

STANDARD DEVIATION: TOO MUCH INTO?

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The nice thing about writing for a nice man like Dave Brennan is that he just points his authors downrange and lets 'em launch literary BBs. Therefore, I am abusing my privilege of a semi-regular column by expounding upon the subject of my choosing, in this case standard deviation (SD). Before I proceed, let me waffle enough to get a free meal at IHOP. What follows is to be read "in the spirit of the discussion," not necessarily keeping with the letter of this discussion, nor any that have gone before. True statisticians are free to correct any mathematical, metaphysical, or incense-burning errors they may detect here, and I will correct their gunsmithing advice.

A common complaint that we hear at Accuracy Speaks, Inc. sounds like this: "My ammo isn't good enough on the chronograph but it shoots good" is not in fact cause for alarm. After all, if you're "shooting good" (however that may be defined) it probably doesn't matter a hoot what the chronograph shows. Remember NRA High power Shooting Rule No. One: the proof is on the target, not on the chronograph or loading bench. Rule Two says that Rule One may not be amended. Many shooters--perhaps most--work up five- or ten-round test samples and make their handload decisions based on those figures. I submit that such tiny samplings don't even begin to scratch the surface of the SD and other mathematical equations, let alone put a dent in same. Remember that you'll be shooting 20-shot groups for score. But if you're going to obtain meaningful info on SD, you need at least dozens, preferably scores, and probably hundreds of readings. Five groups of ten rounds each is just a starter. Let me put it this way:

If I gave you a box of Federal 168-grain .308 and said, "Go shoot it," would you? Hell yes you would! So would I! Virtually all service rifle records have been fired with Federal or 852 ammo. You know it's good stuff and probably wouldn't worry about the SD of those 20 rounds. In fact, service rifle records are fired by people who usually don't know or really care about standard deviation. The champions are shooters, not mathematicians. But that box of ammo isn't representative of all the millions of rounds produced. It is only typical of that tiny sampling, and even within that box, there will be velocity differences that we can manipulate to our liking. Some philosophy for a minute: aside from what is the Meaning of Life, what is Standard Deviation? We define it as a measure of consistency within a very large sample, and only valid in comparison to similar large samples. Remember, 100 rounds is merely a small start on the road to the All-Knowing Service Rifle Oz. Accuracy Speaks decided to illustrate this example by putting 20 rounds over a chronograph. The ammo was Federal "red box" from Lot No.

3250183491, fired by the All-National Guard Rifle Team at Camp Perry in 1992. We ranked them in order fired, then by velocity, highest to lowest:

Velocity in order fired Ranked by velocity

1 2586 1 2610
2 2560 2 2605
3 2560 3 2586
4 2569 4 2586
5 2566 5 2585
6 2501 6 2585
7 2539 7 2581
8 2534 8 2574
9 2586 9 2569
10 2548 10 2566
11 2530 11 2565
12 2610 12 2560
13 2605 13 2560
14 2585 14 2556
15 2581 15 2548
16 2585 16 2545
17 2545 17 2539
18 2574 18 2534
19 2556 19 2530
20 2565 20 2501

SD 25.91

The fastest round fired (2610) was No. 12 while the slowest (2501) was No. 6, an extreme spread of 109 fps--barely four percent difference. The greatest variation among any five consecutive rounds was about 80 fps. (Just to show that we're ahead of you deep thinkers, we admit that the small samples for some of our .223 data were insufficient. But it was what we had at the time, and Dave had a deadline, and we had to make a living.) When we needed the formula for determining SD, we asked no less an authority than Kevin Thomas of Sierra Bullets. He stuffed our chronograph numbers into his handy-dandy computer which spit out the following info:

SD ranking of five-shot groups

No. 1 No. 2 No. 3 No. 4

2586 2501 2530 2585
2560 2539 2610 2545
2560 2534 2605 2574
2569 2586 2585 2556
2566 2548 2581 2565

SD 9.56 27.30 28.38 13.87

The lowest SD of these groups was No. 1, which remained in single digits with 9.56. The greatest was No. 3, which rang the gong at 28.38 with the other two leaning toward those extremes. But let's consider the best and worst from the entire "universe" of those 20 rounds:

Closest 5 shots Widest 5 shots

2586 2501
2586 2530
2585 2534
2585 2605
2581 2610

SD 1.85 43.5

The extreme spread of our closest five-round group was merely 5 fps while the ES of the widest five shots remained 109. Within the whole sample, 16 five-shot groups of consecutively-fired rounds ranged from that same 1.85 to 15.25, and that isn't very much difference. Remember, the worst SD of any five shots was 43.5, based on a spread of 109 fps. The average for the whole sample was a SD of less than 26. But in a match you're going to shoot all 20 of those rounds, not merely the "best" five or the "worst" five. As cumbersome as it sounds, the only way truly to know the SD of your ammo is to chronograph every shot fired at your load development sessions and in practice. After awhile you'll start seeing a pattern as to which loads are most consistent with desirable SD--however you define it. The more info in your SD pool, the more data you use and the more valid your info becomes. (If this sounds like too much work, then find the ammo that shoots good and go practice shooting good.) Some folks insist on single-digit SD numbers; others look for figures under 20. Whatever floats your boat. But don't fool yourself with tiny samples, and don't drive yourself crazy trying to reconcile small groups on the paper with "undesirable" SDs. When in doubt, go with What Works. As Sam crooned in Casablanca, You Must Remember This: if you, your rifle, and your ammo are an MOA combination, you'll shoot lots and lots of Xs. Your problem is in firing perfect shots with perfect wind doping, so stop worrying about a lousy quarter-inch in total group size. The folks who take home the trophies and get their pictures in the magazines are the best technicians ("An expert is somebody who has mastered the basics.") Two minutes equals the 10 ring, and lots of us can hold that steady most of the time. But how many get a crisp sight picture, a perfect surprise break, and gauge their wind throughout an entire match? Damn few. My business is like most other gunsmiths: we make our living selling the tools that can help make you competitive. But there's no way you can buy a championship. It's like auto racing: Gomer Pyle in a Porsche probably won't beat Mario Andretti in a Yugo. So quit worrying about higher mathematics. Instead, go practice...preferably with a match-grade rifle from Accuracy Speaks, Inc.

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