The results were excellent and they offered proof that certain attributes in an archer will help you improve your shooting, if you are willing to train for them.

Dr. Charles Dillman ran tests on a force platform to see if there was anything that stood out in an elite archer and their shooting performance. What we found out was that the better archers were more stable. However, there was no correlation between a very stable shot and its score versus a less stable shot and its score. We came to the conclusion that there was another factor that corrected the less stable shot resulting in a 10 or 9 anyway. This stands to reason since we are constantly aiming and adjusting our aim while at full draw. Say, for instance, you are at full draw and you start to lean, ever so slightly. This will show on the force platform but if your upper body makes the necessary adjustments so your sight is still on the center of the target, the shot goes well. So, with a slight motion from the bottom, then a correction from the top part of the body happens automatically.

What was also interesting was that on the force platform the center of gravity varied from

one archer to another. This makes sense if you recognize that each bow weighs a different amount and each bow's stabilizer positioning and counter weights causes the center of gravity of the bow to shift somewhat. Also, stance will change the location of the center of gravity of the archer. However, what was good about this test was it showed the archers that, no matter what stabilization you used and no matter what stance you took, it was important to have a strong lower half of the body to keep stability at an optimum.

In conclusion, the scientists did feel that the better the archer, the more stable the base. Thus, the force platform was able to verify that you need good lower stability in order to shoot more consistently.

This was verified when the physiology team tested the archers with a Cybex machine. This machine tested the strength in the extension and flexion of the legs. The basic conclusion was that the better archers had a much stronger relationship of leg strength relative to body size than do lesser shooters. While the average archer had a ratio of body size to strength less than 1 to 1 or lower, the top archer had an average ratio of 1 to 1 or much higher (the two top males were 1 to 2!). Thus, the conclusion was established that leg strength was a good factor to help a top archer achieve a much more stable platform while aiming.

The percent body fat of the archers was also tested for and compared with body size and type. Most of the archers were within the norm for average human beings. The average top male archer was considered ecto/meso while the female archer was considered endo/meso. What does it mean? Well, there are three body types considered in testing the typical athlete: ectomorphs are considered

skinny or linear (great for long distance running), mesomorphs are muscular (like wrestlers or boxers), while endomorphs are more rounded or “fluffy.” With blends of these three types you get a skinny muscular (endo/meso) archer such as Darrell Pace or John Williams while in the women you got a more rounded muscular (endo/meso) woman such as Luann Ryan or several of the Korean women archers. Thus, nutrition and physical training were a necessary for athletes to learn.

Next was some testing on heart rate before, during, and after shooting arrows. It was immediately clear that some archers stressed out a lot during their shots. Heart rates were anywhere from 71 to 126 at pre draw and 88 to 147 at full draw. As you would guess, the lower heart rates were from the top archers. Archers were shown how to breathe properly (in the lower part of the chest versus the upper part of the chest). Also, we discussed ways to lower the heart rate by cardiovascular workouts and mental training. Another thing that came out of these tests was that if you shot right on a heart beat, the shot was normally a very poor shot. Although it would be virtually impossible to “time” your shots to not shoot on a heart beat, it is believed that if archers can lower the heart rates, the better the chances are of shooting off the heart beat. Also, rhythm and timing were discussed as a good method to avoid the “heart beat shot.”

Dr. Landers ran a “reaction” test. As most recurve archers know, it is important to have a good reaction to the clicker. Some people believed that a good archer could react out of autonomic response to the sound of the clicker. The speed of the click to the reaction will be extremely fast if this mechanism is involved. It was never achieved. So since it is not autonomic then reacting to the clicker had to be a conscious reaction. The reaction time from the sound of the click to the actual letting go of the string hit between 0.132 seconds to 0.189 seconds. There was no correlation to the hypothesis that the faster the reaction, the better the shot. As a matter of fact, most of the top archers were just about in the middle of the time frames.

Standard flexibility testing was conducted in order to find out if an archer needed to be very flexible or not. According to the results there was no statistical evidence to prove one way or the other. However, it did appear that those who were extremely flexible or not flexible at all were the lower scoring archers. Thus, extremes in flexibility are not necessary for archery. Being just flexible enough to not cause injury to the body while shooting is all that is necessary.

High speed filming was used to get an idea of how the bow, string, arrow, head, hand, and arms reacted before, during, and after the shot. Although the films were very fascinating, the end result was there was too much information and not enough attention to a specific area in order to learn anything.

There was one particular area of the film testing that helped me. At that time I was using a very stiff arrow with a high brace height. I used to be ridiculed for having the slowest bow on the line at many of the major events. As a matter of fact, in 1977 when I won my first world title I did have the slowest bow on the men's line. This was proven when everyone shot through the chronograph that was set up at the event. However, I was able to prove that speed isn't everything. Winds were strong enough for archers to miss at 90 meters. What does this have to do with the high speed filming? Well, I noticed that my string oscillated rather radically compared to the rest of the archers. After discussing it with several of the archers it was decided that if I lowered my brace height the performance might be more stable. I did and the following year my shooting performance was more consistent and much higher on average than in the past. Since I lowered the brace height I had to drop down one arrow size which gave me not just better stability, but a bit more speed.

Finally, Dr. Landers ran a battery of psychological tests in order to determine what mental attributes the top archers had. There were three major sport psychological tests taken and measured. It appears that they measured areas of Confidence, Focus-Current Movement, Imagery, Self-talk, Thoughts about Past Mistakes, Psych-up, Reassurance, Challenge, and Concentration. The results, although fascinating, were just the beginning of in-depth tests to find out more and, more importantly, what to do about what was learned. These items will be discussed in my next article.



Rick McKinney is one of the world's most decorated archers. He was born in Muncie, Indiana where his father was a professional archer and managed a pro shop. His mother and brothers were also archers. Rick won the 1977, 1983, and 1985 World Championships. He won the U.S. National Target Championships nine times, Field Championships six times, Indoor Championships three times and Collegiate National Championships seven times. He has two Olympic Silver medals, 1984 (Individual) and 1988 (Team). His best score is 1352. Rick is currently President of Carbon Tech, a manufacturer of arrows, in Sacramento, California.