

Batter Up!

A Black Belt steps up to the plate with Six Sigma confidence.

Bill had a problem. His company's baseball team wasn't doing that well, and he was part of the reason. Bill was in a long slump. Frankly, he stunk at the plate.

But Bill is a Six Sigma Black Belt. He decided to approach his batting problem just like he would approach any process problem at work—by conducting a designed experiment. First, Bill determined which factors are important. He wrote up a lengthy list and then winnowed it down to four experimental variables (see Table 1).



Bill decided to spend a few evenings and weekends on the practice field swinging at 100 pitches for each of the 16 combinations of the four variables needed to conduct a full-factorial experiment. The field was equipped with a pitching machine that could be programmed to throw pitches at either 60 mph or 80 mph. Bill decided to count any ball that went past the infield in fair territory as a hit. Over a two-week period Bill was able to complete the experiment, producing the results shown in Table 2.

The analysis indicates that factors B and D, and especially the C-D interaction, make big differences in Bill's performance. Factors A and C do not have a significant effect on Bill's batting average. The analysis in Table 3 shows the details.

The 95-percent confidence interval for C (position in the batter's box) includes zero, meaning that C is not statistically significant as a main effect. (C is included because the significant C-D interaction term requires it for statistical reasons.) However, the other factors in the table—B (choke on the bat) and D (speed of the pitch)—are statistically significant. The most important factor is the C-D interaction, which has an impressive effect of more than 9 percent.

Table 1: Experimental Variables for Hitting

Factor	Name	Unit	Type	Level 1	Level 2
A	Foot position	Angle	Categorical	Square	45°
B	Choke on bat	Inches	Numeric	0.000	2 in.
C	Position in box	N.A.	Categorical	Forward	Back
D	Speed of pitch	mph	Numeric	60 mph	80 mph

The coefficient estimate tells us what happens to Bill's batting average as we go from one level of the variable to another. For example, when B is at the high level (choke up on the bat two inches), Bill's batting average improves by about four percentage points.

The analysis indicates that when Bill is facing a pitcher with real heat (80 mph isn't too bad for an amateur pitcher), he can improve his batting average from 8 percent to 28.75 percent by standing near the back of the batter's box (see Table 4). Conversely, when Bill is up against a 60-mph hurler, he's better off in the front of the batter's box (38.75 percent in front hits vs. 15 percent in back). Combining all of these results, Bill's strategy is to always choke up on the bat and position himself in the batter's box depending on the expected speed of the pitch.

Bill may not be ready for the majors with this strategy, but he's hitting a lot better than the .206 (20.6%) he'd been getting without a strategy. In the meantime, Bill, work on hitting that fast ball!

About the author

Thomas Pyzdek is an Arizona Diamond-backs fan and a consultant in Six Sigma. He has written more than 50 books, software and training products, including *The Complete Guide to Six Sigma* (www.qualityamerica.com).

Pyzdek served on the first board of examiners for the Malcolm Baldrige National

Table 2: Bill's Batting Experiment

Run	Stance	Choke	Position	Speed	Hits
1	45°	2 in.	Back	60 mph	13
2	Square	0 in.	Forward	60 mph	28
3	Square	2 in.	Forward	80 mph	14
4	45°	2 in.	Forward	60 mph	38
5	Square	2 in.	Back	80 mph	27
6	45°	0 in.	Back	60 mph	11
7	Square	0 in.	Back	60 mph	13
8	Square	2 in.	Forward	60 mph	40
9	Square	0 in.	Back	80 mph	19
10	45°	0 in.	Back	80 mph	23
11	45°	0 in.	Forward	60 mph	34
12	45°	0 in.	Forward	80 mph	5
13	Square	0 in.	Forward	80 mph	2
14	Square	2 in.	Back	60 mph	23
15	45°	2 in.	Forward	80 mph	9
16	45°	2 in.	Back	80 mph	31

Table 3: Significant Factor Effects

Factor	Coefficient Estimate	95% CI	
		Low	High
Intercept	20.63	18.90	22.35
B-Choke on bat	3.75	2.03	5.47
C-Position in box	-0.63	-2.35	1.10
D-Speed of pitch	-4.38	-6.10	-2.65
C-D	9.38	7.65	11.10

Table 4: Bill's Results

Pitch Speed	Batter's Box Position	Average
Slow	Forward	38.75%
Fast	Back	28.75%

Quality Award. He is a fellow of the American Society for Quality, an ASQ-certified quality and reliability engineer, and a recipient of the ASQ Edwards Medal.

Pyzdek is also the President of the International Quality Federation (www.iqfnet.org). E-mail him at tpyzdek@qualitydigest.com.