As a coach or elite bowler, it is important that you truly understand how changing your release will accurately alter ball reaction. So, it is now mirror time. Answer honestly.... Do you know how ball speed and loft changes will affect your ball reaction? What about axis tilt, axis rotation and rev rate? How do these alter your ball reaction?

Frankly, as a sport, bowling has too many pro shop operators and coaches who continue to discuss bowling in a one-dimensional manner. It would appear that conventional wisdom states that all bowlers throw the ball with only one release. In my opinion, this does a disservice to our sport. It further perpetuates the idea that an elite bowler need only bowl one way to be successful. Or, worse, it fosters the idea that bowlers can't accurately change as adjustments are required. So, in this perception, ball speed, rev rate, axis tilt and axis rotation is held constant with no ability to change. With a static release, the coach and pro shop guru can whip up and concoct an answer for every bowler. For $300, we will take your 10-degree axis rotation release and have you hooking the lane. Yeah, right!

True, as a coach or pro shop operator, it is important to make recommendations to all bowlers including those recreational bowlers who throw the ball only one way. Yet, at the elite level, or if you want to significantly improve your bowling, a bowler must be able to alter his/her release in order to adjust the ball reaction with knowledge and confidence.

Accordingly, we must begin to spread the message of acquiring a diversity of releases. Bowlers who want to improve should acquire the ability to manipulate and shape shots. Coaches and pro shops should begin to articulate how altering your release can impact ball reaction. Then, they can better help with cover and layout choice.

Specifically, the best bowlers can alter their axis rotation, axis tilt, ball speed, rev rate and loft. Honestly, with one bowling ball and some knowledge, a bowler has the potential to manipulate ball reaction to achieve hundreds and potentially over one thousand ball reactions. So, shouldn't coaches and pro shop operators also espouse the importance of learning how to make your game more

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diverse, rather than merely investing thousands of dollars in a ball arsenal?

In this month’s article, I want to share with readers the research that exists on ball reaction. This information comes from USBC, Columbia 300 and Ebonite. It is intended to be reflection data for readers, not the Holy Grail of knowledge. And, I would rather you be able to master even more diversity in your release. Most importantly, it will provide readers with some valuable information compiled in one article. Research provides us with a starting point. But, you have to use your eyes as well. As I always say, start with research knowledge and then use common sense.

Overview of general principles

First and foremost, as a bowler, you should understand that the bowling ball will transition through three distinct phases: skid, hook and roll. So, when watching your bowling ball travel down the lane, you should always ask yourself three main questions as you observe your bowling ball: 1. How far? 2. What shape? and 3. How strong? These three questions translate into the length of skid, the trajectory shape and back end reaction strength.

In a ball reaction nutshell, both loft and ball speed contribute to increasing skid and decreasing overall ball reaction. Rev rate, axis tilt and axis rotation impact the overall length, ball shape and the back end strength. As each of these three increases, in general, the length will increase and the back end strength will grow increasingly stronger.

How does axis rotation manipulation alter ball reaction?

As mentioned earlier, as you increase your axis rotation, the bowling ball will skid further and have a stronger back end reaction. In essence, the earlier the bowling ball enters into the roll phase, the less back end reaction you will have and the less entry angle you will achieve. Research at Columbia 300 revealed that a bowler can obtain 5 more boards of back end strength by increasing the release from 30 to 45 degrees of axis rotation. Specifically, with this 15 degrees of axis rotation increase, the entry angle would also increase from 3.1 to 4.5 degrees.

Moreover, when a bowler increases from 45 degrees to 60 degrees, 3 more boards of additional back end hook are achieved, plus an increase in entry angle from 4.5 degrees to 5.6 degrees. According to research at USBC, Six degrees of entry angle has been proven to maximize strikes.

From this information, you can see the value in learning to change your release consistently to change the amount of axis rotation. You can achieve 8 extra boards of back end or a reduction of 8 boards, between 30 and 60 degrees. For more information on how to accurately alter your axis rotation at release, see my 4-Point Release System article in the February 2007 issue of BTM.

Note: The research was conducted with a ball thrown at 270 rpm and 18 mph. These variables were held constant in an effort to only change the axis rotation to measure the amount of ball reaction change would occur in axis rotation.

Revolutions (rev rate)

Who hasn’t wanted more revolutions or dreamed of having the hand of Rudy “Rev“ Kasamaki or Robert Smith? But, with all of the jaw dropping awe produced with some individual’s rev rate, revolutions remain one of the most desired and least understood skills in bowling. To learn more about how increasing and decreasing revolutions affect hook, Columbia 300 completed some research on this important domain.

From the research findings, we learn that for each increase of 30 revolutions, the ball will cover two additional boards of hook. So, with an increase of 60 revolutions, a bowler can achieve 4 extra boards. With each 30 rpm increase, the entry angle will increase by approximately 0.5 degrees (i.e., 1/2 degree).

As you can see from the numbers, it is important to be able to adjust your rev rate, up or down. Sometimes, you need to cover fewer boards to score high. On the other hand, being able to increase revolutions is important as well.

In addition to added boards of hook, increasing your revolutions will also increase the amount of push past the oil line. In a project at the USBC Equipment Specifications and Certification Department, research revealed that rev rate was more important to “push” than ball speed. Specifically, the results of 14 test bowlers, on a 37-foot sports pattern, demonstrated that as revolutions increased, the amount of push increased as well. Yet, for those who can achieve a rev rate higher than 350 the amount of push decreased as it increased.
How Much Can You Alter Ball Reaction? What the Research Says

On a note of interest, CATS data has illustrated that most elite bowlers (220+) have a ball speed of 19.1 mph and a rev rate of 363 or higher. From the data table, you can see that the bowler in the 300 revs and 18 mph range may be achieving too much push. This extra push can lead to over/under situations too often. Sound familiar? If so, work on increasing your rev rate.

**How does surface preparation effect ball reaction?**

Most knowledgeable pro shop operators or coaches will agree that the surface of the bowling ball plays the highest percentage in regard to ball reaction. This is generally agreed upon to be between 60 and 70 percent of ball reaction. And, at the elite levels, additional surface tweaking with sanding techniques can make the difference between winning and losing. So, it is critical for bowlers to understand how surface preparation can alter bowl reaction.

Ebonite recently published findings from their Research & Development department. Specifically, they explored how various Abralon pad grits impact ball reaction. Surface preparation is an important element of elite bowling. Abralon pads come in various grits. The following grits were reviewed by Ebonite: 360, 500, 1000, 2000, 4000.

The question to ask is how much extra length can be realized by sanding with a high grit pad as compared with a low grit pad. Or conversely, how much earlier can a bowler get the ball to hook and roll? Ebonite found, on a shorter high volume lane condition, a bowler could achieve 2.5 feet extra of length, using a 4000 grit surface as compared with a 360 surface pad. Corresponding to the extra length of the higher grit pad, the breakpoint was further right (for righthanded bowlers) with a reduced back end movement of 2 boards (6 versus 8) leading to an increased entry angle.

**How does ball speed impact overall hook and entry angle?**

In an effort to determine the effect of ball speed on ball reaction, Columbia 300 also conducted research on this relationship. Specifically, they found that an increase of 1 mph (1.6 kph) led to a decrease in 2 boards of hook. In addition, the findings demonstrated that entry angle decreased .2 for every MPH increase.

This is also an important area to be able to change ball speeds reliably. This finding should facilitate reflection on why ball speed and rev rate should match when playing a certain release.

**A reference system to help you manipulate**

As a coach, I have one mission: to improve bowler's knowledge and skill. Knowledge plus practice leads to skill. Skill leads to confidence. Confidence, based on skill and knowledge, leads to dollars or medals, winning.

If you want to be a better bowler, it is time to learn how to manipulate your bowling ball reaction. I have created a Bowler Reference System to enable bowlers to do so accurately and consistently. My goal, as a coach, is to help all bowlers to repeat more consistent shots by introducing key references. I will provide more information on this system at a later time, both in a book and in BTM. But, it promises to help you produce the most complex ball reactions with relative ease. It is easy to teach and easy to learn.

Bowling is a sport. And, it is time that we as a collective global bowling community better understand the complexity of ball reactions and the ability of bowlers to change releases with knowledge about what to expect. And, we need to espouse this complexity to the masses. As illustrated in this article, axis rotation, rev rate and ball speed all have a different impact on the bowling ball reaction.

This data is a starter place for readers. Bowling is a very complex and dynamic sport. But, with this information, you have much of the research base in one spot. Now, you have more specific information on the impact of various release contributions to ball reaction.

**References**