



A Visual Profile of Major League Hitters Dr. Daniel Laby, Dr. David Kirschen & Tony Abbatine

Since 1992, our group has been interested in studying the differences between the visual functions of professional baseball players and the general population. Since that time, we have tested approximately 1500 players from the Los Angeles Dodgers and New York Mets major and minor league systems. We tested each player with a series of visual function tests consisting of three main types: Visual Acuity (sharpness of vision), Stereo Acuity (depth perception) and Contrast Sensitivity (being able to pick a target out of a background).

The Visual Function of Professional Baseball Players

The results of visual acuity testing were most surprising. Certainly we felt that professional baseball players must have excellent visual acuity, but we were surprised to find that 81% of the players had acuities of 20/15 or better and about 2% had acuity of 20/9.2 (the best vision humanly possible is 20/8). The average visual acuity of professional baseball players is approximately 20/13!

Similar results were noted on distance stereo acuity testing. Seventy-eight percent of the professional baseball players were tested with superior stereo acuity this far exceeded the results on the general population. Our research clearly shows that baseball players have much superior distance stereo acuity. In fact, there was a three-fold difference between the number of baseball players achieving superior stereo acuity when compared to the number from the general population.

Our final area of focus has been on contrast sensitivity. Due to the importance of this function to both visual acuity and visual function on the playing field (i.e. tracking a white ball against the stands, or against a cloudy sky), we used three tests of contrast sensitivity. Our results indicate that baseball players have significantly better contrast sensitivity than the general population. There were also differences noted between major and minor league players.

In addition to the standard tests of visual function, we have also evaluated the effect of hand-eye dominance patterns on the performance of professional baseball players. Several studies have sought a relationship between these functions, but none have included both major and minor league populations. Our data demonstrates that hand-eye dominance patterns are not related to batting average for hitters, or earned run average for pitchers.

Although visual acuity, stereo acuity and contrast sensitivity are important to baseball excellence, they alone are not enough to make a major league player. In order for a player to be successful he must learn to integrate and master these visual functions while playing in a game. A concept like visual memory, where an object's representation is stored and its memory is recalled in future similar tasks is important. A superior player must use visual functions to quickly and properly identify the fine details of an object (such as a pitch or a fly ball), in order to produce a mental image of the object and allow for correct identification the next time an identical or similar object is seen. This may be important in recognizing the spin of the ball as it leaves the pitchers hand or the movement of the pitch as it moves along its initial trajectory.

Could Ted Williams see the ball hit the bat?

Although Ted Williams reportedly had excellent vision – he is unlikely to have followed the ball from release to contact with the bat. Despite decades of little league coaches emphasizing the importance of “keep your eye on the ball”, professional baseball players have learned better! In fact, it is physically impossible for the human eye to track the baseball from the pitcher's hand to it striking the bat. The human eye simply cannot move fast enough to keep up with major league pitching. Instead, players depend on all of the visual functions detailed above (as well as the performance skills detailed below) to follow the initial path of the pitch and then predict its final location as it

crosses the plate. The task of the hitter is to put the bat where he thinks the ball will end up over the plate, where the optimal point of contact between the ball and the bat will occur. Although Ted Williams was unlikely to have seen the ball strike the bat, he probably could see the red stitching on the ball and could predict its final position over the plate 4 out of every 10 times he was at bat.

The Hitters camera: it's all about adjustments

Although the human eye muscles (extra ocular muscles) are the strongest muscles in the body, when considering the weight they move, they do not exist in a vacuum. In order for a baseball player to make use of these muscles, he must master their control and develop an efficient pattern of use. Although there is no need to "strengthen" these muscles in the classical sense, a player can re-educate the muscles. By repeatedly viewing a specific task, the neuromuscular system can be re-educated to work quickly and efficiently to move the eyes into the proper position for viewing an oncoming pitch, similar to how fielding practice can create muscle memory. For example, a player who repeatedly views a baseball with different spinning seams will likely be able to train his visual system to notice these patterns quickly during an actual at bat. The human visual system works more efficiently when scanning, sweeping and hunting as opposed to staring at a specific target. By building a visual memory of the correct use of the eyes during practice, the batter will be able to more successful when faced with a live at-bat situation.

The Visual Dynamics of Hitting

Vision can be negatively affected by the stress of the hitting situation. Once the player is in control (he has his mental game locked in) he must use his visual skills on a consistent basis. Ask hitters where they are, **visually**, ("what are you looking at?") as the pitcher begins his delivery. Many hitters will not be able to describe their visual game plan or they will reply that they are "soft-focusing" and then watching for the release point. Implementing established principles of the human visual system can assist hitters in improving the "picture" they rely on to hit. A slight improvement in a hitter's visual mechanics (allowing for an earlier recognition of **where it is and what it is**) is crucial to long-term hitting success at the college and professional level. The following techniques will allow hitters to improve their visual game._

Don't let the ball play you; the Scan and Hunt strategy

The eyes are in their most natural and tensionless state when they are gazing and scanning. Staring or fixating on an object leads to a diminished clarity of vision. Hitters must learn to trust their eyes by "getting off" the pitcher to maximize their visual acuity (sharpness). The traditional soft-focus method of watching the pitcher leads some hitters to over focus (lock-up) and restricts their ability to gaze and scan to the release point. Suggest to your hitters that they should find a comfortable "route" to the pitchers throwing side so as to avoid the visual "locking" that inhibits a clear picture of the oncoming baseball. Over teaching the "release point window" restricts many hitters in scanning for pre-pitch cues and also inhibits their visual rhythm as they prepare for ball release.

Find your groove: Visual Independence

Hitters must take control of their field of vision as they prepare for the oncoming baseball. Many hitters inhibit their ability to observe pre-pitch visual cues (arm slot, wrist angles, elbow height, head tilt) by over-fixating on the pitcher or parts of his body. Hitters should experiment with different gaze routes to the pitchers release point. As all coaches preach, hitting involves timing and a certain internal rhythm. The hitter's visual mechanics should be no different. Locking in to the pitchers tempo and horizontally shifting (right to left for a RHP) to the release point may not be the ideal "road map" for all hitters. Hitters should be encouraged to take their own routes to the release point so that minimal attention is given to the pitchers tempo and body movement. Popular "routes" described by

professional hitters include approaching the pitchers throwing side from the **back, shortstop side,** and from the **front of the mound.**

Separating the good from the best; Visual Stress Response in Hitting

The intensity of the at-bat, or more accurately, the intensity with which an at-bat is pursued, is one of the more important factors involved in visual stress. Intensity relates to the degree of physiological arousal created by the hitter. As a general rule, the greater the intensity with which a visual task is approached, the greater will be the stress response. Game observations of hitter's ocular (eye) actions have allowed us to classify professional hitters into three visual categories as they approach an at-bat. Certain hitters exhibit a **catatonic (fight) approach** to the at-bat; exerting maximum visual concentration and maintaining an intense desire for achievement. The second category we have called the **fright approach**, which consists of a paralysis of action; just staring at the pitcher; immobilized to effectively recognize where the ball is coming from and what type of pitch is being thrown. Hitters with high strikeout totals and/or missing breaking balls by significant margins are typically found in these two visual categories. The **syntoxic (flow) approach** involves pursuing the at-bat with the least amount of pressure or tension, flowing with it, not becoming upset if the at-bat is difficult. Classic behavioral medicine tells us that a psychological acceptance of a visual task will make it less stressful. It is no coincidence that hitters that genuinely enjoy the challenge of an at-bat see the ball sooner and clearer as a result. The eyes are no different than other hitting muscles. Increased tension and over-exertion (bug-eyes) will decrease focus flexibility and restrict eye movement. Significant improvements of a hitter's game performance must start with an examination of their visual mechanics.

Real-game practice: Visual Mechanics must precede all swings

Effective pre-game and practice swings should always have a game-like visual start. Hitters should execute their individual routes and tracking patterns prior to looking at the ball on the T or swinging from a soft-toss drill. Besides giving the eyes an effective stretch, the hitter is rehearsing the entire hitting process needed for game situations. Hitting practice with no visual component is similar to a pitcher preparing to pitch in a game while warming up in the bullpen 45 feet away from the catcher! Markers in the back of the hitting tunnels or baseballs positioned near a team's soft-toss or T-stations will provide for a visual start to each practice swing. We have all heard the maxim; "Perfect practice makes perfect performance"; adding the visual process to all practice swings will simulate game hitting. No different than making mechanical adjustments in their swing, hitters can adjust their **visual mechanics** to achieve long-term game success.

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